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Roles of Kasetsart University in Promoting Agricultural Education for Sustainable Development

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Kasetsart University (KU) was the first higher education institute to offer agricultural education in Thailand. With a strong emphasis on basic and applied agricultural research aimed at feeding the Thai people and promoting their economy, KU has been the destination of choice for students across Thailand wishing to take advantage of the university's innovative research and educational opportunities. With the increasing acceptance of sustainable agriculture as mainstream in Thailand, KU has pledged innovation and promotion of education and research in a diverse range of areas of sustainable agriculture and development.

KU's Faculty of Agriculture offers a master's degree program in sustainable agriculture. With growing public recognition of the program and with financial support (especially in the form of scholarships) from KU's International Study Center, the Sustainable Agriculture Master's Degree Program has been recruiting more students, including those from overseas. From 2007−2011, the Faculty of Agriculture provided a 2-week-long training program, the KU-UT Internship Program in Sustainable Rural Development, to over 30 master's degree students from the University of Tsukuba (UT). Under the strong partnership between KU, UT, and the Japan International Cooperation Agency, this internship program was one of KU's most successful projects and a model for other KU training programs. The KU-UT Internship Program offered ample opportunities to UT students (mostly from African and South East Asian countries) to learn about, engage with, and experience agricultural systems in Thailand that have embraced the concept of sustainable development. KU also promotes university-wide programs that address social and environmental problems and then employ sustainable approaches to find solutions. With 16 agricultural research stations and four student training centers located throughout Thailand and ready to serve as experiential laboratories for students, KU can boast of readiness and leadership in education on sustainable agriculture and development.

Key words: Kasetsart University, sustainable agriculture, sustainable development

Introduction

Thailand is located in the heart of the South East Asian Peninsula and is well endowed with fertile land, including that in the Chao Phraya Basin or Delta. Rice—the most economically important crop in Thailand—has been planted on this central plain since as long ago as the Sukhothai Era in the 13th to 15th centuries. Driven by the concepts and practices of the "Green Revolution" in the mid-1960s, Thailand was transformed from a country with subsistence-level production to one with the ultimate goal of large-scale production for export. During the period 1950−2000, with an average annual growth rate of 6.6 times the Thai gross domestic product, a 2000% increase in total output and a 700% increase in per capita output, Thailand became one of the fastest-growing countries in the world (Karel, 2001).

Some drawbacks have accompanied the benefits gained from the Green Revolution and the commercialization of agricultural systems. Intensive use of fertilizers, pesticides, and herbicides has caused land

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degradation and soil erosion and has had adverse impacts on humans and the environment. In addition, in 1997, Thailand experienced a financial crisis and an economic slump that subjected people throughout the country to more hardships. As a consequence, the agricultural practices based on the Green Revolution have shifted toward a more ecosystem-based approach, namely sustainable agriculture (Pookpakdi, 2006).

In fact, the principles of sustainable agriculture were understood by Thai national policymakers before the turn of the millennium (Amekawa, 2010). The Seventh National Social and Economic Development Plan (1992−1996) was the first evidence of the country's keen interest in sustainable agriculture. From the Eighth Plan (1997−2001) until the present one (the Eleventh, from 2012 to 2016), there has been an increasing trend toward the incorporation of sustainable agriculture into real-life agricultural practices (National Economic and Social Development Board, Thailand, 2012; Reunglertpanyakul, 2002). The rapid and extensive acceptance of sustainable agriculture in Thailand is due largely to the 1997 birthday speech given by H.M. King Bhumibol Adulyadej, Thailand's current and beloved king, regarding "the return to sustainable agricultural systems" instead of heading toward "modern agriculture."

In showing strong support for sustainable agriculture, the Office of the Commission on Higher Education, part of the Ministry of Education that supervises the standards of basic and higher education in Thailand, has developed and implemented a 15-year plan (2008−2022) to inspire students at all levels to incorporate the concepts of sustainable agriculture and development into their daily lives (Office of the Commission on Higher Education, Thailand, 2008).

Chinnasri and Chinnasri (2011) illustrated the status of educational programs and courses on sustainable agriculture at different universities in Thailand. Kasetsart University (KU), the Asian Institute of Technology, Chiang Mai University, and Thammasat University offered formal undergraduate and graduate studies in sustainable agriculture. KU, in addition to providing a master's degree course, had developed subjects that were related to sustainable agriculture.

Our objective here was to examine the roles and readiness of KU in supporting education on sustainable agriculture. We examine the formal educational courses and a training program offered at the university. We also describe the university's 16 research stations and four training centers and their specializations that act as the important instruments to help the students achieve and appreciate the beauty and value of sustainable agriculture.

Formal programs on sustainable agriculture

The Faculty of Agriculture offers a master's degree program in sustainable agriculture. The academic calendar is from August to December for the first semester and from January to May for the second semester. Interested students can select a study path that is either research or coursework oriented (Kasetsart University International Student Center, 2013). Students can graduate within 2 years, equipped with knowledge and experience in sustainable agricultural methods. The KU International Student Center has played a pivotal role in supporting the program by awarding scholarships each year to two foreign students. With better and more extensive promotion of this course to the public, it is anticipated that more students will enroll. KU is well known in Thailand as the first agricultural institution in the country (Kasetsart University, 2009). The future of the program remains bright and promising.

Another formal program administered by the KU Graduate School is "Sustainable Land Use and Natural Resource Management." This graduate program offers courses leading to a master's degree or PhD (Kasetsart University Graduate School, 2011, 2012). The courses are recognized for their unique approach as shown by the increase in the numbers of students every year. Over 100 master's degree students and approximately 50 PhD students are currently in the program. The Faculty of Environment at KU is also a good example of the strong commitment of the university to concepts in sustainable agriculture (Kasetsart University College of Environment, 2013). The Faculty was established as the College of Environment in 2000 and was later upgraded to the Faculty of Environment, with the aim of widening the scope of its mission and responsibilities. The Faculty of Environment offers study programs toward MS and PhD degrees.

Sustainable agriculture training program

An internship program on Sustainable Rural Development was run jointly by the University of Tsukuba (UT) and KU from 2007 to 2011. KU was the host institution during a yearly 2-week-long training and field trip in Thailand. During the 5 years of the program, 37

Table 1. Countries of origin and numbers of participants from each country in each year of the Kasetsart University-University of Tsukuba Sustainable Rural Development Internship Program offered by Kasetsart University during 2007-2011.

Country	No. of Participants	Years of Attendance (No. of participants in that year)
1. Bangladesh	2	2007 (1), 2011 (1)
2. Ghana	10	2007 (1), 2008 (2), 2009 (3) 2010 (2), 2011 (2)
3. Indonesia	2	2008 (2)
4. Kenya	7	2007 (1), 2008 (1), 2009 (2), 2010 (2), 2011 (1)
5. Lao PDR	2	2010 (1), 2011 (1)
6. Malawi	2	2007 (1), 2008 (1)
7. Malaysia	1	2007 (1)
8. Nigeria	1	2011 (1)
9. Philippines	1	2007 (1)
10. South Africa	2	2008 (1), 2009 (1)
11. Sri Lanka	1	2007 (1)
12. Thailand	2	2007 (1), 2011 (1)
13. Vietnam	1	2007 (1)
14. Zambia	3	2007 (1), 2008 (2)
Total	37	

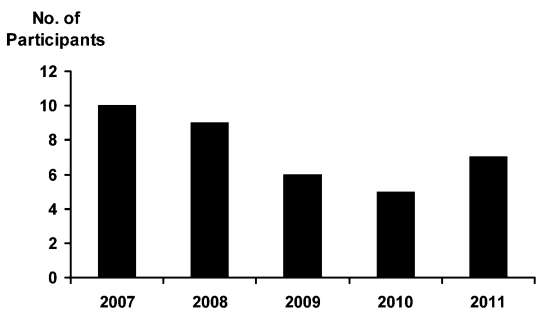

Fig. 1. Total numbers of participants in the Kasetsart University-University of Tsukuba Sustainable Rural Development Internship Program offered by Kasetsart University during 2007-2011.

participants from 14 countries in Africa, South Asia, and South East Asia attended the training course and field trip in Thailand (Table 1). Ghana had the greatest number of participants and Kenya the second greatest. Each year, the number of participants ranged from five to 10 (Fig. 1). In the training program at KU, members of the Faculty of Agriculture, the Faculty of Economics, and the Faculty of Engineering helped to introduce UT students to successful research work and projects that embraced the concept of sustainable agriculture and development as their main theme. UT students were provided with a wide range of opportunities to attend lectures and visit the following successful sustainable agriculture centers:

1. Khao Hin Sorn Royal Development Study Center

The Khao Hin Sorn Royal Development Study Center is located in Chachoengsao Province in central Thailand. The center was established in 1979, with a main emphasis on tackling the problem of soil erosion in this area (Office of the Royal Development Projects Board, Thailand, 2004, 2012). In addition to learning about soil-erosion-related problems and solutions, UT students were able to study the New Theory Farming System, which was introduced to Thai farmers by His Majesty the King of Thailand. According to The New Theory Farm System, the average Thai farmer's fields (2.4 ha or 15 rais; 1 rai＝40×40 m) are divided into four parts at a ratio of 30:30:30:10: 30%, or 0.72 ha, is used to make ponds for fish culture, 30% is devoted to field crops and vegetables, 30% is for rice paddy fields, and 10% is set aside as the family's living area

and for animal husbandry.

2. Kung Krabaen Bay Royal Development Study Center

The Kung Krabaen Bay Royal Development Study Center is located in Chanthaburi Province on the east coast of Thailand. It was founded in 1981 with the prime mission of conserving mangroves and using sustainable aquaculture appropriately (Office of the Royal Development Projects Board, Thailand, 2004, 2012).

3. Huay Hong Khrai Royal Development Study Center

The Huay Hong Khrai Royal Development Study Center was established in 1982 and is situated in Chiang Mai Province in Northern Thailand. The main projects implemented at this center are the development of agricultural techniques and irrigation systems appropriate to the watershed landscapes of northern Thailand (Office of the Royal Development Projects Board, 2004, 2012). Additionally, crop cultivars have been exclusively developed to generate income for northern farmers and to fit into agroforestry systems.

4. Chao Phraya Abhaibhubejhr Hospital

Chao Phraya Abhaibhubejhr Hospital has pioneered the introduction of Thai herbal products for sole or complementary use (along with modern medicines) in curing health problems in Thai people. The hospital is located in Prachinburi Province about 120 km east of Bangkok. The process used to produce herbal medicines at the hospital is standardized and meets Thai Good Manufacturing Practice standards and international regulations. The hospital also uses raw herbal materials from special areas or villages that employ organic and chemical-free agriculture. The medicinal plants are subject to regular inspection to ensure the safety and efficacy of the products.

In addition to visiting these successful centers, UT students spent 2 or 3 days in villages to observe the ways of life of the local Thai people and interact with these people. This was also an ideal time for the students to apply their classroom knowledge to real-life situations. In addition, students were able to learn from, absorb, and even experience for the first time the local villagers' wisdom. A village next to the Kung Krabaen Bay Royal Development Study Center in Chanthaburi Province and another village (Nong Sarai) in Kanchanaburi Province were selected as the sites for these visits.

The Sustainable Rural Development program also allocated 2 or 3 days for the students to learn about specific subjects or areas of personal interest. UT students, accompanied by KU faculty members who were specialists in the students' areas of interest, visited cassava and rice paddy fields, tomato fields, and factories processing various crops. Other students who had chosen to focus on soil fertility were taken on field trips to learn about and explore many aspects of soil conditions in Thailand.

Readiness of KU to provide education on sustainable agriculture

This year (2013) marks the 70th anniversary of KU. As the first agricultural university in Thailand, KU has steadily developed into one of the largest universities in Thailand. Currently, the number of students at all levels plus the number of staff members from the four university campuses is approximately 70,000 (Kasetsart University, 2013). In the 2012 academic year 14,000 students graduated from KU.

One of the strongest points of KU is its large number of university research stations and student training centers. Sixteen research stations and four student training centers are scattered across the different geographical locations and socioeconomic areas of Thailand, ready to offer endless opportunities to students and faculty members to learn about, practice, and conduct research relevant to sustainable agriculture under various environmental conditions (Figs. 2, 3). Each station or center is unique and represents the diversified characteristics of KU from which the public and students can benefit. The stations and centers are described below.

Sustainable agriculture and development research stations

1. Doi Pui Research Station

Doi Pui Research Station is the venue for students to learn about various kinds of orchids and temperate fruits such as peach, pear, plum, and apple (Kasetsart University, 2013). Situated on the top of Doi Inthanon, a mountain in Chiang Mai Province in northern Thailand, the Doi Pui Station was used 50 years ago by the Faculty of Forestry to study watershed management. Currently, the largest collection of strawberry cultivars in Thailand is found at the Doi Pui Research Station. The Royal 60 and 80 cultivars—the first ones to be developed by the station—are popular among Thai people because of their large size, juicy flavor,

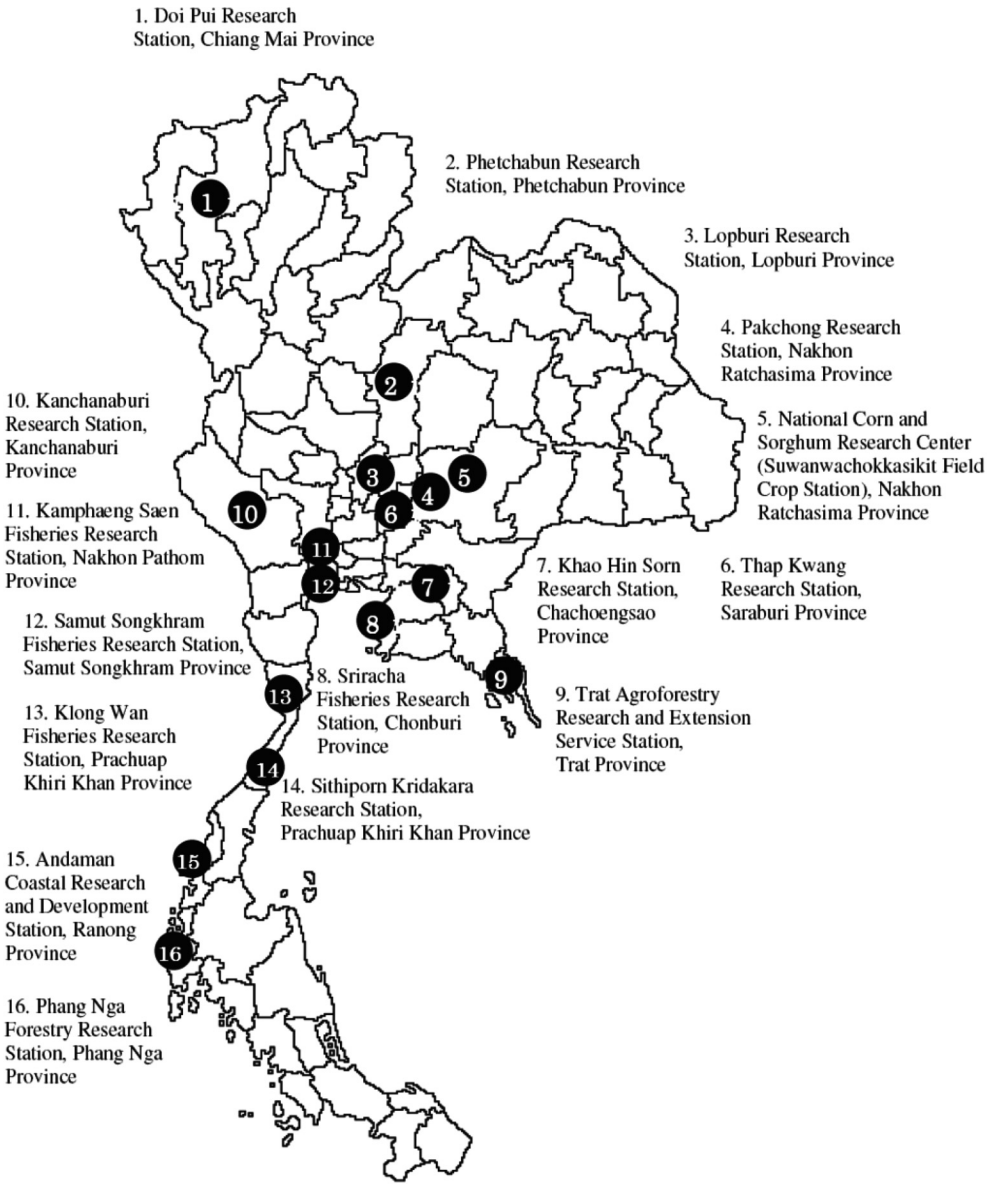

Fig. 2. Locations of Kasetsart University research stations, which have played important roles in promoting sustainable agriculture throughout Thailand.

and high levels of resistance to diseases and insects.

2. Phetchabun Research Station

In 1988, KU initiated a research and development project on agricultural development in the upland areas of Phetchabun Province (Kasetsart University, 2013). Its success in developing careers for the local people and generating more income led to the establishment of Phetchabun Research Station. The work at this station has helped connect local people with new knowledge and technologies in agriculture—especially in the cultivation of Jerusalem artichoke. This is the station's signature plant. It is nutrient rich and possesses medicinal properties such as the potential to ameliorate diabetes and lower cholesterol levels and high blood pressure. A temperate fruit, plum, has been grown in abundance at the station; when the trees blossom, their beautiful flowers attract increased numbers of visitors. The study of the intercropping of coral trees with coffee at this station is an excellent and practical example of a sustainable cropping system: the canopy of the coral trees acts protects the coffee plants from strong sunlight.

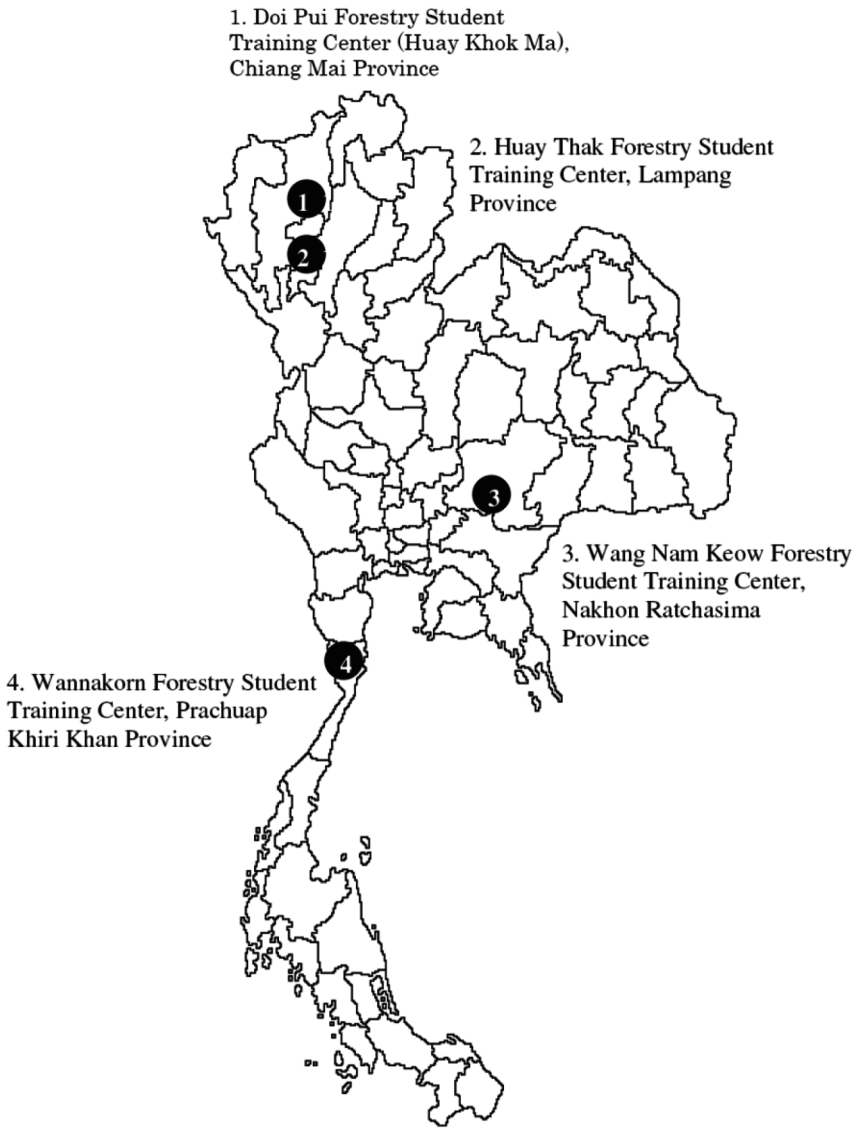

Fig. 3. Locations of Kasetsart University student training centers, which offer educational training programs to Kasetsart University students.

3. Lopburi Research Station

Located in a national forest in Lopburi Province, Lopburi Research Station is divided into two parts—one for growing field crops with natural rainwater and the other for growing them with overhead irrigation (Kasetsart University, 2013). The mission of Lopburi Research Station is to develop research work and appropriate technologies for growing economically important field crops such as cassava, sugarcane, corn, and legumes. Special projects, for example, on the development of organic fertilizers and the biological control of insects by using herbs, have been implemented to serve the local people.

4. Pakchong Research Station

Pakchong Research Station has a reputation for research on fruit trees such as custard apple, banana, mango, avocado, and papaya (Kasetsart University, 2013). The station is located in the Pakchong district of Nakhon Ratchasima Province in northeast Thailand. With good weather and fertile soil, the station has generated a number of new fruit tree cultivars for the public. The Petch Pakchong custard apple and the Pakchong 50 banana are two examples of fruit trees that are popular among the Thai people and were commercially developed by researchers from this station. Knowledge of the yield and quality improve-

ment of fruit trees from this station is regularly extended to interested growers and learned by KU students.

5. National Corn and Sorghum Research Center (Suwanwajokkasikit Field Crop Station)

For over 47 years, since its establishment in 1965 as a field crop training station for KU students, the National Corn and Sorghum Research Center in Nakhon Ratchasima Province has become increasingly recognized by national and international agricultural scientists, thanks to the collaboration among KU, the Thai Ministry of Agriculture and Cooperatives, and the Rockefeller Foundation (Kasetsart University, 2013). The Suwan 1 corn cultivar, which is high yielding and highly resistant to the downy mildew fungus, was developed and improved by researchers at this center. This corn cultivar was named the world's number one tropical corn cultivar by Dr. Takumi Izuno from CIMMYT (the International Maize and Wheat Improvement Center). The achievement of developing Suwan 1 corn was highly recognized by the Thai National Economic and Social Development Board in 1978. Subsequently, several corn cultivars, such as Suwan 2, 3, and 5 and Insee 2 sweet corn, have been released to the public and have become popular among corn growers.

6. Thap Kwang Research Station

Founded in 1959 as a KU student training station in animal husbandry, the station was upgraded to a research station in 1978 (Kasetsart University, 2013). The Thap Kwang Research Station is located in Saraburi Province in northeast Thailand and has focused its research on swine and cattle development. Each year, KU undergraduate and graduate students spend part or all of their time studying and working in sustainable pig and cattle production. When Thailand suffered an economic slump in 1997, the station set up a project called Value-Added and Processed Pork for small-scale entrepreneurs; this project has led to great success today in these kinds of business in Thailand.

7. Khao Hin Sorn Research Station

The Khao Hin Sorn Research Station is situated in Chachoengsao Province in eastern Thailand (Kasetsart University, 2013) and was established in 1985. The primary goal of this station has been to introduce vetiver grasses, which are drought resistant, as well as to develop drought-tolerant cultivars of crops such as cassava, soybean, and sweet potato. In the past, farmers in this area faced problems with soil erosion. Vetiver grasses have been introduced to, and studied in, this area and are now used extensively by local people to prevent soil erosion.

8. Sriracha Fisheries Research Station

This station in Chonburi Province was established in 1960 as a training station for fisheries students (Kasetsart University, 2013). It became the Sriracha Fisheries Research Station in 1980. The mandate of the station is to develop research on aquaculture, marine microbiology, and oceanography. In addition, the station emphasizes career building for fishermen in the Sriracha district. The station has taken the lead in developing techniques for raising Asian green mussel, scallop, silver perch, clownfish, and plankton.

9. Trat Agroforestry Research and Extension Service Station

Trat Agroforestry Research and Extension Service Station in Trat Province in eastern Thailand is the only forestry research facility in Thailand. It was established in 1994 (Kasetsart University, 2013). The mandate of this station is to conduct research and gather information on agroforestry that will contribute greatly to the economic, social, and environmental development of Thailand. Technologies developed at this station are demonstrated and transferred to the public at all levels. With hot and humid weather all year round in this area, the station has formulated three types of agroforestry system, namely for home gardens, for Para rubber (*Hevea brasiliensis*) plantation, and for orchards. These integrated tree-on-farm approaches are advantageous over conventional agricultural and forest production methods in term of increasing productivity, economic benefits and diversity. Trat Province is home to agarwood (*Aquilaria crassna*). The trees are grown abundantly throughout the area and are used to produce perfume and incense. Another plant commonly found in this area is red gingerwort (*Etlingera punicea*). This plant is a perennial herb of the ginger family and is used as a local perfume and in medicines to treat headache and other conditions.

10. Kanchanaburi Research Station

Located in western Thailand and founded in 1991, the Kanchanaburi Research Station features expertise in the agricultural systems appropriate for growing grapes, cantaloupe, and cassava in hot and dry conditions (Kasetsart University, 2013).

11. Kamphaeng Saen Fisheries Research Station

This station in Nakhon Pathom Province was founded 1991 as an aquaculture experimental station

(Kasetsart University, 2013). In 2001 the station was reorganized to perform more research and related activities, and its name was changed to the Kamphaeng Saen Fisheries Research Station in accordance with its diversified responsibilities. The main mission of this station is to support the field training of fisheries students. In addition, the station has helped faculty members to conduct research on all aspects of economically important freshwater fishes and animals.

12. Samut Songkhram Fisheries Research Station

The goal of Samut Songkhram Fisheries Research Station in Samut Songkhram Province is to tackle the problem of environmental degradation due to the raising of excessive numbers of black tiger prawns in the area (Kasetsart University, 2013). Plans for environmental remediation have been studied as a major focus of the station. Appropriate technologies for the culture of silver perch, one of the most economically important fishes in Thailand, have been sought by the research team at this station.

13. Klong Wan Fisheries Research Station

Klong Wan Fisheries Research Station is located in Prachuap Khiri Khan Province in southern Thailand (Kasetsart University, 2013). The mission of the station is to study the ecology and diversity of marine natural resources in the bay area of Prachuap Khiri Khan Province. The complete process of production and marketing of flower crabs (*Portunus pelagicus*) has been extensively studied at this station.

14. Sithiporn Kridakara Research Station

This station was named in honor of Prince Sithiporn Kridakara, the father of Thai modern agriculture, who was the first Thai to experiment with integrated farming systems in this area (Kasetsart University, 2013). The station is located in Prachuap Khiri Khan Province in southern Thailand. The station has taken the lead in research into cropping systems for Para rubber and oil palm.

15. Andaman Coastal Research and Development Station

The Andaman Coastal Research and Development Station is located on the west coast of southern Thailand in Ranong Province. It is dedicated mainly to improving the environment in this area, which was drastically changed by the devastating tsunami of 2004 (Kasetsart University, 2013). Research projects conducted at this station are also contributing substantially to our knowledge of coastal natural resources—especially mangrove forests and marine animals. Found only in southern Thailand, including in this area, the Thai water onion plant (*Crinum thaianum*) is an endangered species that has been conserved and extensively studied by researchers from this station.

16. Phang Nga Forestry Research Station

Established in 1983 in Phang Nga Province, southern Thailand, this station has facilitated research into the conservation of tree species commonly found in southern Thailand (Kasetsart University, 2013). The research has demonstrated that the condition of the soil in which *Acacia mangium* is grown is improved because of the organic matter generated by the tree. *Acacia mangium* is a fast-growing multi-purpose tree. Wood from this tree is used for making furniture and paper.

Centers for student training in sustainable agriculture and development

1. Doi Pui Forestry Student Training Center (Huay Khok Ma)

The Doi Pui Forestry Student Training Center is located in Chiang Mai Province in northern Thailand (Kasetsart University, 2013). Established in 1965 as Thailand's first research station for watershed management, in 1985 it became a center for field training of forestry students from KU. The center has also been the site of collaborative meteorological and hydrographic research between KU and Tokyo University of Agriculture since 1997. The center's lush mountainous surrounds are ideal for KU forestry students to conduct their research and learn about the environmental processes of watershed management in a real-life setting.

2. Huay Thak Forestry Student Training Center

Situated in Lampang Province and close to Chiang Mai Province in northern Thailand, the Huay Thak Forestry Student Training Center began as a demonstration forest for comprehensive forest management (Kasetsart University, 2013). Currently, the center's main mission is to serve the needs of those forestry students receiving advanced training in forest ecology and conservation. The center's areas comprise hill evergreen, dry evergreen, mixed deciduous, and deciduous dipterocarp forests, enabling forestry students to hone the skills they need to become well versed in the fields of forestry engineering, silviculture, forest biology, and management.

3. Wang Nam Keow Forestry Student Training Center

The Wang Nam Keow Forestry Student Training Center is located in Nakhon Ratchasima Province in northeast Thailand (Kasetsart University, 2013). The topography of dry evergreen and dry dipterocarp forests is highly appropriate for conservation studies and broad-based interdisciplinary education of forestry students. Conservation in agrotourism is also a strong point, because parts of the center's areas are located in the Khao Yai national conserved forest. Students can spend their time at the center on forest and environmental studies while developing a better understanding of viable environmental management.

4. Wannakorn Forestry Student Training Center

Situated in Prachuap Khiri Khan Province and founded in 1960, the Wannakorn Forest Student Training Center has a long history of service to forestry students who are eager to learn about coastal ecology and the local forests, which consist mainly of common ironwood (*Casuarina equisetifolia*), and creeping plants (Kasetsart University, 2013). After their training at the center, students will be well equipped with the relevant knowledge of environmental problems and will be able to respond to the present and future challenges facing the coastal forests of Thailand.

Conclusions

KU is at the stage of developing programs to facilitate students' perception and appreciation of the concepts of sustainable agriculture and development. KU hosts formal educational courses such as a master's degree in sustainable agriculture and master's and PhD degrees in sustainable land use and natural resource management. Over the past years, more students have been enrolling in such programs. The university also pledges support to sustainable agriculture through the establishment of the Faculty of Environment, in which full-time enrollments have been growing.

Training courses such as the KU-UT internship program on sustainable rural development have been strongly encouraged by KU administrators. Under such programs, students can learn about successful sustainable agriculture programs that have already been launched in Thailand and can discuss areas of improvement. Further activities that give the students direct interaction with local villagers so they can learn from them have also been added because it appears that the 2-week course stopped in 2011. Finally, individual visits by the students to their areas of interest strengthen and widen their knowledge, from grass root problems to final solutions.

However, relying solely on formal educational courses and training programs may not help the university to achieve its mission goals in sustainable agriculture. KU, through its rich and well-established infrastructural resources, has therefore reorganized the functions and responsibilities of its faculties, research stations, and student training centers to meet the needs of its students. The 16 research stations and four student training centers are positioned in various strategic geographic and climatologic locations to help diversify and improve students' understanding of the concepts of sustainable agriculture. KU has the greatest number of university research stations and student training centers in Thailand. The new university policy is first to refurbish the infrastructure of these stations and centers. In addition, the mandate and mission of each station and center need to be clearly stated, especially in relation to the delivery and implementation of concepts in sustainable agriculture and development. By the end of 2013, nine research stations will be transferred from the administration of the Inseechandrastitya Institute for Crops Research and Development and the Suwanwajokkasikit Animal Research and Development Institute to the administration of the Faculty of Agriculture. Therefore, more students of agriculture will have ample opportunities to conduct more research and receive more training on sustainable agriculture than in the past.

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