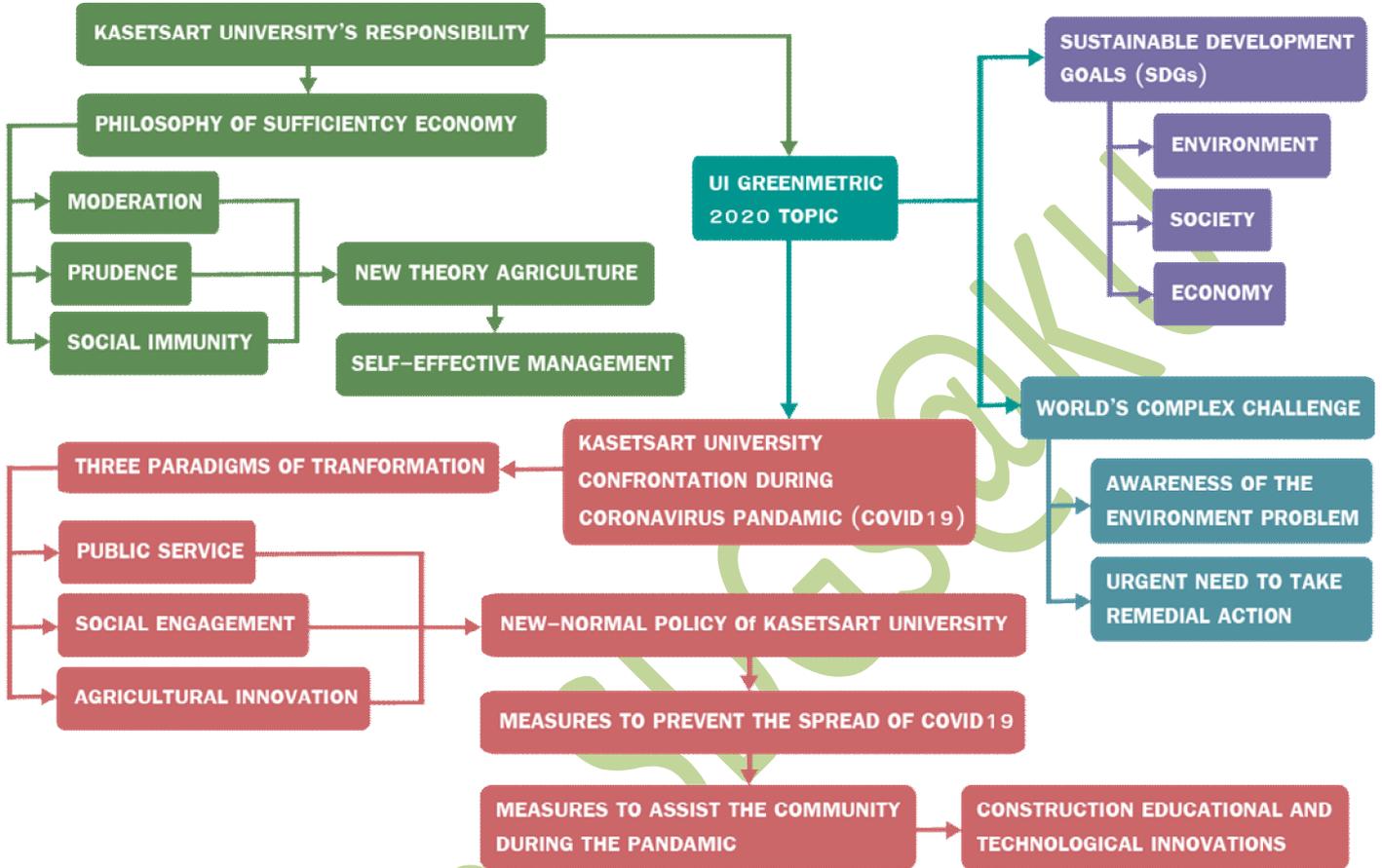


### World's Complex Challenge



SEP for

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SEP for SDGs@KU

Royal Guidance  
in the commencement ceremony of Kasetsart University  
at Kasetsart University Auditorium  
Thursday, 18 July 1974

The Queen and I are delighted to participate in Kasetsart University's graduation ceremony again. We are gratefully aware of the reports that the university's affairs have performed very well with doubly more graduates. The overall academic program in Kasetsart University is for the development of occupation, livelihood and general economy directly. Graduates of this university therefore are the hope of the country and of all people as an important force in the creation of national security and economy. So all of you should be aware and realize that it is a duty to commit and work for the benefit of the public completely.

“The development of the country needs to be done in a hierarchical manner. A foundation of sufficiency of most people is required as a preliminary by using economical methods and equipment, while being theoretically correct. When achieving a solid, moderately ready and practical foundation, the prosperity and higher economic status then gradually develop in the next order. Focusing only on building prosperity and economy quickly without consistent action plans with the state of the country and people will cause imbalances in matters, which can eventually lead to disruption as can be seen in many civilized countries that are facing current severe economic problems”.

Therefore, all graduates should be able to think thoroughly and firmly about the right principles and methods to perform their work further for good national economy and people's livelihoods.

Wishing everyone to have physical and psychological strength, merit thinking, wisdom and knowledge, with reasonable wise and practice, in order to be able to operate their own and national business to achieve excellent results with happiness, success in life, for everyone.

**“Universities’ Responsibilities for Sustainable Development Goals  
and World’s Complex Challenges.”**

Kasetsart University has seriously realized feasibility of sustainable development that will assist community within the university to properly live with surroundings. By concerning about possibility, the university has responsibilities to construct assistance to develop many campaigns that will transmit advanced knowledge to the community in Kasetsart University. Significantly, the role model that is brought to employ with sustainable policy of the university is **“Philosophy of Sufficiency Economy”**. The philosophy is the royal initiative concept of His Majesty King Bhumibol Adulayadej the Great (Rama IX of Thailand) who had made a lifetime dedication to the improvement of his people’s livelihood and the sustainable development of his nation. His Majesty King Bhumibol Adulayadej was esteemed as the **“World’s most hard-working monarch”** and the **“Greatest Development King”**. The King’s vision is based on his own lifelong experiences and Buddhist inspiration and it has been called “Sufficiency Economy Philosophy (SEP)” framework. His Majesty King Bhumibol Adulyadej the Great had ever given his first statement involved with the Philosophy of Sufficiency Economy on commencement ceremony at Kasetsart University on 18th July 1974. The King stated to the graduates that:

*“Economic development must be done step by step. It should begin with the strengthening of our economic foundation, by assuring that the majority of our population has enough to live on...Once reasonable progress has been achieved, we should then embark on the next steps, by pursuing more advanced levels of economic development.”*

He systematically thought that modern development has caused changes in all aspects of Thai society. The positive impacts of the advancement are economic growth, progress of material and public utilities, modern communication systems, and improvement and expansion of education which can reach rural areas or the underprivileged in the society. Conversely, prompt economic growth and the increase of consumerism has led to a state of economic dependence and deterioration of natural resources as well as the dissolution of existing kinship and traditional groups to manage them. The traditional knowledge and wisdom that have been employed to solve problems and accumulated in the past are forgotten and have started to disappear. Importantly, what has dissipated is the people’s ability to rely on themselves and conduct their lives and pursue their destiny with dignity. The former Thai economic crisis served as a costly lesson of unbalanced and unstable growth, partly due to the improper economic and social development process, in which the economy relied heavily on foreign capital inflows and external markets. **“Sufficiency Economy”** is a philosophy based on the fundamental principle of Thai culture. It is a methodical process of development based on moderation, prudence, and social immunity, one that uses knowledge and virtue as guidelines in living. Essentially, there must be intelligence and perseverance which will lead to real happiness in leading one’s life. On a personal level, the Philosophy of Sufficiency Economy can be adopted by adhering to the middle path. The awareness of virtue and honesty is likewise decisive for people as well as public officials. The Philosophy of Sufficiency Economy and its three pillars can be clarified as follows: **Moderation**, the sufficiency at

a level of not doing something too little or too much at the expense of oneself or others, for example, producing and consuming at a moderate level. **Reasonableness**, the decision concerning the level of sufficiency must be made rationally with consideration of the factors involved and careful anticipation of the outcomes that may be expected from such action. And **Risk Management**, the preparation to cope with the likely impact and changes in various aspects by considering the probability of future situations.

Furthermore, decisions and activities must be carried out at a sufficient level depending on two conditions in the following sequence: **Knowledge**, comprising all-round knowledge in the relevant fields and prudence in bringing this knowledge into consideration to understand the relationship among the field so as to use them to aid in the planning and ensure carefulness in the operation. **Virtue**, being promoted, comprising the awareness of honesty, patience, perseverance, and intelligence in leading one's life. The relationship between the Philosophy of Sufficiency economy and National Development in His Majesty's concept can be described hereafter: His Majesty's concept emphasizes that the producers or consumers try to produce or consume within the limit or limitation of existing income or resources first. This is the principle in decreasing the dependence and increasing the ability to control the production themselves, thus decreasing the risk from not being able to efficiently control the market system. However, Sufficiency Economy does not mean that one must constantly be frugal. A person can indulge himself in luxury once in a while, provided that it is within his capacity to do so. But the majority of the country's population often overspends beyond their means. Sufficiency Economy can lead to the goal of establishing economic stability. Fundamentally, Thailand is an agricultural country; therefore, the country's economy should be keyed towards agro-economy and food stability in order to establish a stable economic system to a certain degree. This is an economic system that can help lessen the risk or economic instability in the long run. Sufficiency Economy can be applied to all levels, branches, and sectors of the economy. It is not necessarily limited to the agricultural or rural sectors, or even the financial, the real estate, and the international trade and investment sectors by using similar principles of emphasizing moderation in performance, reasonableness, and creating immunity for oneself and society. As previously mentioned, Kasetsart University has always brought this important framework of His Majesty King Bhumibol Adulayadej the Great (Rama IX) to employ and apply in many policies and campaigns.

As describe above, the Philosophy of Sufficiency Economy has implicated the **"Sustainable Development Goals"**, or SDGs, also known as the global goals, were adopted by all united nation members. The SDGs are integrated, universal and transformative— that is, they recognize action in one area that will affect outcomes in others, and development must balance social, economic and environmental sustainability. The definition in term of **" Sustainable Development"** is the frequent subject of international conferences everywhere and **"Sustainability"** is also a contemporary catchphrase for group across many sectors. The terms come up in everything by serving as modus operandi. One of the most enduring definitions comes from *Our Common Future*, or the Brundtland report, published in 1987 by the United Nations World Commission on Environmental and Development. It arrived at a time when increasing

awareness about the limits of natural resources and the impact of human actions on the environment had begun to inspire calls for a new, more integrated model of development. The report stated that:

*“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”*

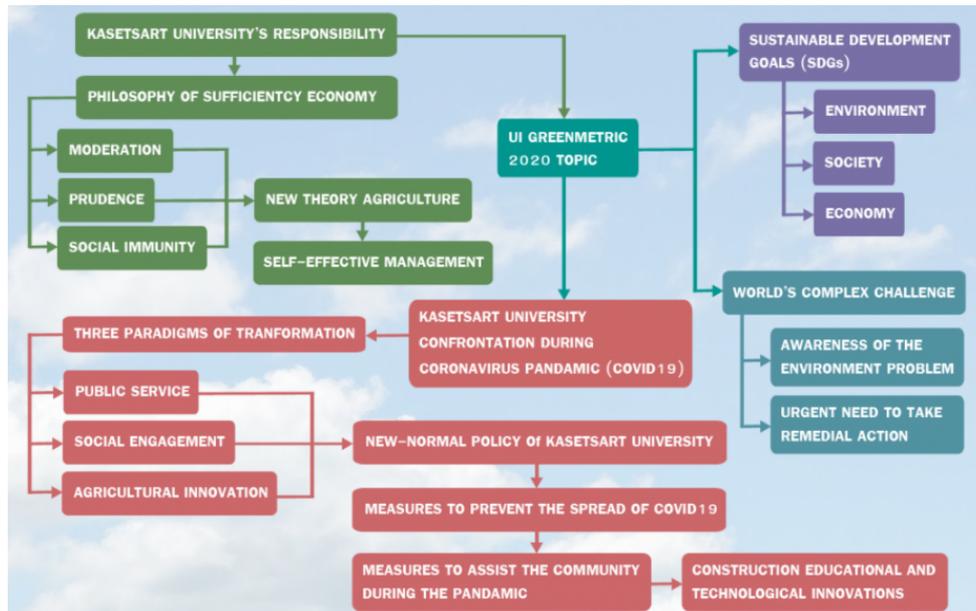
Today, the growing popularity of sustainable development suggests paradigms shift may finally be underway. That is, the age of sustainable development, philosophy and mindset, which is a central concept for our age. It is both a way of understanding the world and a method for solving global problems. As previously mentioned, all of this is an increasing sense of urgency.

Simultaneously, UI GreenMetric World University Ranking is one of the most important organizations which believes that many universities around the world have strong efforts to implement environmentally friendly and sustainable policies and programs. In 2020, the UI GreenMetric World University Ranking has the major significant topic which involves **“Universities’ Responsibilities for Sustainable Development Goals and World’s Complex Challenges.”** At present, our world is facing with a most dangerous situation that we have never expected before with coronavirus pandemic. The COVID-19 is impacting institutions around the world including Kasetsart University, its scope and dimensions also mean that poses a major threat towards achieving the UN Sustainable Development Goals (SDGs). The coronavirus pandemic unavoidably influences the SDGs and affects their implementation. The strong concerns in dealing with COVID-19 are disrupting many conservation programs. Thus, COVID-19 jeopardizes some process of the implementation of the SDGs. It sends a cautions warning about need to continue to put an emphasis on the implementation of the SDGs. While progress towards the goals had been slow, especially in Asia-Pacific countries where regression had been recorded even prior to the pandemic, the crisis is now undoing decades of advancement within just a few months. Nevertheless, Kasetsart University remains as optimistic as UN because during this tough time the university still follows a launching plan of the United Nations which aims to defeat the virus and build a better world. The plan calls for international solidarity and Kasetsart University still believes that assistance from educational institution can strongly provide many essentials for community. The university always hold the principles of three transformative paradigms that have intentionally concerned in what the world has being faced and what the university have to necessarily do. Continuously, there are many university’s policies that relate to enhance quality living and protect all people in the university and surrounding community from the coronavirus pandemic. The mentioned policies earlier, we are called **“Three Paradigms of Transformation”** which are the main concerns for developing the university to better improvement. The paradigms are the key elements to integrate people’s cooperation surroundings the community and in Kasetsart University. Firstly, the first paradigm is determined as **“Public Service”** which is a significant service intended to serve all members of the community. This tough year with the COVID-19 pandemic, many specialists deliberately construct modernized innovations for protecting people in the community. Latterly, the second paradigm relates to **“Social Engagement”** which includes activity, interaction, social exchange, and lack of compulsion. The

university has built the continuum of community commitment to develop this paradigm such as transactional, transitional and transformational engagement. And the last paradigm is defined as ***“Innovation for Agriculture”*** which means carefully working process during the pandemic with leading agricultural researchers, businesses, landowners, and farmers to develop the knowledge and technologies that will make modern farming more sustainable, resilient, and productive. Through practical and interactive workshops, farm walks, and on-farm demonstrations, this will help the community to put knowledge into practice. Furthermore, Kasetsart University always realizes in constructing a happy, safety community, and also making strong social connections that create a sense of belonging. And along with belonging comes a sense of responsibility to support each other. With a strong sense of belonging and knowing other community members will take care of each other comes a sense of peace, security, and meaning. Consequently, the ***“Three Paradigms of Transformation”*** are still the major concepts that can clearly be seen in Kasetsart University’s activities and policies.

Coronavirus outbreak (COVID-19) is an infectious disease caused by a newly discovered coronavirus. The best way to prevent and slow down transmission is well informed about the COVID-19 virus, the disease it causes, how it spreads and the way to prevent. Kasetsart University takes this concern seriously when the Thai government declares reported cases of COVID-19. Intentionally, paying close attention to community in Kasetsart University is what should be conducted by mandating policy. The significant policy that the university must seriously pay attention to the community is new normal approach which is applied to support operations in Kasetsart University. Kasetsart University Announcements are provided to urge community within the university following protocols intimately in order to protect the expansion of the COVID-19. Obviously, the university has proclaimed the eight issues of preventive measures to reduce the widespread jeopardy of COVID-19. Particularly, the operations in Kasersart University during coronavirus pandemic have changed to 100% online process, for instance, all faculties/ epartments/program of study must avoid in-person classes, and adopt alternative methods of pedagogy such as online learning/ teaching, assignment-based and project-based learnings. Moreover, Kasetsart University encourages instructors to adjust their teaching plans, pedagogical contents, teaching formats, learning assessments or evaluation to appropriate and effective ways. They can work with the Office of Computer Services or Campus Offices in charge of information technology or relevant areas to help arrange their daily education and research activities. Consistently, providing propriate guidance is always brought to employ in many areas in the university. Then, according to the Thai government and the Ministry of Higher Education, Science, Research and Technology’s Lockdown Easing Announcement, school and universities are allowed to resume normal classroom operations but complying with the standard health guidelines to prevent the spread of COVID-19 on campus.

## World's Complex Challenge



## Chapter : I Setting and Infrastructure (SI)

### [1] Setting and Infrastructure (SI)

#### [1] Campus sites



**Main campus, Bangkhen campus**  
**50 Ngam Wong Wan Rd, Lat Yao Chatuchak Bangkok 10900 Thailand**  
**Longitude = 13.84725    Latitude = 100.57157**

This is the original and main campus of the university. It is situated on the area measuring 846 rai (135 hectares) in the lower part of the northern zone of Bangkok at the distance of approximately 6 kilometers to the south of Don Mueang International Airport. At present, 15 faculties, 6 offices, 6 institutes and the Graduate School of the university operate at this campus with a total student population of approximately 38,681. The faculties are Agriculture, Agro-Industry, Architecture, Business Administration, Economics, Education, Engineering, Environment, Fisheries, Forestry, Humanities, Science, Social Sciences, Veterinary Medicine and Veterinary Technology. The headquarters of all colleges, institutes, centers and offices of the university are also located in the campus.



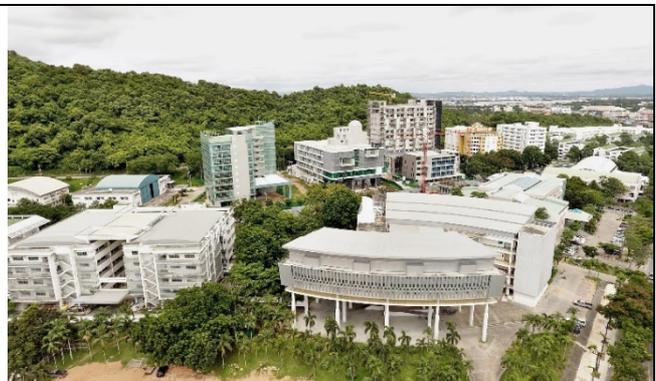
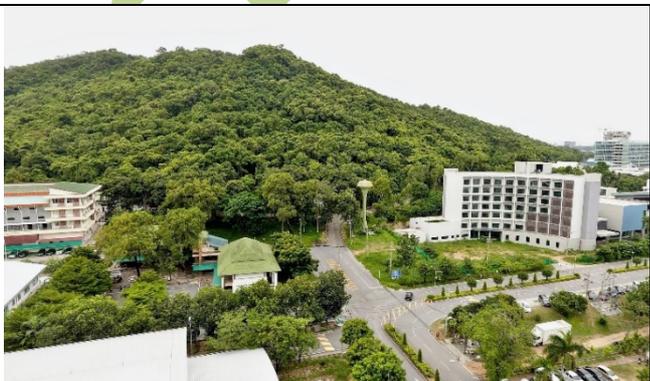
**Kamphaeng Saen Campus**

**1 Moo 6, Malaiman Road, Kamphaeng Saen, Kamphaeng Saen District, Nakhon Pathom 73140 Thailand**  
**Longitude = 14.02372    Latitude = 99.97487**

Kasetsart University, the first Higher Education Institute in Thailand to offer an academically strong program in agriculture, has been established since 1943. It was located in the area belonged to the Ministry of Agriculture and Cooperatives called Kaset Klang Bangkhen or Central Kaset Bangkhen.

In 1965, M.L. Xujati Kambhu, the University President at that time, perceived that the existing area at Bangkhen was not adequate to support the educational expansion according to the National Social and Economics Development Plan. He then searched for a new site. The University Council considered that Kamphaeng Saen District was the most appropriate site for several reasons. Firstly it was only 80 kilometres from Bangkok and 30 kilometres from down town Nakhon Pathom Province. Secondly, the soil was fertile suitable for cultivation. The water can be channeled from the Meaklong River through the irrigation canal dug from the Vajiralongkorn Dam in Kanchanaburi Province. Moreover, big plots of land were available. The Council, then, presented the University master plan to the Cabinet for the purchase and development of land. It was approved on December 6, 1996. Kasetsart University bought altogether 7,951 rai of land and the first phase building were constructed in 1974 and finished in 1978.

On November 12, 1979, Kamphaeng Saen Campus started teaching and learning activities by moving the third and fourth year students in faculty of Agriculture and agriculture related programs from Bangkhen to Kamphaeng Saen. From 1990, Kamphaeng Saen Campus could offer classes to students from the first to the fourth year including graduate students.



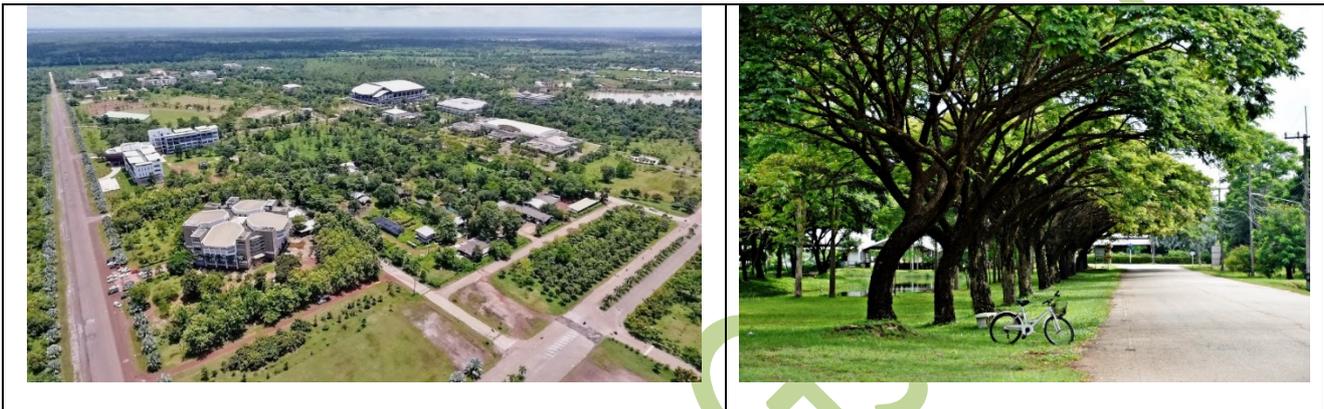
**Sriracha Campus**

**199 Moo 6 Sukhumvit Road, Tung Sukla, Sriracha District, Chonburi, 20230 Thailand**  
**Longitude = 13.12089    Latitude = 100.91940**

This campus occupies the area of 199 rai (32 hectares) in Si Racha District of Chon Buri Province at the distance of approximately 107 kilometers to the east of Bangkok. It was originally an agricultural research station of the university since 1954. Its establishment as a campus took place in 1989 and was dictated by the pressing of the country shortage of high quality manpower as a consequence of the Eastern Seaboard Development Project.

In the campus offers degree courses and short-term training programs in four faculties which are Management Sciences, Engineering at Si Racha, Economics at Si Racha and International Maritime College.

The campus also provides special master's degree programs in Business Economics, Agribusiness, Industrial Administration and Development and so on.



**Chalmphrakiat Sakon Nakhon Province Campus**  
**59 Moo 1 Tambon Chiang Khrua, Muang district, Sakon Nakhon Province, 47000, Thailand**  
**Longitude = 17.29016    Latitude = 104.10856**

Chalmphrakiat Sakon Nakhon Province Campus is the fourth campus of Kasetsart University. The campus was established in 1996 to commemorate the Golden Jubilee Anniversary of his Majesty King Bhumibol Adulyadej's accession to the throne. To mark such significance, His Majesty the King graciously granted permission for the university to include the modifying term "Chalmphrakiat", literally meaning "upholding the honor of His Majesty the King", in the name of the campus. The campus intends to provide much needed development - accelerating academic services and expected to be the center of education for the upper northeastern region of Thailand. Therefore, the campus will meet the needs of the growing region and will support the government's policy of expanding educational opportunities to the distance provinces. The campus aims are for development in management, education, teaching, research and human resources. These aims are in line with Kasetsart University's four primary objectives of learning and teaching, research and development, academic services and extensions, and promotion of traditional arts and cultures.



**Suphanburi Campus Establishment Project**

**98 Moo 11, Khok Khram, Bang Pla Ma District, Suphan Buri 72150, Thailand**

**Longitude = 14.4261653    Latitude = 100.162022**

**Suphanburi Campus Establishment Project.**

To meet the government policy to distribute educational opportunities Tertiary level to the region  
To produce undergraduate and graduate students in sports science, Health Sciences, Law, Management and Human Resource Development

To develop manpower in the western region and Nearby With an emphasis on teaching and learning services at the degree and short courses levels. Including professional training in various fields

To carry out research, academic development and provide academic services in related fields

To be a source of public health services Including the dissemination of technology and provide academic services to people in the upper-western region

To study and promote cultural conservation Traditions, traditions, art, ancient sites, antiques, as well as dialects which are important cultural heritage

To coordinate cooperation with various agencies Both domestic and foreign Provide education at international standards and in line with the development of Thai society

**[2] Campus setting**

1.) In the initial period (1904-1913), agricultural education was first established. In 1904, Prince Phichaimahintharodom, Director of the Department of Sericulture of the Ministry of Agriculture, founded the School of Sericulture in Tambon Thung Saladaeng, Bangkok, adjacent to the mulberry gardens and the Sericulture Experimental Station. Initially, the School offered a two-year program devoted to sericulture alone, but in 1906, the program was extended to three years and expanded to include instruction on the cultivation of other crops and also on veterinary science, and at the same time, the name of the institution was changed to the School of Agriculture.



In 1908, the Ministry of Agriculture merged the three schools under its jurisdiction, namely, the School of Surveying, which had been founded in 1882, the School of Irrigation, founded in 1905, and the School of Agriculture, in order to train personnel to serve in the various departments and divisions of the Ministry. The school was named the School of the Ministry of Agriculture and was located in the Sapathum Palace. At the same time, a new curriculum, Thailand's first tertiary-level agriculture curriculum, was drawn up and was inaugurated in 1909.

In 1913, the Government of Siam merged the School of the Ministry of Agriculture with the Civil Service School, which was established under the Ministry of Public Instruction and Religion, because the purposes of the two were identical. Agricultural education was thus placed under the Ministry of Public Instruction and Religion.

2.) In the middle period (1914-1923), the first primary school agriculture teacher training school was established. The Minister of Public Instruction and Religion, Chao Phraya Thammasakmontri (Sanan Thep-hatsadin na Ayutthaya), founded the Primary School Agriculture Teacher Training School at Ban Suan Luang in Bangkok. The School offered a two-year program for graduates of Secondary Level 3 (the entrance requirement was later raised to Secondary Level 6). Upon completion of the program, graduates were awarded a certificate in primary school agricultural education. In 1918, the School was relocated to Tambon Phra Prathon in the Meuang District of Nakhorn Pathom Province.

3.) In the later period (1924-1942), the primary school agriculture teacher training school system was established in all regions of the country. In 1924, the Primary School Agriculture Teacher Training School was moved from Nakhorn Pathom Province to Tambon Bang Saphan Yai in Bang Saphan District of Prajuab Khirikhan Province, and in 1926, a second primary school agriculture teacher training school was established in Tambon Thap Kwang in Kaeng Khoi District of Saraburi Province. Following this, agricultural education on the primary and secondary levels was provided through primary- and secondary-level agriculture technical schools.

Toward the end of the year 1931, Mom Chao Sitthiphorn Kritdakorn, Director of the Agricultural Research Department of the Ministry of Agriculture, proposed that agricultural research stations be set up in the Northeastern, Southern, and Northern Regions together with primary school agriculture teacher training schools so that agricultural research and agricultural education could be carried out in concert. As a result, primary school agriculture teacher training schools and agricultural experiment stations were established in each region of the country, and in this way, the Ministry of Agriculture once again became involved in agricultural education.

In 1933, the Non Wat Primary School Agriculture Teacher Training School was established in Tambon Non Sung, Non Sung District, Nakhorn Ratchasima Province, and the Mae Jo Primary School Agriculture Teacher Training School was established in Tambon Nong Han, Sansai District, Chiang Mai Province.

In 1934, the Khor Hong Primary School Agriculture Teacher Training School was established in Tambon Khor Hong, Hat Yai District, Songkhla Province.

The operating of agricultural experiment stations in conjunction with the three primary school agriculture teacher training schools proved to be an excellent model of the interplay between research and education. The first experiment-station-head-cum-headmasters were Luang Ingkhasikasikan at Non Wat, Luang Suwan Vajokkasikij at Khor Hong, and Phra Chuangkasetinlapakan at Mae Jo.



In 1935, agricultural education policy changed once again. The government, concerned that the numbers of agriculture teachers graduated would be in excess of needs, decided to close the three new primary school agriculture teacher training schools. In response, Luang Ingkhasikasikan, Luang Suwan Vajokkasikij, and Phra Chuangkasetinlapakan together proposed a project whereby the Mae Jo school was retained as a secondary-level agriculture technical school. This was later elevated to become the College of Agriculture, with the status of a division in the Department of Agriculture and Fisheries. The person appointed to serve as the first director of the College was Phra Chuangkasetinlapakan.



Also in 1935, the Ministry of Agriculture established in Phrae Province another technical school, namely the School of Forestry, which offered a two-year program, and shortly later, this was made a part of the College of Agriculture.

In 1938, the Ministry of Agriculture established the Central Agriculture Station, or Kaset Klang, in Bang Khen District of Bangkok, the area in which the main campus of Kasetsart University is located. The College of Agriculture was moved from Mae Jo to Bang Khen, and Luang Suwan Vajokkasikij became the

director. The College offered three-year certificate programs in three fields: agriculture, cooperative science, and forestry. Students of the agriculture program studied all three years at Bang Khen, while students of the cooperative science program studied their first two years at Bang Khen and their third year at the Department of Cooperatives at Tha Thian in order to facilitate their practical training. The forestry program was conducted at the School of Forestry in Phrae Province.



[3] Total campus area (m<sup>2</sup>)

campus	area (m <sup>2</sup> )
Kasetsart University	5,424,000
Kamphaeng Saen Campus	12,726,560
Sriracha Campus	862,592
Chalermphrakiat Sakon Nakhon Province Campus	7,730,464
Suphanburi Campus Establishment Project	1,218,298
<b>Total campus area</b>	<u>27,961,914</u>

[4] Total campus buildings area (m<sup>2</sup>)

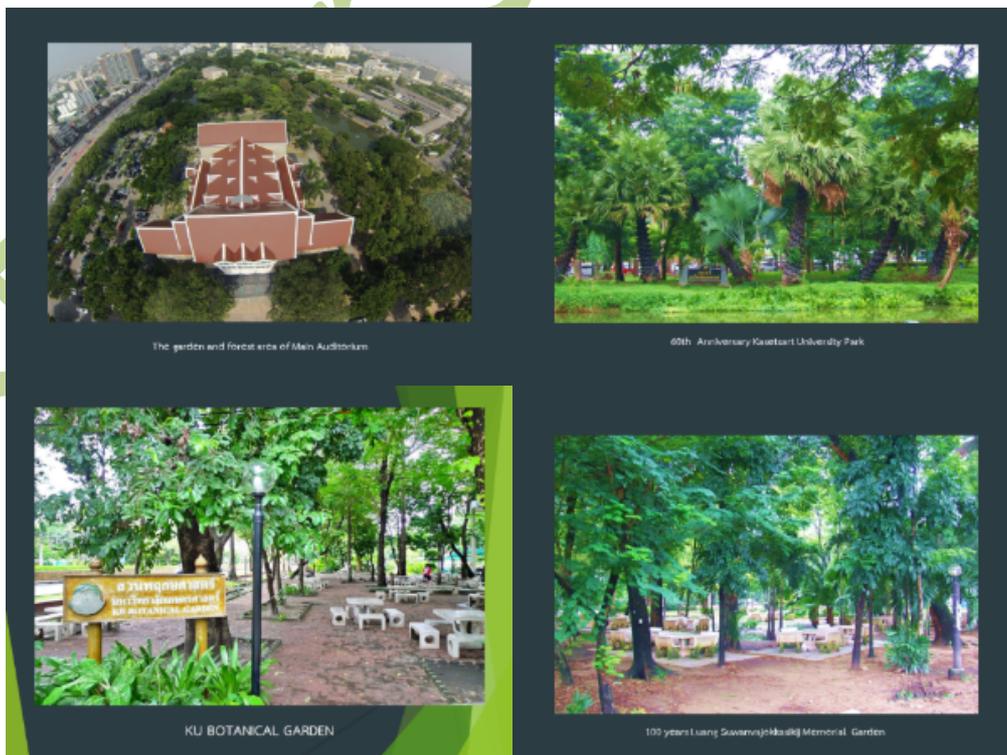
campus buildings area (m <sup>2</sup> )	
Main campus , Bangkhen campus	1,163,480
Kamphaeng Saen Campus	787,027
Si Racha Campus	180,393
Chalermphrakiat Sakon Nakhon Province Campus	171,130
Suphanburi Campus Establishment Project	18,216
<b>Total</b>	<b>2,320,246</b>

[5] The ratio of open space area to total area

The ratio of open space area to total area	Total campus area (1.5)	Total campus ground floor area of buildings (1.6)	Percentage % open space area
Main campus , Bangkhen campus	5,424,000	305,302	94
Kamphaeng Saen Campus	12,726,560	119,240	99
Si Racha Campus	862,592	46,313	95
Chalermphrakiat Sakon Nakhon Province Campus	7,730,464	62,711	99
Suphanburi Campus Establishment Project	1,218,298	7,028	99.6
<b>Total</b>	<b>27,961,914</b>	<b>540,208</b>	<b>98</b>

[6] Total area on campus covered in forest vegetation (m<sup>2</sup>)

Bangkhen Campus





**Kamphaeng Saen Campus**



Chalermphrakiat Sakon Nakhon Province Campus



72ndYear HM Queen Sirikit Chalermphrakiat Dry Dipterocarp Park

Chalermphrakiat Sakon Nakhon Province Campus

Suphanburi Campus Establishment Project



Suphanburi Campus Establishment Project

[7] Total area on campus for water absorption besides the forest and planted vegetation (SI.4)



Bangkok



Kamphaeng Saen Campus



Sriracha Campus



Chalmprakiat Sakon Nakhon Province Campus

**[8] Total number of regular students**

Campus	
Main campus, Bangkok	34,986
Kamphaeng Saen Campus	14,938
Si Racha Campus	10,570
Chalermphrakiat Sakon Nakhon Province Campus	6,448
Suphanburi Campus Establishment Project	178
<b>Total Students =</b>	<b>67,120</b>



**[9] Total number of academic and administrative staff**

Campus	Professors	administrative staff	Total
Main campus, Bangkok	<b>2,361</b>	<b>4,566</b>	<b>6927</b>
Kamphaeng Saen Campus	<b>633</b>	<b>1,192</b>	<b>1825</b>
Si Racha Campus	<b>284</b>	<b>319</b>	<b>603</b>
Chalermphrakiat Sakon Nakhon Province Campus	<b>229</b>	<b>328</b>	<b>557</b>
Suphanburi Campus Establishment Project	<b>6</b>	<b>19</b>	<b>25</b>
Total =	<b>3,513</b>	<b>6,424</b>	<b><u>9,937</u></b>

SEP for SDG





SET



**[10] Percentage of university budget for sustainability efforts within a year**

Budget for sustainability effort	ปีงบประมาณ พ.ศ. 2560 (A.D.2017)	ปีงบประมาณ พ.ศ. 2561 (A.D.2018)	ปีงบประมาณ พ.ศ. 2562 (A.D.2019)	Average
จำนวนเงินรายรับทั้งหมด (Baht)	14,223,590,155	15,054,377,545	13,736,323,686	
<b>Total university Budget (US Dollars)</b>	458,825,489	485,625,082	443,107,216	462,519,262
ค่าใช้จ่ายสำหรับสิ่งแวดล้อมและความยั่งยืน (Baht)	7,654,483,147	8,491,407,920	6,549,182,674	
<b>Environment and sustainability Budget (US Dollars)</b>	246,918,811	273,916,385	211,263,957	244,033,051
<b>ร้อยละ % Percentage</b>	54	56	48	53

## Chapter : II Energy and Climate Change (EC)

According to Kasetsart University’s announcement, energy conservation policy has been established as guidelines for all departments within the University for the efficient use of electricity, which is the main energy source in the operation of the university's activities. Various measures are determined, such as the environmentally friendly design of buildings or structures or smart building using the Building Automation System (BAS) to manage energy within the building along with raising awareness of students and personnel in matters of energy conservation together with the policy of using more energy efficient electrical appliances to reduce energy consumption with the goal to replace 80 percent of all electrical appliances.

Finding alternative energy sources is another measure to reduce the use of electricity from fossil sources, such as Solar Power, Wind Power, Clean Biomass, Biogas, with a focus on being clean and environmentally friendly as well as indirectly reducing greenhouse gas emissions.

### [1] Energy efficient appliances usage

Kasetsart University announced the guideline of electrical energy conservation policy for all departments in the university. The principle to use electricity efficiently, cost-effective, and has the greatest benefit which must start from the method of choosing electrical appliances that are effective and suitable for use. As well as, knowing how to use that electric appliances. This is not only helping to save energy but also having a good impact on the public, in terms of preserving nature and the environment.



**Figure 1-1** Proactive policy of approach on Green University

Kasetsart University has a policy on improvement of overall electrical appliances in the university. More than 85 percent of the total electrical equipment in the campus were replaced such as LED light bulbs instead of fluorescent and used energy-saving labels number 5 electrical appliances.

1. Changing of LED and T5 light bulbs at many offices in the campus



**Figure 1-2** Changing of LED and T5 light bulbs



Automatic movement sensor set to turn on the light when in use.



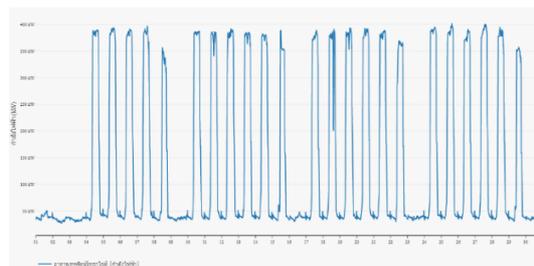
Energy consumption monitor



Energy measurement system

**Figure 1-3** Changing of LED and T5 light bulbs  
Using the system ESI (Energy Information System)

The information from the EIS system, which installed in the University Library, were used to assess energy consumption of the Library. Using of machinery, energy, and air system within the Library. The meter was installed on the 4th floor of Debaratana Vidhayachote Building. There was a project to set up an EIS energy information promotion point on the 1st floor of the building. So that students can study various energy information Including air quality data of the 4th floor of the building.



**Figure 1-4** The graph shows the power consumption

2. Energy-saving labels number 5 air conditioner with Inverter system can save 20-30 % of electrical power. (Figure 1-5)

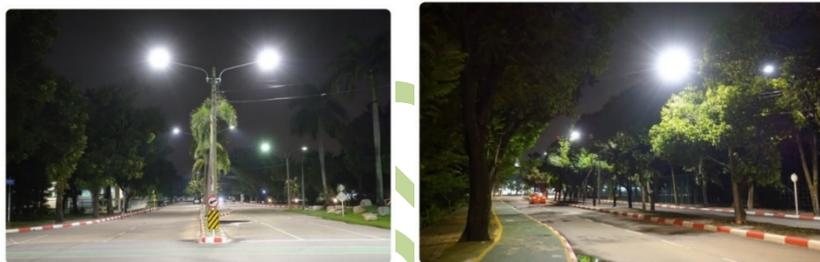


Air ventilation system to control carbon dioxide and increase Good air circulation / ventilation

**Figure 1-5** Energy-saving labels number 5 air conditioner with inverter system can save 20-30 % of electrical power.

3. Changing of LED street lights

Kasetsart University conducted a project on changing of LED street lights. It is brighter and saved 50 – 70 % of electrical consumption. (Figure. 2.1-5)



**Figure. 1-6** Changing of LED street lights

4. Computer Energy Star



**Figure. 1-7** Computer Energy Star

At present, ENCOM LED is a technology for producing energy-saving light bulbs. It is an innovation for efficient lamp production. It does not emit UV rays and heat when operating and safe from mercury, it is more than 40,000 hours of lifespan and help reducing environmental problem. Many forms of innovation and production of energy-saving electrical appliances have operated in the country. This is an

opportunity for Kasetsart University to use technology, from the development of efficient electrical appliances, to be useful and suitable for each location. Besides, it is concurrence to the university's electricity saving policy.

**[2] Smart Building implementation**

Kasetsart University renovated buildings into ‘Smart Building’ by using Building Automation System (BAS). The BAS will automatically control air conditioning, lighting, fire control, access control, security and elevator control system. (Figure 2-1)



**Figure 2-1** Building Automation System (BAS)



Staff have to pass the finger print for scanning access system before enter to the Data Center at the Office of Computer Services, KU.

**Figure 2-5** Finger print scanning access system with identification card



Setting of online CCTV system, it can be monitor anytime, anywhere via internet.

**Figure 2-6** Online CCTV system



Gas extinguisher for automatic fire protection



Automatic fire engine system runs by gasoline in case when electrical power is disruptive or cut off.

**Figure 2-7** Automatic fire engine system runs by gasoline/diesel.

**Electrical consumption management via the Internet of Things application**

The Faculty of Sports Science has installed devices for electrical consumption management via the Internet of Things application.



**Figure 2-8** Electrical consumption management via the Internet of Things application

**[3] renewable energy sources in campus and provide capacity produced in kilowatt hour**

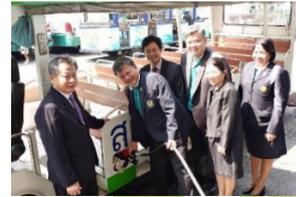
There are 5 kinds of renewable energy which Kasetsart University set a policy for consumption namely: bio diesel, clean biomass, solar power, wind power and combination of heat and power (biogas).

The usage of renewable energy is 249,275 kilowatt in 2020

1. Biodiesel production station

Kasetsart University joined the pilot project on testing the use of B10 biodiesel under the project "Support the Increasing Proportion of Biodiesel Usage" with the National Metal and Materials Technology Center, National Science and Technology Development Agency. The biodiesel

will be used with no less than 10 common cars and welfare buses of Kasetsart University, in order to jointly assess the use of B10 from biodiesel that has been actually increased in the field. Before pushing for the use of B10 biodiesel as a tangible alternative fuel. Also in line with the Green University Project of Kasetsart University, to raise awareness of the biofuel using and reduce pollution caused by operated buses on campuses, especially the nano dust PM 2.5 (Environmental Nano-pollutants: ENP).



### 2. Clean Biomass Producing hot gas with a Gasification Stove

Gasification Stove has a diagram of Figure 1, which is heated to the neck at about 1200 ° C. This hot gas is heated to about 5,000 kilojoules (kJ)., which can be ignited. The composition of the biomass consists of Carbon Monoxide 18-25%, Carbon Dioxide 5-10%, Hydrogen 13-15%, Methane 3-5%, Nitrogen 45-54%, and Steam 10-15%. There is also a hot gas fired furnace with charcoal and biomass as shown in Fig. 1 and Fig 2.



Picture 1 Diagram of Gasification Stove  
Picture

2. gasifier stove with charcoal fuel

### 3. Solar Power

On 12<sup>th</sup> December 2019, Assistant Professor Dr. Suriyan Thanyakijjanukij as Dean of Faculty of Fisheries, Assistant Professor Dr. Thon Thamrongnawasawat as Deputy Dean of Special Affairs, along with administrators, professors, personnel and students of the Faculty of Fisheries, participated in the opening ceremony to deliver the Floating Solar power generation system from BCPG Public Company Limited, which was honored by Mr. Bundit Saphianchai, President and the Company's management team of BCPG as the giver at the Museum of Fishery Natural Science, Center for Research Management and Academic Support, Faculty of Fisheries, Kasetsart University.

BCPG Public Company Limited provided a support to the Faculty of Fisheries, Kasetsart University, with the installation of Floating Solar power generation system with 39.06 kW peak capacity (53.1045 hp) at the pond in front of the Faculty of Fisheries. The objectives were to study, train and experiment with the pilot project to produce clean energy (Zero Emission Building), together with aquaculture raising, as well as to honor His Majesty King Maha Bhumibol Adulyadej Borommanatthabophit, the Father of Thai Energy.



**Figure-2.5 3** Solar Power



**Figure 2.5-3** Solar energy fills oxygen in water.

#### 4. Usage of wind power

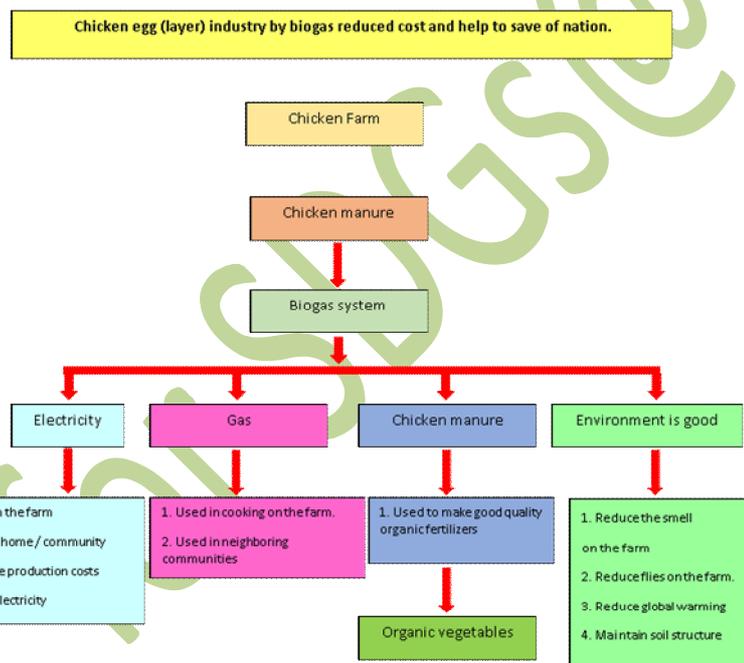


#### 5. Biogas production station

Biogas production station of Kasetsart University produced gas from food waste 400 kg. /day and converted into heat energy from a gas tank of 15 cubic meters to use in the canteen.



Using hen manure in the biogas system is a fixed dome type. The gas used is connected to the electricity generation system in the laying farm to save electricity. The sludge and hen manure obtained after fermentation will be dried and pellets are sold as animal manure pellets, broiler chicken manure (dried chicken husk) 4 tons / year, egg (dry) manure from 6,500 laying hens, 20 tons / year. Utilization put in 12 tons of grass field into 8 tons of biogas pond



Kasetsart University has set a goal to manage renewable energy concretely in the next 2-3 years. The University will construct the roof of the parking lot, which is a solar power generation system. This system will be used for 15 welfare electric buses of the University for student and personnel transportation services and general public around the university. Apart from installing a solar roof system for electricity generation, the other challenge is establishment of a solar farm on various campuses. This will be a source of learning about clean energy for students and surrounding community.

**[4] The Ratio of renewable energy production divided by total energy usage per year**

There are 5 kinds of renewable energy which Kasetsart University set a policy for consumption namely: bio diesel, clean biomass, solar power, wind power and combination of heat and power (biogas). The usage of renewable energy is 249,275 kilowatt in 2020.

**[5] Elements of green building implementation as reflected in all construction and renovation policies**

1. The design of the building for ventilation and natural light. (Figure5-1)



**Figure5-1** The interior design of the university emphasize on the ventilation and natural light.

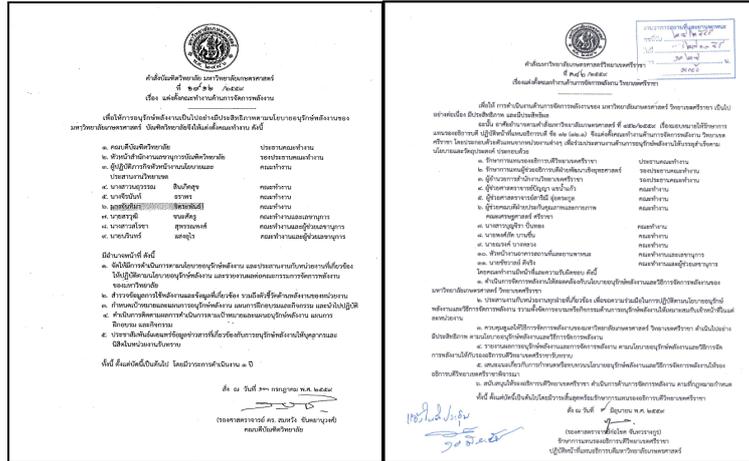
The Office of the University Library created area between buildings as “Library in the Park” 1so that students can sit and relax in natural site.



**Figure 5-2** The interior design of the university emphasize on the ventilation and natural light.

To respond to the “Green Campus” policy, the Office of the University Library renovated 475 square metres of space (which was damaged from mega flood incident in 2011) within the office to be “Library in the Park”- reading area in natural atmosphere and saving energy for student and staff. Moreover, the Office separated space within the Library in the Park as a site of special event such as “Music in the Park” among variety of botanical garden which comprised of 2 species of plant: Acanthaceae and Bignoniaceae.

2. The Faculties/Offices of Kasetsart University appointed a sub-committee on energy management to set a policy and plan of energy conservation approach that follow the university’s overall plan and appointed managers of building who can conduct efficiently the plan. (Figure 5-3)



**Figure 5-3 Energy Conservation Committee**

**Kasetsart University Library/Learning Center (KULC) wins the Thailand Energy Awards 2018**

Kasetsart University Library/Learning Center (KULC) wins the Thailand Energy Awards 2018 for concept of energy efficient building. Dr. Anamai Damnet, Vice President for Special Projects and Suphan Buri Establishment Campus Project, received the award plaque from Deputy Prime Minister of Thailand Air Chief Marshal Prajin Juntong, The library representative including Dr. Aree Thunkijjanukij and staff of library participated in the award ceremony.

Kasetsart University Library/Learning Center (KULC) has been promoting the energy conservation in the library building since 2015-2017, such as installation of paper pulp roof insulation, replacing LED lamps, installing pull-chain light fixtures, installing air exchanger & ventilator equipment. Overall it helps saving the energy up to 501,973 kWh.

In addition, the 7S Model for Organization Improvement and the transferring of technology and knowledge among 10 members of the Green Library Network have also been implemented. The Thailand Energy Awards 2018, the Department of Alternative Energy Development and Efficiency organized the contest to honor those who have outstanding performance in energy conservation and alternative energy development. It promotes awareness of energy conservation and promotes the development of alternative energy. It also creates awareness for those who are involved in applying for sustainable development.



Energy and Environment Management Board 7S Green Office and the Green Library Network

Kasetsart University Library Office organized the training on energy and environmental management project for library’s personnel and users, according to UI Green Metric criteria. This program was held to promote various activities related to energy and environmental conservation, in accordance with the ranking criteria of the UI GreenMetrics Ranking.



**Figure 2.-4** Training Activity on Internal Auditors of Energy, Library

3. Bidalankarana Learning Center building, Faculty of Economics, Kasetsart University received "BEC Awards 2018". This is the label for energy efficiency standard of new building design.

The Department of Alternative Energy Development and Efficiency (DEDE) offered the "BEC Awards 2018" to 18 buildings that met the Building Energy Code (BEC) design standard for energy conservation. In 2018, there were only 18 buildings out of 114 buildings from 33 organization were inspected and certified from DEDE.

Bidalankarana Learning Center building of Faculty of Economics, Kasetsart University is a -13storey building. It has an area of 22,979 square meters, with a height of 69.5 meters and WWR 20% of ratio. This building can save 54% of energy and received a very good building rating.



**Figure 5-5** Bidalankarana Learning Center building of Faculty of Economics, Kasetsart University



NZEB building needs to generate renewable electricity to replace the external electricity for the zero net energy usage. The renewable energy in present time is focusing on solar energy. For example, installing solar panels on the ground, which is a waste of space and cannot be used for any other purposes. Another option is to install solar roof, which requires a lot of money to improve the roof structure for old buildings without rooftop. However, even when using the entire roof area, it is still not enough to produce electricity for this museum. Therefore, the latest innovation of Floating Solar Technology is used.

5. Kasetart University has a policy on increasing green area inside and outside of the building



**Figure2.9-6** Green Building of the Faculty of Economics and a part of the Institute of Food Research and Product Development



**Figure2.9-10** Office of the Library at Kamphaeng Saen Campus

According to a criteria of Thai Green Building, Kasetart University has a policy to preserve green spaces by requiring new building size 1,000 square meters or more to have a green roof, green wall or install solar energy, at least 50% of the green roof area totally. All buildings in the university will have natural ventilation system, using a translucent roof, using of shading materials to reduce heat entering the building, and planting trees on the roof. As for the master plan of the university, the buildings that was

constructed before, will be renovated. It is another challenge to improve the building to meet the green building criteria.

**[5] total carbon footprint**

**Kasetsart University Forests**

Kasetsart University Forests plays an important role in the production of research. student Internship and academic services to the society as well as providing the ecosystem service for students, staff and visitors, as the source of greenhouse gases, water sources, conservation of plants and animals, etc. For the economy and society, it is the food banks, and the hiring place of local workers for distributing of the ecotourism to the community.

No.	Area	Area (Rai)	CO <sub>2</sub> )Ton(
<b>(1) Campus</b>		<b>1426.89</b>	<b>1,355.24</b>
<b>1</b>	Kasetsart University Bangkhen Campus	24.89	223.25
<b>2</b>	Kasetsart University Kamphaeng Saen Campus	131.00	124.45
<b>3</b>	Kasetsart University Chalermphrakiat Sakon Nakhon Province Campus	931.00	884.45
<b>4</b>	Kasetsart University Sriracha Campus	340.00	323.00

Kasetsart University Forest plays an important role as a recreation area and a source of carbon dioxide. Kasetsart University Forest at Chalermphrakiat Sakon Nakhon Province Campus is a community food bank for people to collect forest products.

**1. Kasetsart University Bangkhen Campus with total area of forest 24.89 rai, absorbs carbon dioxide of 21.25 tons per year.**

- 1) Varunawan Park, 6 rai, absorbs 5.7 tons of carbon dioxide per year.
- 2) Thai Commemorative Garden, 4.6 rai, absorbs carbon dioxide absorbed 4.37 tons per year.
- 3) 100 years garden of Luang Suwan Vajokkasikij, 5.25 rai, absorbs carbon dioxide 4.99 tons per year
- 4) 60-year garden, 6.52 rai, absorbscarbon 6.19 tons of carbon dioxide per year.
- 5) Arokaya Utthayan..2.5 rai., absorbscarbon 2.09 tons of carbon dioxide per year.



**2. Kasetsart University Kamphaeng Saen Campus**

His Majesty the King's 80th Birthday Anniversary Park, the area of 131 rai absorbs 124.45 tons of carbon dioxide per year.

**3. Kasetsart University Chalermpkrakiat Sakon Nakhon Province Campus**

H.M. Queen Sirikit's 86th Birthday Anniversary Natural Park and Dipterocarp Forest with the area of 931 rai including of variety of species of the plants such as dipterocarp forest, Shorea siamensis Miq., Shorea obtuse Wall., Terminalia alata Heyne ex Roth., Buchanania latifolia Roxb., Aporusa avillosa Baill., Xylia xylocarpa (Roxb.) Taub. , absorbs 884.45 tons of carbon dioxide per year.

**4. Kasetsart University Sriracha Campus**

Khao Nam Sap, 340 rai of a dry evergreen forest with notable species include Wrightia tomentosa Roem., Lagerstroemia floribunda Jack., Nephelium hypoleucum Kurz, absorbs 323 tons of carbon dioxide per year.

The Green Library Network and the VGREEN team of the Faculty of Environment, Kasetsart University received a certificate of the "Thai People Carbonless Heart (carbon-neutral man)" from assessing the annual greenhouse gas emission from daily activities, and buying carbon credits to compensate all to zero. The "Hundred Hearts Unite to Reduce Global Warming" event was organized by the Greenhouse Gas Management Organization (Public Organization).



A training activity for internal energy auditors and the Carbon Footprint training course, under the Energy and Environment Management Program, in accordance with UI Green Metric criteria was organized by the Kasetsart University Library. The objective of the activities was to promote various activities related to energy and environmental conservation for personnel and users of the Kasetsart University Library.



**Figure 5-1** Carbon Footprint training course

**KU Eco Green Campus**

Kasetsart University is the first certified Thai university by Thailand Greenhouse Gas Management Organization (Public Organization), under the Thailand Voluntary Emission Reduction Program in forestry and green area category.



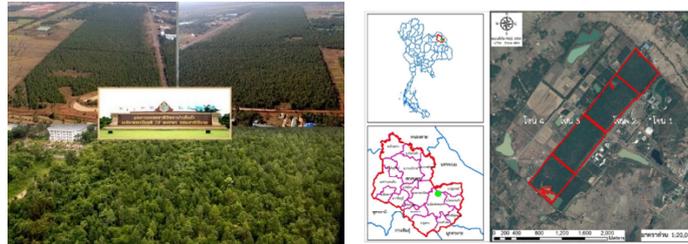
Thailand Greenhouse Gas Management Organization (Public Organization) organized an event on “Hundreds of Hearts to Reduce Global Warming” on 19 September 2018 at Vibhavadee Ballroom, Centara grand at Central Plaza Ladprao Bangkok. In this regards, H.E. General Surasak Kanchanarat, Minister of Natural Resources and Environment of Thailand presented a Plaque to Assoc. Prof. Dr. Trin Saengsuwan, Vice President for Kamphaeng Saen Campus for his achievement on KU Eco Green Campus project.

The project is registered as one of Thailand Voluntary Emission Reduction Program or T-VER. Owing to Kamphaeng Saen Campus separated area of 235.77 rai within the campus into 3 zones for difference purposes as follows: Zone 1 – 100 rai of forest area Zone 2 – forest area Zone 3 –Yangna tree (*Dipterocarpus alatus Roxb.*) planting area



**KU Forest for Life**

Chalermphrakiat Sakon Nakhon Province Campus, Kasetsart University received a certificate of the event "Hundred Hearts Unite to Reduce Global Warming" which organized by the Thailand Greenhouse Gas Management Organization (Public Organization), in the category of Thailand Voluntary Emission Reduction Program (TVER).



The number of 352 Pink Trumpet trees (*Tabebuia rosea*), or Chompoo Pantip in Thai, at amphaeng Saen Campus, Kasetsart University have been registered as the “Heritage of the Land” for the fiscal year 2019. This kind of tree was initiated grown in 1977 by Prof. Dr. Wattana Sathiensawat, the first Vice President for Kamphaeng Saen Campus at that time. He received the seed from Professor Rapee Sagarik, President at that time, which Professor Rapee brought the seeds from Singapore. Professor Wattana considered that growing of big trees would help obstruct strong wind and giving shade for the campus. Therefore, two sides of the roads within Kamphaeng Saen Campus were full of this kind of trees. Begin from the road in front of the Kasetsart University Laboratory School Kamphangsaeen Campus ducational Research and Development Center to the Chandrubeksa Gate approximately 3 km. Until now, ink Trumpet trees are still growing and providing beautiful flowers every year in Kamphaeng Saen campus as these days.



On 14 September 2019, Dr. Chongrak Wachrinrat, Acting President of Kasetsart University, together with executive administrators, students, and personnel joined the event “KU Big Cleaning and Planting Trees Day 2019” at the area of Soi Phahon Yothin 45. The purpose of this activities was in honor of the auspicious occasion of the coronation of His Majesty King Maha Vajiralongkorn Phra Vajiraklaochaoyuhua in 2019. In addition, lead the representatives of the class of KU 79 students to planted trees at the garden of Rapee Sagarik Building. These activities managed to promote unity and raise awareness of personnel and students of Kasetsart University in taking care of buildings and locations. As well as keeping cleanliness,

planting trees and looking after environment, to create a beautiful shady and a good landscape within Kasetsart University, Bang Khen Campus.



Tuesday 11 August 2020. Kasetsart University Kamphaeng Saen Campus organizes a rice planting project on Mother's Day and Father's Day. The area is used more than 13.5 rai at the fields (behind the fuel gas station). The campus development project is used 6 rai in the area of the civil servant flat at Kasetsart University, Kamphaeng Saen Campus, Nakhon Pathom Province. The objective to honor Queen Sirikit Queen Royal Princess Maha Chakri Sirindhorn on the occasion of the 88th Birthday Anniversary, 12 August 2020



## Chapter : III Waste (WS)

### 1. Recycling campaign program

Kasetsart University recognizes the importance of the management of solid waste and recycled materials by encouraging all sectors to participate in the reduction, sorting and recycling of some waste. Kasetsart University has a serious intention to encourage personnel, students, and the general public to use the resources wisely and use it with thought.

#### Upcycling

Upcycling is the development of creative scrap materials which is the process of restoring the condition of waste materials or making materials or products failing into function like their original function into new, high-quality and valuable products. It is also friendly to the environment.



Figure Furniture from waste materials to add value

**Waste separation and dispersal.**

Kasetsart University promotes waste separation. The waste bank is one of the projects to promote the separation of solid waste in order that students have the understanding of the waste separation method and also creates students' awareness to sort waste. Build a reclaiming mechanism to reduce the amount of solid waste that has to be taken to a landfill and also to create separate bins for purchasing as well.

**Students work together to create plastic bottles disposal to separate plastic bottles waste by installing in the student dormitory**

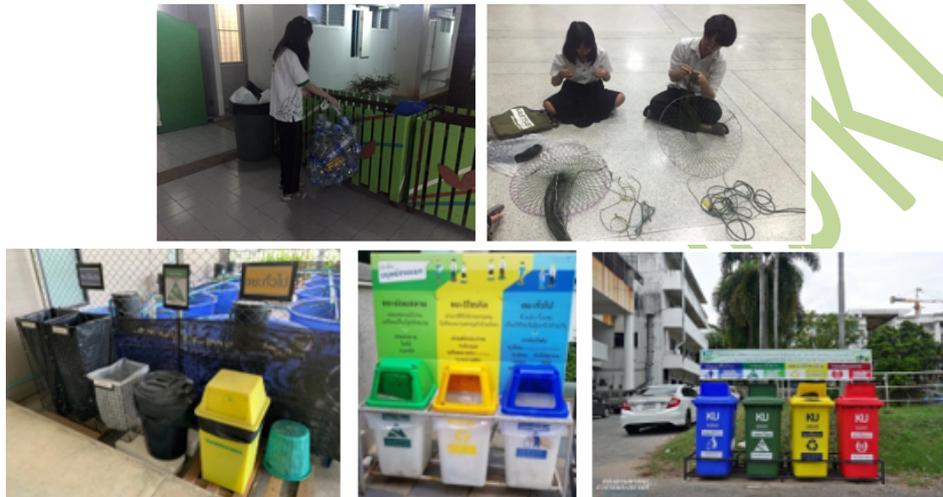


Figure waste separation

**The campaign to use cloth bags instead of plastic bags.**

Using cloth bags instead of plastic bags reduced waste and reduced global warming. Consumers will participate in solving environmental problems by using a cloth bag instead of a plastic bag. Bring using waste materials to make a recycle cloth bag. This will embed environmental protection behavior.

**Putting stickers on the campaign to reduce the plastic bags and synthetic container to reduce waste in different places all over the university**



Figure Reusable Bag go Green, Agriculture Fair

**Vertical Recycle Box**

There are 6 compartments for recycling materials, with a lid made of acrylic. With sound and light systems, with Solar Power system. The cabinet is made of durable fiberglass materials. There is a push button which consumes approximately 0.02 units of energy per time. Use only 0.6 square meters of space. Use begins with the push of a button. **Vertical Recycle Box (VRB)** cabinet will display a speech, explain the separation and provide environmental knowledge, and energy-saving LED lamps will work to stimulate interest and provide light, then open the ceiling. Cabinet put recyclable materials into the compartment as explained by **Vertical Recycle Box (VRB)** cabinet.

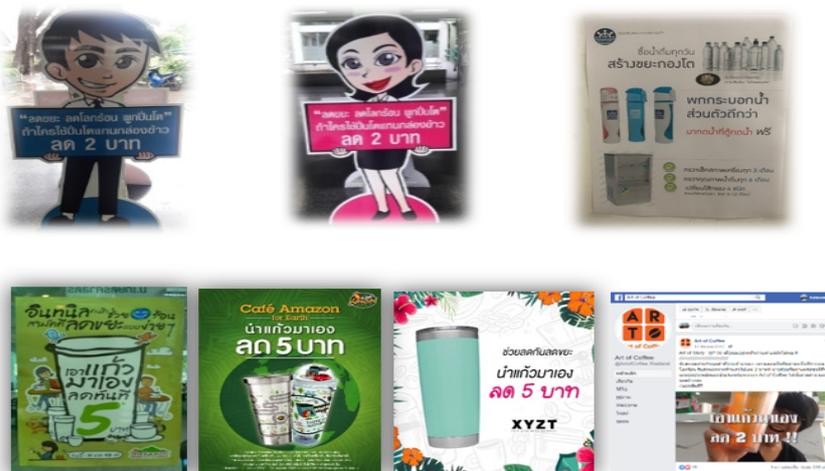


**Figure Vertical Recycle Box**

**2. Program to reduce the use of paper and plastic on campus**

Restaurants and beverage shops in Kasetsart University have seen the importance of reducing the use of single-use plastics according to university policy.

Therefore, to cooperate in the campaign with the sellers in the university, for example, stop using plastic bags, the use of food container (Pinto) instead of plastic bags offers a discount or price reduction on food and drink if buyers bring their own food containers with natural materials (bagasse used to contain food instead of synthetic containers, etc.)



**Figure Campaign sign, bring your containers**

### 3. Disposal of Organic solid waste

Due to the increased amount of solid waste, the accumulation of solid waste has occurred causing problems on environmental pollution. Composting the organic solid waste is thus a way to transform the 'load into value'. It can also help reduce such problem, costs and the amount of solid waste to be disposed of requiring the fewer landfill areas.

#### Black soldier fly

At present, the problem of the amount of waste is increasing and unable to immediately eliminate, often causing the accumulation of waste and environmental problems. More than 50 percent of the waste is scraps of vegetables, fruits, and weeds. Therefore, the organic waste is composted into fertilizer so that changing the burden to be valued add. As well as helping to reduce problems occurring in the waste-management system and the cost of waste management operations. Also reducing the amount of waste that needs to be disposed, resulting in less landfill.



**Figure Disposal of organic solid waste using black soldier fly**

#### Water Hyacinth Eradication

Water hyacinth is a plant that grows quickly. It can adapt to be durable in all water conditions. Therefore, spread quickly along the river. Until now it has become a serious weed in the water source. It polluted water, ecosystems and obstructing water flow. Dr. Arm Unartngam from the Department of Science. Faculty of Liberal Arts and Science and Dr. Jintana Unartngam from the Department of Plant Pathology, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University. Kamphaeng Saen Campus, as researchers of the project, agreed that, the elimination of water hyacinths is often preferable to manual scooping by labor with invented machinery. Which requires a lot of time and budget. It had to do continuously but found that still unable to control the spread of water hyacinth. The concept of disposal is to control the propagation of water hyacinths using biological methods by using the fungus to destroy water hyacinths. This will cause abnormalities or diseases and cannot grow and propagate. It is a natural eradication to use living organisms to control other living things.



**Figure Water Hyacinth Eradication**

#### 4. Treatment of inorganic solid waste

Each method of waste management has its advantages and disadvantages. Selection of appropriate method must consider the important relevant elements such as waste quantity, types, nature of the waste, tools and devices, premises, the cooperation of students and staff, benefits and the properties of wastes. Solid waste that is disposed of each day consists of various types of waste with the variation of waste composition. Inorganic solid waste is a type of waste that Kasetsart University has paid much attention to manage it properly. Since the number of activities in the university has been increasing, the number of inorganic solid waste tends to increase as well. Therefore, inorganic solid waste management is implemented in various sectors to reduce the amount of inorganic solid waste that is dumped in landfills.

#### Green Roof Project

The green roof project has screened boxes of UHT milk and beverages and recycled through the creating process into many different materials. All components such as paper, plastic and aluminum foil can be recycled. The made roof from milk box is durable, flexible also fire resistant. The materials of construction are not heavy. A roof sheet measures 1 x 2.40 meters uses approximately 2,000 beverage boxes in production.. These kind of innovation were donated to Friends in Need (Pa) Volunteer Foundation for social benefit.



**Figure Green Roof Project**

## 5. Toxic waste management

### Small dust is also called PM 2.5

Due to conditions of PM 2.5 dust exceeding the standard in Bangkok and its suburbs, to mitigate the impact of such situation during the Agricultural Fair at Kasetsart University, the security unit of the university therefore organized the traffic system within the campus area for smooth and easy transportation. People who visit the Agricultural Fair are allowed to park on the prepared university car park and used the electric vehicle service to transport. Steam fan and water spray are prepared in the event. There are trucks spraying high pressure water spray to the plants and leaves around the university every morning, afternoon and evening. Also, the Bangkok Metropolitan Administration arranges and supports drones to spray water around the university as well.



Kasetsart University receives "Meteorological stations near the surface and air pollution or KU TOWER" from the Water Resources Informatics Institute (Public Organization) under a memorandum of cooperation on "Development of technology for exploring, analyzing and processing data on water resource and climate management". It is the first research station in Thailand that is used to research the influence of atmospheric matter on near-surface meteorological characteristics in urban areas covering the atmosphere vertically. Weather forecast utilizes vertical weather measurements from KU TOWER to accurately calibrate weather forecasts from the WRF-ROMS model. It also uses air pollution measurement data from the air dust sampling device conveyor system from a high mast station to study the relationship between climate and dust in urban area, which is a great benefit for the accuracy of the country's weather forecast results. Therefore, KU TOWER is one of the key elements of the country's climate research. Also, Kasetsart University has an online daily on-campus air dust report system by embedding link on the university website page and the website <https://airq.ku.ac.th>.



Figure KU TOWER

## 6. Wastewater management

Kasetsart University realizes the importance of wastewater management and water quality improvement through the wastewater treatment process. Treated water is reused for some activities to reduce the cost of tap water and dilute the dirtiness of the wastewater before discharging into the environment.

### Wastewater treatment system: Constructed wetland.

Kasetsart University recognizes the importance of waste water management and improvement of water quality by nurturing treatment process and recycling. in order to reduce water using in departments and public sector. Including reducing contamination of waste water before releasing outside Therefore, various types of wastewater treatment systems have been established in the area of the university and surrounding areas as follows:



Figure Artificial pond

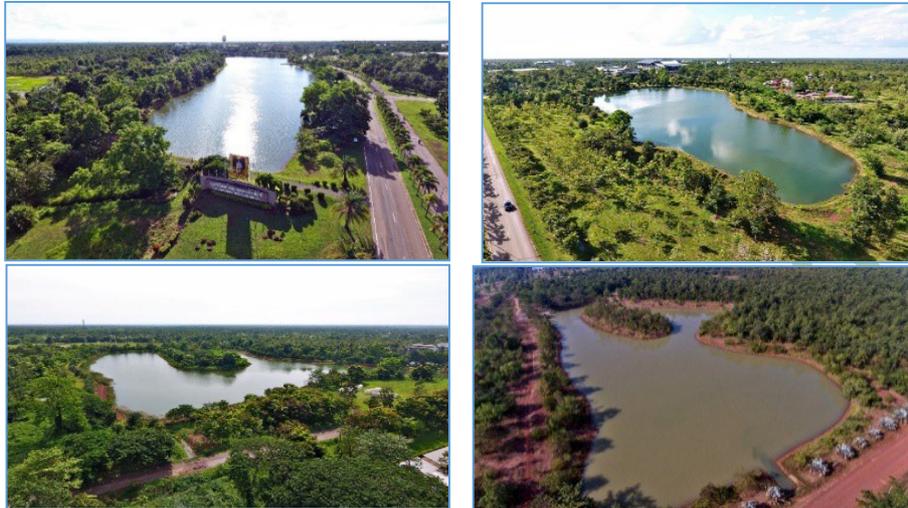
Water quality test - Kasetsart University engages students in practicing skills and techniques for collecting and analyzing wastewater samples in the university area. The analyzed wastewater quality can be used as a guideline for maximizing the efficiency of wastewater management. It also creates a good conscience in maintaining a sustainable environment as well.



Figure Water quality test



3. 7 reservoirs were drilled in the area of Chalermphrakiat Sakon Nakhon Province Campus to contain rain water for using in the campus and surrounding agricultural area, such as Sakon Nakhon, Kalasin, Nakhon Phanom, Mukdahan, Nong Khai and Udon Thani (North and South). All 7 reservoirs can contain approximately 1,400,000 cubic meters of water as in the picture.



[Figure 4.1-4]

4. Ngamwongwan Parking building within Kasetsart University Bangkok Campus has installed an underground tank to reserve rainwater for use. The advantage of installation an underground tank is to prevent subsidence that may occur in the area and space-saving installation as well. Also, the underground tank causes the stable temperature of the contained water because it is not exposed to the outside air directly.



[Figure 4.1-5 Underground water tanks at Ngamwongwan Parking building.]

5. Due to Sriracha Campus is located on the area of mountainous terrain with a high slope. The Faculty of International Maritime considered the benefits from the physical characteristics. Therefore, the Faculty had built a waterway system that transports rainwater that flows from highlands to store in wells which built within the faculty's area for using in education that require to test ships in the field of shipbuilding engineering, etc. (as in the picture).



[Figure 4.1-6 Rainwater transportation system for storage pond.]

## 6. The Use of Water Efficient Appliances (Water tap, toilet flush, etc)

Agricultural irrigation technology - Kasetsart University considers that the problem of dry season and lack of water will become more severe. Therefore, there is an idea to save water in agriculture while enable the plants grow effectively. Plant irrigation technology can be the answer for agriculture. Appropriate and economic plant watering and soil moisturizing allow farmers to have consistent quality products that meet market demand. However, technologies have been collected and cooperated with nearby communities to provide opportunities to learn how to water plants economically and efficiently, reduce the amount of water usage in all campuses. Thus, vegetable irrigation technology is applied to provide appropriate water for plants efficiently.

Faculty of Agriculture (Rai Suwan) has applied the linear water irrigation with corn and millet. The method is suitable for large agricultural areas with application system control and trainings to educate farmers' networks on water technology application for plants and crops.



## Chapter : V Transportation (TR)

### 1.The total number of vehicles (cars and motorcycles) divided by total campus' population:

According to Kasetsart University policy that intends to develop the university beneath the main theme "Land of the Knowledge" by connecting to agricultural knowledge which is educational foundation of Kasersart University. The structural knowledge is brought to employ such as the king knowledge, community awareness and international knowledge by integrating that knowledge to construct academic works for leading educational organization to greenuniversity. Therefore, the development of internal utility is significant for the community in Kasetsart University, that is, physical arrangement surrounding the university for constructing realization to safety is the main element which leads accomplishment to happiness university.

**Public Service:** The realization of Kasetsart University which refers to public transportation in community by limiting the amount of vehicles and decreasing poisonous emission. Especially, during the coronavirus pandemic (COVID-19) impacts the way of life in the university, the behavioral pattern of the community has changed to new approach which is called “New Normal”. This new normal approach is related to respect physical distancing for preventing the COVID-19. Thus, Kasetsart University has declared defensive measures to assist and support instructional systems as follows:

**1. Public transportation service:** students, personnel and general public can travel inside the university for free by provided electric vehicle buses (EV Bus), speed limit of 30 km/h. In addition, Mass Rapid Transit Authority of Thailand has provided the public transportation “The Green Line” which is located close to the university for alleviating traffic congestion on public roads around Kasetsart University. As previously indicated, this factor affects to the traffic within the university because of more passers-by, thus, Kasetsart University has to arrange more transportation services by providing 2 EV buses during rush hour from 6.30 to 9.30 AM. And another rush hour from 3.30 to 6.30 PM. During the coronavirus pandemic (COVID-19), there are sign boards to inform the passengers in the EV buses that must follow the New Normal approach by respecting physical and social distancing to prevent the widespread of infective disease. The message in the sign boards has the core idea “Space Out, Keep Out and COVID-19 can be prevented”. Consequently, the drivers are assigned to clean up cabin passengers with disinfectants to construct a confidence interval and prevent the COVID-19.

**2. KU sharing motor:** Kasetsart University has countersigned as a cooperation with a private sector in supporting electric vehicles which are brought to employ within the university. As previously mentioned, the provided cooperation is in the pattern of “Haupcar” by preparing 7 electric motorcycles within Bangkhen Campus and 6 Honda PCX Hybrid for students and personnel.

**3. Campaign for bikes:** crusading for non-poisonous travel and promoting exercise campaign for all campuses are realized. More 7,000 bikes are used within the university.

**4. Pavements:** improvement of sidewalks is operated for safety and convenience for pedestrians such as determining ECO street, all cars are prohibited to pass or enter, however, the bus stop is defined to locate nearby to go to other educational buildings and offices.

**5. Park and ride points:** interconnection by determining park and ride points in the university is constructed to decrease traffic problem, pollutions, and poisonous emission. And this also assist people in the KU community to realize about safety and exercise for their health by walking to the offices and educational buildings.

**Types of vehicles provided in the Kasetsart University’s public transportation**



**Project on in-campus transportation service provision of electric scooters**



**KU Moto Sharing**



**2. Average number of passengers of each shuttle**

The provision of welfare shuttle service of Kaset Sart University for all campuses accommodated totally 385 passengers per day and it can support transferring students, staff, and visitors who contacts the KU's institutes as many as 300,600 people per month.

**3. Total trips of shuttle service** provided each day were as many as 1,122 trips per day as shown in the table below.

**4. Zero Emission Vehicles (ZEV) policy on campus are available, and provided by the university free.**

**Lesson Learned: Best Practice of Zero Emission Vehicles (ZEV) policy in Kaset Sart University**

Kaset Sart University has the policy to promote pollution-free travel in the university and the use of vehicles that reduce carbon dioxide emission and noise pollution. It also encourages students and staff to avoid using such vehicles but using more public transport provided by the university. Results from the previous implementation by comparing the cost of fuel consumption, diesel engine and electric system in Kaset Sart University, Bangkok Campus is shown in the figure below.



**5. Average number of Zero Emission Vehicles** (e.g. bicycles, cano, snowboard, electric car, etc.) on campus per day



Figure Zero Emission Vehicles: bicycles



Figure Zero Emission Vehicles: GOLFCART

**6. The total number of Zero Emission Vehicles (ZEV) divided by total campus population**

Kasetsart University supports travel without pollution and encourages of using the vehicles that reduced carbon emission and noise pollution in the university. To encourage students and personnel to avoid using cars by using public transport provided by the university. The University changed the public transport service engine from diesel engine to electric power which is a clean energy without air pollution and noise as well as using the electric golf carts to contact in different departments in the university instead of cars or motorcycles.

Besides, there is also a campaign to use bicycles in commuting to promote physical exercise for students and personnel. In the future, we will have the idea to manage all teaching and learning areas as vehicle-free zones that are preparing for a pedestrian street by starting to improve the utility systems for the traffics safety and convenience and more facilitated to the pedestrian.

**7. Ratio of ground parking area to total campus' area**

**Lesson: Best Practice,** Traveling by car in the university

Kasetsart University has created a master plan of the Kasetsart Green University, Bangkok 2017 - 2022. To define using areas and make it clear and be able to link with the different places in the university and public transportation system outside the university, both buses and sky trains will be served in the future by improving the physical system that is conducive to the sustainable transport system in the university.



Figure Map of central parking area in Kasetsart University, Bang Khen

At present, parking spaces have been renovated to connect to the various entrance gates of the university. The university public transport has also renovated with a waiting area outside the campus and sky trains to advance the parking and traffic efficiently, besides, it is an efficient use of resources, and also helps to limit additional vehicles in university. Therefore, the university has provided a central car parking area of Kasetsart University in Bangkhen campus.



Figure Central Parking Building in Kasetsart University, Bangkhen

14 Program to limit or decrease the parking area on campus for the last 3 years (from 2017 to 2019): [ 5 ] Program resulting in more than 30% decrease in parking area or parking area reduction reaching its limit.

**Limited or reduced the parking areas in Kasetsart University in the past 3years (from 2017 to 2019)**

To create the tidy of teaching and learning areas and working place within Kasetsart University, we are setting the measure of internal transporting control to contribute the limited or reduced the parking areas in Kasetsart University in the past 3years (from 2017to (2019with the details as follows:

1. Providing public transportation service, Line 5 to send and pick up students from the dormitory, Soi Phaholyothin 45 to the university.



Figure providing bus welfare within KU

2. Designated of pedestrian street areas in teaching and learning zone by prohibiting cars passing through - is strictly prohibited

**KU Eco Street.** The Implementation to improve the teaching and learning areas to be pedestrianized to reduce traffic problems, accidents, and air and noise pollution that will affect students and personnel's health. By the opening of the WALKING STREET on July 1, 2020. KU Eco Street or **Chuchat Kamphu road**, starting from S.R 1 intersection until Vajiranusorn building approximately 1 km long. The university has converted into a pedestrian street and a bicycle lane, with new flooring materials, more convenient for running and walking. There is a nice atmosphere, pleasant and shady all day long. Besides, there is a new landscape improvement near the Luang Suwannawat Kasikit, a 100-year garden to be beautiful and suitable for use with more running lanes and as well as sitting areas in the garden.

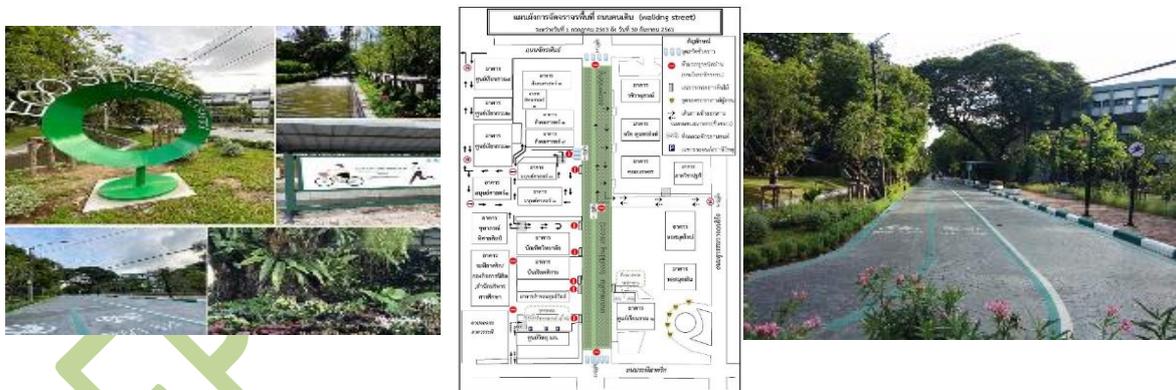


Figure a walking street in a teaching area

3. Setting the parking lot, then traveling near the central car park, which connected to the bus stop and the pedestrian street.
4. One-way traffic management
5. Improvement of streets, pedestrian signs and bicycle paths conducive for pedestrians and bicycles
6. Barrier systems in the area of various units within the KU to limit or reduce the parking space.
7. Determination of no parking areas and do not enter into KU to limit or reduce parking space.

To restrict vehicles in and out of Kasetsart University must have an entrance pass by sticking a sticker from Kasetsart University that can bring a car and motorcycles that can enter to the university.

According to Kasetsart University, it allows cars from outside to enter to Kasetsart University, Bangkok, to reduce traffic problems around the university while having the construction of the green line and red line during rush hour to reduce the traffic impact of Vibhavadi Rangsit Road and Phaholyothin Road.

Now the construction of the train is nearing completion with the green line electric train that was started the operation in Kasetsart University on December 9, 2019. Bangkok has built Bang Khen Canal Road to connect traffic between Vibhavadi Rangsit Road and Phaholyothin Road to be used now. Therefore, Kasetsart University allows cars that will pass inside the university limited with a university pass card, only to make the area within the university in a suitable condition for being an educational institution with no serious accidents, safe and reduce air pollution, which will result in students traveling safely within the university whether using bicycles and electric trains. Measures for organizing traffic discipline within Kasetsart University, Bangkok as follows:

Measure 1: All types of vehicles that do not have a prohibited card from entering and exiting at Kasetsart University, Bangkok University except Ngamwongwan Gate 1, which will take effect on 2 December 2019

Measure 2: Time to open the entrance-exit of Kasetsart University

1. Vibhavadi Rangsit Gate Ngamwongwan Gate 2 and Ngamwongwan Gate 3, allowing access to only cars with a pass to and from Kasetsart University only, and all 3 gates will have time to open the door entry and exit from 05.00 - 10.00 pm.
2. Ngamwongwan Gate 1 allows cars to enter and exit 24 hours a day under the supervision of a security guard.

As for other entry-exit gates used in conjunction with the departments of the Ministry of Agriculture and Cooperatives, The university will discuss the management of traffic system in Bangkok Central Agricultural area and will implement digital technology and artificial intelligence system (AI: Artificial Intelligence) will be applied in future management.

Measure 3: Determination of bus routes in teaching and learning areas

1. Only cars with Kasetsart University licenses can pass through the teaching and learning area consists of Chuchat Kamphu Road, Raphee Sagarik Road, and Wiroj Imphitak Road, from December 2, 2019, onwards.
2. Prohibited all types of cars and motorcycles driving in a bicycle lane

Measure 4: Driving safety campaign for students and personnel of Kasetsart University.

1. All types of cars and motorcycles must drive at a speed not exceeding 40 kilometers per hour in the area of Kasetsart University.
2. Motorcyclists and passengers must wear a helmet to prevent danger while driving and sitting motorcycle.



Figure yellow white area, red white area and no parking area in the University



Figure Traffic signs allow parking only permit and no enter sign

### Improvement of traffic routes in KU.

Kaset Sart University, Kamphaeng Saen campus be aware of the safety of traveling on the campus. Therefore, has improved traffic routes, painted traffic lines, and installed reflective road studs on the key routes. There are roads and tunnels inspection, as well as strict traffic discipline by the campaign to wear a helmet for riding safety.



Figure Painting and drawing traffic lines /Road restoration

### Organizing the rigorous campaign traffic discipline

Security group Building work and vehicles, Central Service Division With public relations in cooperation with student affairs academic and student Administration Division received a traffic officer of Kamphaeng Saen Police Station, set up a tightening check-point for traffic discipline since January 2019 to enforce traffic rules and wearing a helmet.

On September 8, 2020, at 1:30p.m. student development work, Student Affairs Management Division incorporate with Security Work, Central Service Division were setting up a rigorous campaign traffic discipline around the intersection of Faculty of Engineering, Kamphaeng Saen (Wattana Sathien Sawat Road). This campaign for motorcycles' rider and pillion wearing a helmet. To record traffic offenses and warning for the safety of traveling and riding within Kaset Sart University, Kamphaeng Saen Campus.



Figure Providing vehicle inspection services that use natural gas Compressed into fuel (CNG) Formulation of screening measures and entering areas within Kasetsart University. During the coronavirus disease (COVID-19) epidemic situation

Kasetsart University, Chaloen Phra Kiat Campus, Sakon Nakhon Province, Increase the surveillance concentration of COVID-19 infectious disease (COVID-19), utilize academic and technological capabilities to develop SAVESAKON application to support screening in the university area by working with the Provincial Public Health Office Sakon Nakhon and starting from June 8, 2020, onwards.

The Department of Computer Science and Information, Faculty of Science and Engineering, Kasetsart University, Chaloen Phra Kiat Campus, Sakon Nakhon Province developed an application to utilize the screening of the Coronavirus 2019 (COVID-19) surveillance measure under the name "SAVESAKON" for use in the Kasetsart University area. Chaloen Phra Kiat Campus Sakon Nakhon Province

This operation conforms to the measures of Sakon Nakhon Province and according to the policy of Kasetsart University. The preparation for the university semester-open in the academic year 2020. In the cause of have teaching in university. This advantage is surveillance and promptness in investigating disease in case of infection in the area. This application has started in 2 places in Sakon Nakhon Province.

According to Assistant Professor Dr. Watcharaphong Intarawong, Vice President of Chalermprakiat Campus, Sakon Nakhon Province, has a policy for campuses to set measures to monitor COVID-19 and to take action very seriously to keep the campus area the safest. In taking care of students and staff As well as people in the surrounding area Since the outbreak in March 2020

According to Assistant Professor Dr. Watcharaphong Intarawong, Vice President of Chalermprakiat Campus, Sakon Nakhon Province provided campus policy to monitoring measures for COVID- 19and seriously take action to protect the campus area as safe as possible for taking care of students and staff as well as people in the surrounding area since the outbreak in March 2020

By setting up screening points in the campus area and taking care of the cleanliness of all areas were used in the teaching as well as comply with the measures of the Ministry of Higher Education, Science, Research, and Innovation of Kasetsart University related to the order of Sakon

Nakhon Province. From this result in the risk of Chaloe Phra Kiat Campus, Sakon Nakhon Province is very low and considered to be a safe area for students and personnel on campus.

From the measures of the campus above, Assistant Professor Dr. Suphap Kanyakham, Dean of the Faculty of Science and Engineering realized the importance of technical and technology applications to support the implementation of surveillance measures for COVID-19

Dr. Jaruwat Paille, Assistant Dean of International Relations and lecturer of the Department of Computer Science and Information who responsible for the SAVESAKON project for screening people who travel in and out of the Kasetsart University, Chaloe Phra Kiat Campus Sakon Nakhon Province, both students, personnel, and the general public by scanning the QR Code for locating and the staff at the screening point to check the status of travelers entering and exiting the area that there is no risk of infection.

Moreover, using this application is a joint operation with the Provincial Public Health Office of Sakon Nakhon Province (Sakon Nakhon Province), with the screening staff specifying the list of screening staff of Sakon Nakhon Province.

Sakon Nakhon Province was used in 2 departments such as Sakon Nakhon Provincial Public Health Office, starting on May 18, 2020, and Kusuman Hospital Sakon Nakhon Province, starting on 20 May 2020.

On the part of campuses has been cooperated with the Academic Administration Division, Students and the Central Service Division, Chaloe Phra Kiat Campus Office, Sakon Nakhon Province. To facilitate access to the data of student and personnel information system. There is planning to use the application in three screening points is Gate 1, Gate 2, and Gate 6, which will be implemented on 8 June 2020 until the coronavirus outbreak situation (COVID-19) will be in a normal situation.

On June 4, 2020, Assistant Professor Dr. Suphap Kanyakham, Dean of the Faculty of Science and Engineering with a team to test the application used together. Besides, Ms. Patriya Supaudorn, Director of the Academic and Student Administration Division with the personnel has participated with the test as the results of the application can be used well.

#### **8. Number of initiatives to decrease private vehicles on campus**

##### **Lesson: Best Practice for transportation initiatives to decrease private vehicles on campus**

Policy for an internal transportation system, Kasetsart University to the operation of the welfare bus service under the Green University policy, the use of environmentally friendly public transport will help reduce the carbon footprint in the university area. Guidelines for the implementation of the policy for each campus are as follows:

#### **9. Pedestrian path on campus are available, designed for safety, convenience, and in some parts provided with disabled-friendly features.**

##### **Lesson: Best Practice Pedestrian path policy on campus**

Kasetsart University has specified a vision and strategy for the development of Kasetsart University for 12 years (2017 - 2028). The university has a goal of developing Kasetsart University to be "the University of the Sciences of the Land" with a strong continuity and sustainability by integrating agricultural science that is the basis of the university with the King's Philosophy,

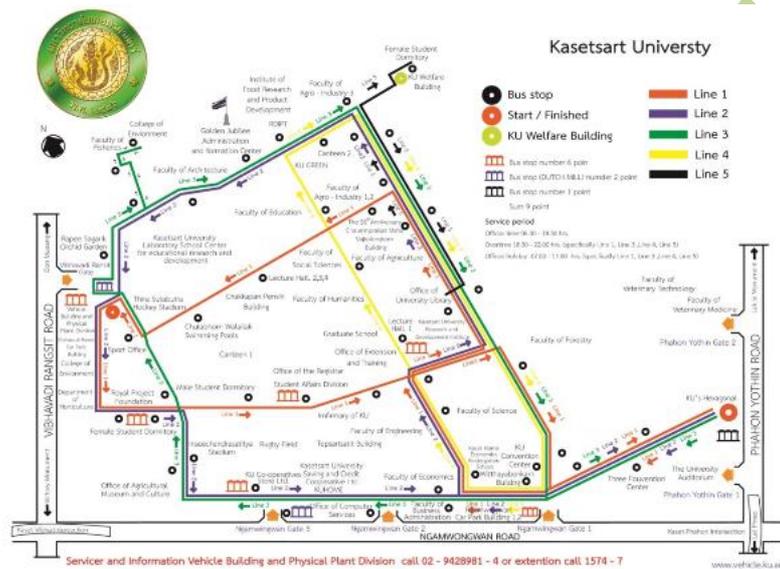
community science, and international science and philosophy to create academic creativity leading to the top university in the following aspects:

To respond to the policy, the university developed an internal utility system to be able to facilitate providing a shady and safe place, open public spaces, open space, and co-working space, ensuring safe travel of students, teachers, staff, and people.

In addition, serving as a green university (Green University) also creates landscapes and facilities to create a university of happiness (Happiness University).

**10. Approximate daily travel distance of a vehicle inside your campus only**

**(in Kilometers):**



**Chapter : Education and Research (ED)**

1. Kasetsart University provides the course “Knowledge of the Land”

**Public service :** Kasetsart University provides the course “Knowledge of the Land” aiming to build up dignity and awareness of being the Knowledge of the Land of Kasetsart University, that plays an important role for Thai and global societies. Being as a higher education institute, Kasetsart University deeply reflects on its identity, “Creating the knowledge of the land for the national well-being”. Addition to that, Kasetsart University has an intention to reinforce and develop the students to be smart, moral, and skillful to learn and work in accordance with the university’s identity as well as to further have appropriate characteristics for being the Thai and global citizens. The course contents relate to the history, uniqueness, and identity of Kasetsart University, learning from role models who created the knowledge of the land, perception of being the Thai and global citizens, reinforcing and developing learning and working skills to achieve the goals under the principles of awareness, determination, creativity, and harmony.

Additionally, the non-degree course of “Knowledge of the Land for Sustainable Development” consists of various modules, which are professional or partitional, encouraging Thai people to be knowledgeable of both theories and practices. It focuses on knowledge of performance and practical skills with learning-by-doing in the real learning sites, the development

of current traditional farming to smart farming by focusing on agricultural administration and technology. This help farmers to gain more income and to shift to be entrepreneurial farmers who increase the value to the agricultural products through agricultural processing and initiate a start-up driven by the Concept of Innovation Driven Enterprises (IDE). This is the greatly important foundation for supporting Thailand to be the country with “Stability, Prosperity, Sustainability”.

The non-degree course of “Knowledge of the Land for Sustainable Development” consists of 21 modules in total. Each module has different objectives but each of them is also related and correspond to industries that are an important mechanism for driving the country’s economy. They also correspond to the national education reform and national development like the New Generation of Graduates Project which was directed by Thai’s Ministry of Education.

**Twenty-one modules of the curriculum “Knowledge of the Land” are available.**

1. Animal Produce Production for Food Security and Sustainability
2. Science in Environmental Management for Security and Sustainability
3. Innovation of Natural Rubber for Sustainability
4. Community Development for Sustainability
5. Gem and Jewelry for Sustainable Gem Industry
6. Agriculture for Life and Health
7. Ornamental and Economical Aquatic Animal Aquaculture
8. Analysis and Development for Agribusiness and Social Enterprise
9. Agroforestry Land Use
10. Forest Based Enterprises
11. Plant Production for Food Entrepreneurs
12. High Quality Beef Production
13. Integration of Thai Rice Production for Food Safety
14. Entrepreneurship for Vegetable Fruit and Cereal Beverages
15. Wood Product Technology for Modern Entrepreneurs
16. Young Children’s Development and Rearing
17. Happy Aging Society in the 21<sup>st</sup> Century
18. Psychology for Entrepreneurship Development
19. Entrepreneurships for Fertilizer Business
20. Data Science for Business
21. Computing and Informatics

**Socials engagement:** The students will learn with activity-based learning or using activities in learning processes. This course focuses on creating the joint learning processes in which the students are nourished with various skills and the knowledge and the instructors of the Office of Academic Affairs and Office of Student Affairs are integrated.



(Figure 6.1-1) 21 modules of the curriculum “Knowledge of the Land”



(Figure 6.1-1) 21 modules of the curriculum “Knowledge of the Land”

## 2. Best practice : Research on excrement absorbent pad made from water hyacinth

**Public service.** Water hyacinth is an aquatic weed highly affecting environment like slowing down water flow, polluting rivers and canals, being a hiding place for poisonous animals. Each year, the government needs to spend a large budget on eliminating water hyacinth. Though water hyacinth has been brought to make fertilizer, bags, and different types of basketry, it cannot be completely removed. Therefore, the use of water hyacinth should be further developed. Utilizing water hyacinth will help add value to weeds and generate extra income to farmers during their leisure time when they do not have to engage in agricultural work. The inventor team viewed the importance of utilizing water hyacinth, a significant aquatic weed causing a national level problem; therefore, it is used to make an excrement absorbent pad for animals. Water hyacinth fibers are porous, being able to absorb liquids fast, having a high water holding capacity. Besides, it is designed to be easy to clean and the absorption efficiency of animal excrement is increased. The pad is designed to be easy to dispose off without diffusing dust. It helps reduce a waste problem caused by cat sand residue, saw dust, and jute stems as well as dust problem, suitable for small sized pets.

**Agricultural innovation.** Water hyacinth is created more value by being blended into fine pieces, compressed into sheets, and sun dried to give more strength. For one time production, 25 kilograms of water hyacinth are required for 2 sheets of A4 paper, considered a large quantity of water hyacinth material. By doing this, it can help reduce water hyacinth waste in water sources better. Since the product is made from natural material, it will break down easily. The excrement absorbent pad made from water hyacinth has animal excrement absorption property and it does not produce or accumulate dust, can be used with animals that have allergies.

**Socials engagement.** This research was conducted by Lecturer Peera Arreesrisom, Faculty of Veterinary Technology, Kasetsart University.



(Figure 6.4-5) Research on excrement absorbent pad made from water hyacinth

### 3. Best practice : Research on growing melon under solar cell system

**Public service.** Growing melon under solar cell system is considered an alternative for farmer since it can help reduce cost of production. This system alleviates the problems related to management, greenhouse workers that are difficult to find, and high wages. The system offers efficient control of water; watering schedule is set at every hour and watering is run 1 minute per time. As seedlings start to grow, watering schedule is increasingly adjusted depending on its stem. Efficient watering can help reduce the fertilizer problem from running off the system and minimizing fertilizer application quantities. The watering system is controlled by solar energy or solar cells instead of electrical energy. Furthermore, farmers can grow kitchen vegetables along the lines where fertilizers flow into. In this regard, it is a by-product making farmers can generate more income. In case an experiment of the research gives a favorable result, it will be magnified and promoted to farmers accordingly.

**Agricultural innovation.** The solar cell system used for growing melon is green energy to replace fossil energy. Regularly, the solar cell system is used to solve problems of growing melon in a greenhouse, save energy and reduce a loss of fertilizers running off with water. The solar cell system is used to rotate nutrient solutions, reducing a high level of loss while melons can grow well.

**Socials engagement.** This research was conducted by Mr. Sarun Hongsakornprasert, Farming Research and Development Station, Agricultural Research and Technology Transfer Center, Faculty of Agriculture, Kasetsart University.



(Figure 6.4-6) Research on growing melon under solar cell system

#### 4. Disinfection spraying robot

**Public service** Currently, disinfection spraying to kill Covid-19 in areas prone to Covid-19 infection, inside and around buildings, requires sanitation workers, bringing them to be at high risk for infection. The research team then designed and developed a disinfection spraying robot to ease health risk to the workers. It can work two times faster than humans and is suitable for public areas inside and around the buildings such as walkways, halls, offices, waiting areas, food courts, etc. The robot is operated by a remote control through a wireless closed circuit camera within a distance not less than 500 meters. The robot has a camera attached to its body and can be directed via a smartphone. Kasetsart University gave the disinfection spraying robot prototype to Faculty of Medicine, Siriraj Hospital - Mahidol University, Faculty of Medicine, Vajira Hospital-Navamindradhiraj University, Phanyananthaphikkhu Chonprathan Medical Center – Srinakharinwirot University, and Naval Command Center to spray disinfectant in many high-risk areas, both inside and outside, such as universities, hospitals, educational institutes, living places where many people are living places where many people are staying crowdedly or even military campuses, prisons having a lot of people being at risk for infection including places where infectious people stay, recovery rooms, quarantine rooms, etc.

**Agricultural innovation** The disinfection spraying robot was developed from the team’s experience and knowledge in building an agricultural mobile robot applied to building this robot to serve urgent demands in a current situation.

**Socials engagement.** The research was conducted by Asst.Prof. Panya Lao Anan Thana, Department of Electrical Engineering, Faculty of Engineering, Kasetsart University and the team of former and current engineering students.



(Figure 6.5-11) Disinfection spraying robot

**5. The Project for Conservation and Development Kung Bang Krachao Green Areas:** Kasetsart University signed cooperation agreement with Department of Forestry and PTT. As of today green areas in large cities have decreased continuously, Kasetsart University, Department of Forestry, and PTT realize the importance of conservation and development of Kung Bang Krachao green areas which include 6 sub-districts, i.e. Bang Krachao, Bang Nam Phueng, Bang Kobua, Bang

Krasob, Bang Yor, and Song Kanong, Phra Padaeng district, Samut Prakan province, being the last green areas of Bangkok and its outskirts. Moreover, PTT has supported the study and planning to improve the water flow in the areas, research on preventing erosion of river banks by building rows of bamboo poles to protect the shore from wave breaking, giving rise to new clay accumulation, mangrove forest restoration, and management of the Chalerm Phrakiat 80th Birthday of King Bhumibol Adulyadej Park at Song Kanong sub-district, Phra Padaeng district to be a learning center of plant varieties in the lower Chao Phraya basin (during 2016-2019). Currently, Kasetsart University has implemented all projects continuously though they were handed over to Department of Forestry. The university keeps on giving the importance to those projects so as to strengthen Bang Krachao to sustainability by adhering to the “sufficiency economy philosophy” of His Majesty the late King Bhumibol Adulyadej Maharat Borommanatbophit firstly given in the graduation ceremony at Kasetsart University on Wednesday 18 June 1974 as a developing guideline.

**Public service:** On the signing of this cooperation, Faculty of Forestry Kasetsart University selected plant varieties in the Chao Phraya basin, local plants such as iron wood, garjan, parashorea stellata, elaeocarpus, big bag tree, banyan, bargad, kankrao, persimmon, queen’s crape myrtle, etc., and prepared income-generating plots for planting fruit trees and economic trees such as barracuda mango, sapodilla, mangosteen, ginger, galangal, herbs that can be used as a role model. Growing trees brings generates economic benefits and can be applied to everyday life of people in the community. Bang Krachao is an ecotourism destination and nature conservation place. It is agricultural land where public park, Sri Nakhon Khuean Khan Botanical Garden, and Siamese fighting fish museam are located. It offers an area of more than 200 rais, encouraging people to pay a visit to experience a way of life, culture, tradition, and nature, driving eco- friendly tourism and promoting good quality of life of people in the community.

**Agricultural innovation:** The university brought personnel and students as well as a body of knowledge and innovation to develop and promote the selling of local products for generating income for people in the community.

**Social engagement:** Kasetsart University cooperated with government agencies, state enterprise, and community to conserve a primitive way of life according to the royal initiative as a role model of participatory development of local people that leads to sustainable development under the strategic development of Chaipattana Foundation by determining the implementation of project for water conservation, forest conservation and Kung Bang Krachao conservation. It is considered a progressive step for restoration and conservation of green areas in an urban community through community participation and network associates. Meanwhile, it is an action following in the late King Bhumibol’s footsteps and doing good deeds in tribute to the late King Bhumibol while students and staff are able to bring the obtained body knowledge to share with others, support and develop communities accordingly.



(Figure 6.8-6)

**6. A tree planting activity was organized by Kasetsart University on Asarnha Bucha Day** in 2020 by having the Department of Her Royal Highness Princess Maha Chakri Sirindhorn participated at Luang Suwanawat Kasikit 100 Years Garden (beside the integrated learning center 1) in Kasetsart University Bangkhen, Kasetsart University, and planted 4 trees on the day, namely Inthanin, Tabaek, Sela and Nonsee, which are the trees of Kasetsart University, together with the administrators, personnel and students of the Faculty of Forestry jointly planted 20 kinds of trees, totaling 170 trees. This garden was built in honor to commemorate Luang Suwannawajok Kasikit or Mr. Thongdee Resanon, a professor of agriculture and the 3rd university chancellor on the occasion of his 100 years of age. The garden is also a recreation place for the faculty, staff, students and the public on the area of forest garden, perennial plants and various types of plants.



(Figure 6.8-2.3)

*"The development of the country needs to be done in a hierarchical manner. A foundation of sufficiency of most people is required as a preliminary by using economical methods and equipment, while being theoretically correct. When achieving a solid, moderately ready and practical foundation, the prosperity and higher economic status then gradually develop in the next order. Focusing only on building prosperity and economy quickly without consistent action plans with the state of the country and people will cause imbalances in matters, which can eventually lead to disruption as can be seen in many civilized countries that are facing current severe economic problems"*

**Royal Guidance  
in the commencement ceremony of  
Kasetsart University at Kasetsart University Auditorium**

**Thursday, 18 July 1974**

