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Learning wild plant toward carbon neutral agriculture in international training program

Kim, H.[1*], Singseewo, A.[2] and Poungsuk, P.[3]

[1]ECOgreen Institute of Environmental Education and Research, Republic of Korea; [2]Faculty of Environment and Resource Studies, Maha Sarakham University, Thailand; [3]Facultultry of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkraband, Thailand.

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Abstract Results showed that learning about wild plants leaded the students to be well practiced in carbon neutral in agriculture. Tit demonstrated learning wild plant increased student's ecological citizenship, improved agricultural skills, self-esteem toward carbon emission activities, agricultural skills, self-esteem toward carbon emission activities. Among 67 graduated students, 14 students answered the questionnaire which 12 students answered that they applied what they had practiced in their fields such as family and community food security. With students' evaluation of the educational methodology of the program showed that the method of making a roadmap to cut the CO2 emission is the highest score followed by a mean score of 4.88, and research on wild plant product was the second highest score and followed by mean score of 4.82.

Keywords: Wild plant, Carbon Neutral in agriculture, Environmental education, International Cooperative training program, Ecological citizenship

Introduction

Since Unite Nation has adopted the Paris Agreement, it is a legally binding international treaty on climate change. The Paris Agreement goal is to limit global warming to well below 2 degrees Celsius, preferable to 1.5 degrees Celsius, compared to pre-industrial levels. The Paris Agreement requires all the Parties to put forward their best efforts through "nationally determined contributions" (NDCs) and to strengthen these efforts in the years ahead (UNFCCC, 2022). The Net0 (2020) posted that the Energy and Climate Intelligence Unit offers a Net Zero Tracker to list countries in the "Net Zero Emissions Race". Bhutan and Suriname have achieved negative emissions, Sweden, United Kingdom, France, Denmark, New Zealand, Hungary made in

[*] **Corresponding Author:** Kim, H. **Email:** skyhj@naver.com

law and European Union, Canada, South Korea, Spain, Chile, Fiji which proposed legislation.

Climate change is among the greatest threats to agricultural systems. Green Revolution though multiplied agricultural production several folds but at the huge environmental cost including climate change. Jonathan mentioned that in 2019, the Inter-governmental Panel on Climate Change (IPCC) concluded that agriculture and the food system are key to global climate change responses. Emissions associated with agriculture fall in two different categories of emissions under the United Nations Framework Convention on Climate Change (UNFCCC, 2022) reporting system: agriculture and land use, land-use change and forestry (LULUCF). The first category comprises direct emissions from agriculture, such as methane and nitrous oxide emissions from livestock, rice cultivation and fertilization of grassland and cropland. LULUCF comprises (other) emissions from agricultural cropland and grassland, for instance, through the loss of soil organic matter, tillage, field burning of agricultural residues or the clearing of natural vegetation. Puupponen *et al.* (2022) mentioned carbon neutrality is expected to both contribute to climate change mitigation and require adaptation in agricultural sector. Developing the systems are required by a low-carbon society is a process based on natural and agricultural science. For example, carbon neutrality needs changes in land use practices in farming.

Then, how can we make carbon neutral society through agriculture. Castillo (2022) said that to adapt to climate shocks and their impacts, a call for ecological citizenship has been made in education. Because through the integration of ecological education in a variety of settings, students can develop a sensitivity to environmental problems and the need of the marginalized in society.

Fiorini *et al*. (2022) mentioned long-term studies reported that the combination of conservation tillage, adequate fertilization coupled with intensive crop rotation can enhance Soil organic carbon (SOC) stock (Paustian *et al*., 2000, Reeves, 1997). The enhancement of SOC in cropland plays a vital role not only in reducing the atmospheric C pool, but even in determining soil fertility and sustaining crop productivity (Reeves, 1997).

This research was conducted in Canaan Global Leadership Centre (CGLC) in Wonju, Republic of Korea. CGLC is famous training centre of practical training and disciplined life. This training program was designed for KOICA-Yonsei Master's Degree Program in Community Development students. This research focused on how the student implement when they are returned to their nation or designed how students translate from carbon emission agricultural practice into carbon neutral in agriculture through international training

program. Still, it has limited due to small number of population and sample. Although, they are coming from 33 different counties and work in the government or related government.

Materials and methods

The study conducted in qualitative research to found out how students could implement carbon neutral in agriculture after the training. For that reason, researcher was done to make questionnaire for alumni student. Unfortunately, during research period that the world has faced on COVID-19 lockdown, so that the data gathering was limited. After researcher get the data from alumni student's answer, improved training program and applied with 2020's students. And They made roadmap for decarbonize in agriculture area. The variables of study were independent variable-learning wild plant in training program and dependent variable-student's reflection.

Population and samples

Population and samples were students who enrolled Yonsei – Canaan Summer program. The population of the study were 86 students who enrolled Yonsei-Canaan summer session from 2016 to 2020. They came from 33 different countries. Samples are responded students of researchers' alumni questionnaire from 2016 to 2019 and enrolled Yonsei-Canaan summer program students in 2020. First sample group consisted with 14 students from 13 different countries and second group consisted with 17 students from 15 different countries.

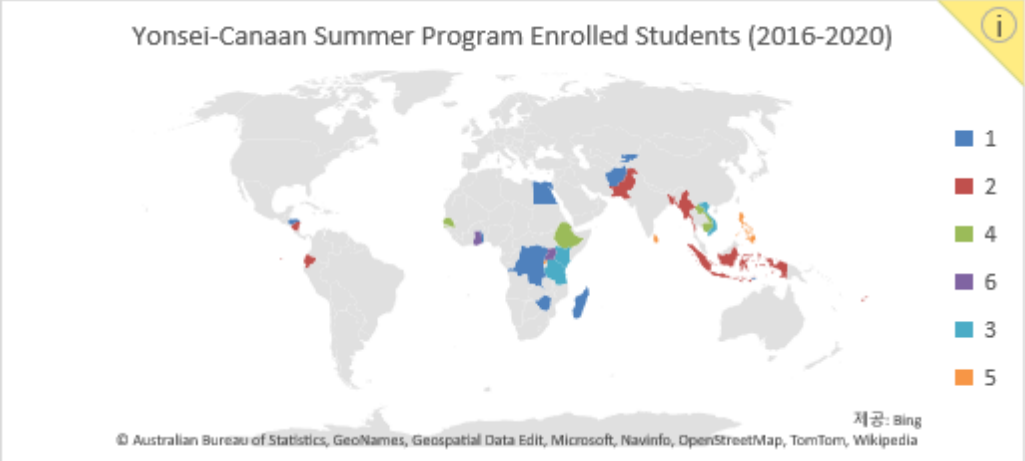

Figure 1. Number of populations from 2016 to 2020

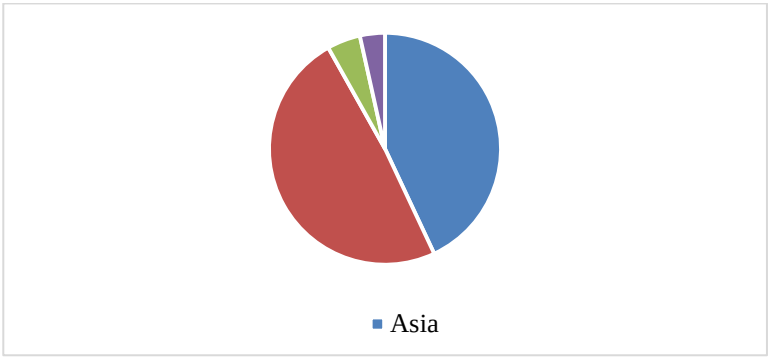

Figure 2. Distribution of student's home country by continent

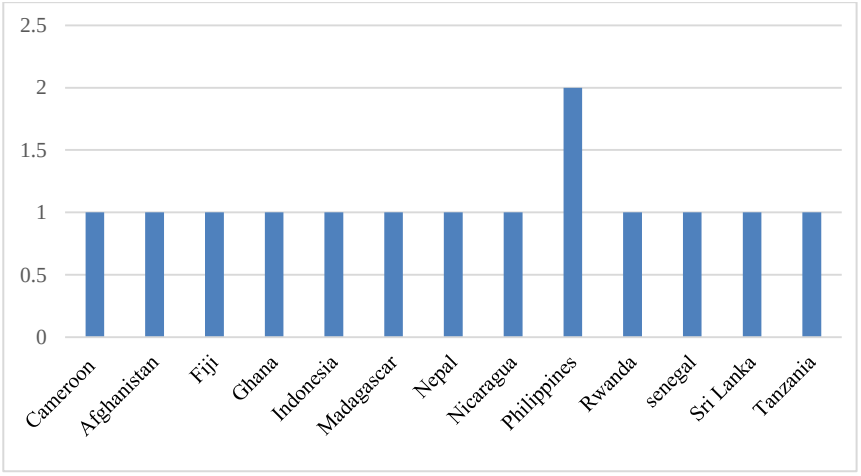

Figure 3. Sample 1, Students who responded questionnaire among alumni's student from 2016 to 2019

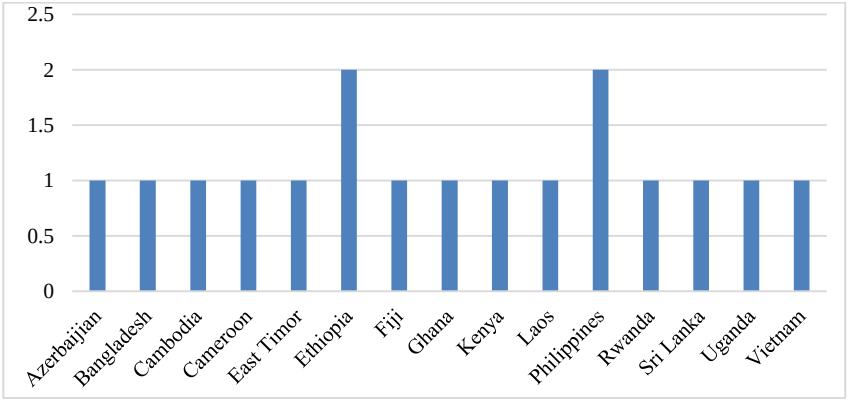

Figure 4. Sample 2, Yonsei-Canaan Summer Program Enrolled Students in 2020

Research instruments

The research was done in two parts. First part was done with alumni students from 2016 to 2019, and analysed their answers. Second part was done with Yonsei-Canaan who enrolled students in 2020. In-depth interview was scheduled after the program. The quality of the in-depth interview schedules was submitted and proposed with experts to determine the consistency of inquires with the purpose of data collection through IOC technique. The researcher analysed students' reflection of class and their answer of questionnaire and interviews.

Research procedures

The flowchart showed the steps of research process. The researcher sent questionnaire to alumni student who enrolled Yonsei-Canaan summer program from 2016 to 2019 to get how they implemented from learning into their work place. Also the data were get from the students who enrolled Yonsei-Canaan summer program in 2020.

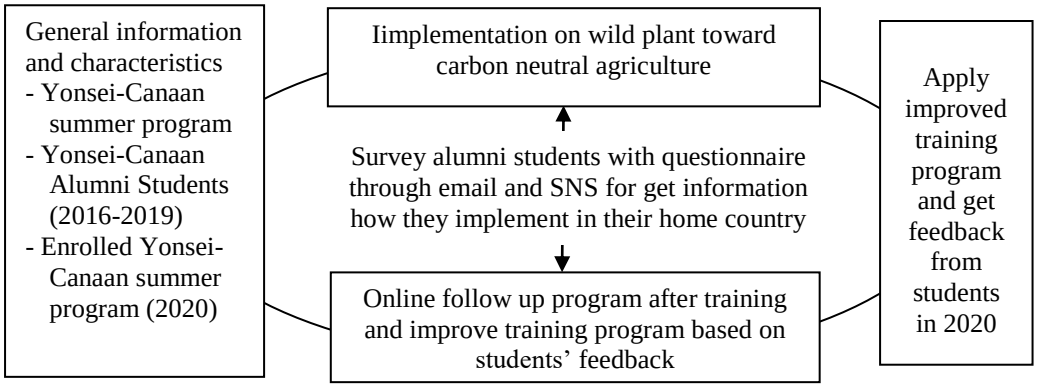

Figure 4. Flowchart of research process

Data analysis and statistic Used

The researcher analysed the content analysis on students' basic information, Index of item Objective Congruence (IOC) for the quality inspection of research instruments, and statistics used in this study were piquancy, mean and standard deviation.

Results

Learning wild plant increasing student's ecological citizenship

Most of the students explained that their view point of natural environment changed like wild plants from weeds as a hazardous. It made the students to call weed into wild plant or individual plants name.

Improving agricultural skills improve self-esteem toward carbon emission activities

After learning wild plants students recognized that wild plants showed up soil nutritional condition, pH level, and improved soil and water conditions, and wild plants can use as a food, medicine and materials for daily product for human, wild plants could use and fertilizer and repellent in agricultural practice.

When they made a product from each wild plant's followed by local wisdom of each country, they were happy to learn from each other. And some of the students pledged to treasure and made learning program of local wisdom, back in their country. In fact, some of alumni students from 2016 to 2019, they implemented their home country. 14 students among 67 alumni delivered their answers of questionnaires. And 11 students answered yes on the question of whether they practiced or implement in their home country what they had learned from Yonsei-Canaan Summer Program. Student from Tanzania practiced in corn production value chain whereby farmers had been capacitated on postharvest technology and corn marketing at national and cross border markets. Student from Cameron working with farmers on how to make biofertilizer by using indigenous microorganism and Tithonia leaves (Tithonia Diversifolia). Also, how to use some grasses (neem leaves and oil, bokassa grasses) to make bio pesticide in case to reduce chemical residues. They are initiated neem seed oil by producing neem seed oil and cake. Also, neem cake can be used as anti-nematode and animal food. Student from FIJI did home garden during COVID-19, when they harvested, and shared agricultural product with neighbour. Student from Senegal supported local woman's agrobusiness. Students from Indonesia, Nepal, Nicaragua, Philippines, Rwanda, Sri Lanka made their home gardens or used food waste into earthworm compost. Student's whom could not be implemented, it answered that they transferred to other section far from agriculture. Although they did not practice right now but willing to practice when they will be received chance.

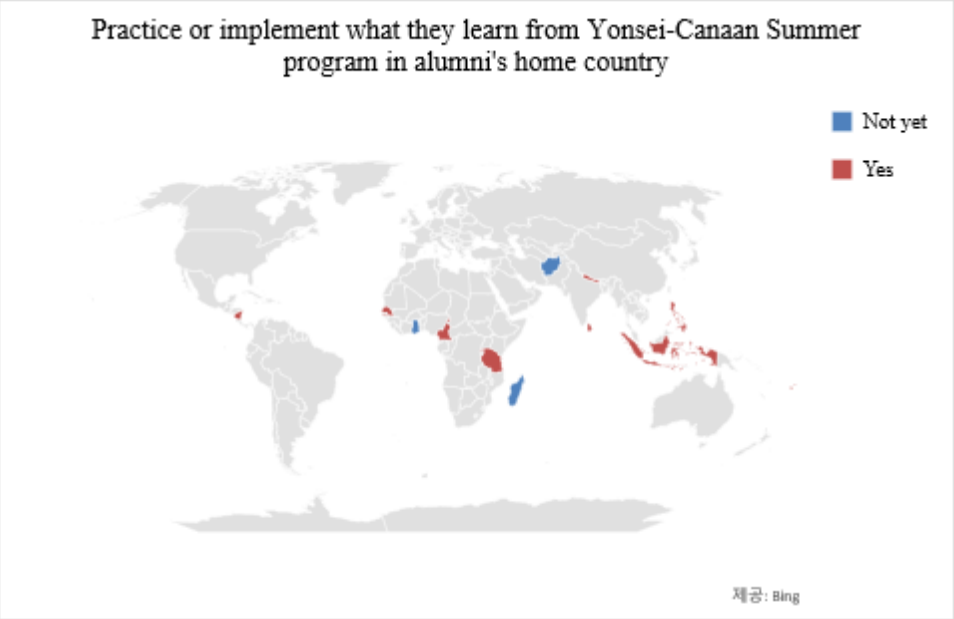

Figure 5. The implementation of Yonsei-Canaan Summer program in alumni's home country

After the training program finished, students could see the climate change in holistically and make design carbon neutral society

Student from Azerbaijan wanted to transfer their daily habits from consumerism to self-sufficiency. Student from Cambodia wanted to transfer the skill to make daily product to farmers to support their business. Student from Ethiopia mentioned that he could reduce his spend due to make self-daily product. And students from Philippines and Vietnam were happy to learn wild plant as a useful herb.

When the last training program did with group to make roadmap to reduce carbon emission in 10 years. Students made roadmap in three different parts like policy, education and community development. When they finished their groups work, students faced on dilemma between economic growth and environmental preservation. Both are considered to be important factors for human's quality of life. So that, students could understand the important of international partnerships for the sustainable development goals.

Student from Cambodia shared this message after the training program. Regarding group discussion activity, it gave me new experience on how to establish an action plan to reduce carbon dioxide emission in the environment. As we know that climate change is a critical issue in the world and practically, it is not an easy issue to be addressed. It needs holistic mechanisms to address those problems. In this regard, the integrate interventions should be enacted

more responsively. The intervention should start from every single person by active engagement and strong willingness to fight against all form of the activities which is harmful and hazard to cause environment destroying. Personally, I will strongly participate to fight against all my activities which cause environment crisis, I would like to share the negative impact to my community to aware on the degradation of resource and environment and encourage them to stop all the actions which are a hazard to the environmental crisis. (Cambodia)

Table 1. Educational methodology and student's evaluation

Items	Mean (n=17)	S.D.	Description
1. Please check if that methodology helps you to understand the lecture			
• Research on wild plant product	4.82	0.528	Strongly agree
• Make roadmap to cut the CO2 emission	4.88	0.332	Strongly agree
Total	**4.85**	**0.43**	**Strongly agree**
2. Please check if below practice helps you to understand the subject			
• Make a soap	4.76	0.437	Strongly agree
• Make a shampoo	4.41	0.712	Agree
• Use eco-friendly detergent,	4.76	0.437	Strongly agree
• Use eco-friendly tooth powder	4.82	0.528	Strongly agree
• Observe the land	4.88	0.332	Strongly agree
• Make liquid compost	4.76	0.437	Strongly agree
• Farm activities (clean the area, make bed, plant a crop and mulching)	4.41	0.712	Agree
• Produce product from wild plants	4.88	0.332	Strongly agree
Total	**4.71**	**0.491**	**Strongly agree**

Legend:

Scale	Score	Description
4.50-5.00	5	Strongly agree
3.50-4.49	4	Agree
2.50-3.49	3	Moderate agree
1.50-2.49	2	Disagree
1.00-1.49	1	Strongly disagree

Therefore, students evaluated training program is shown in as Table1. It showed the educational methodology evaluation by students enrolled in 2020. Section number 1 was a group of workshop methodology and number 2 was a field practice methodology. The group workshop methods were research wild plant production, and make roadmap to cut the CO_2 emission. Among the group workshop methods, the data showed that students were strongly agreed on methodology which helped to understand the lecture with mean of 4.85 respectively. It was found that the method of make roadmap to cut the CO_2 emission is presented to be the highest score, and followed by mean score 4.88.

Discussion

The research findings are discussed. Park (2010), presented that ecological and democratic citizens as well as social structural transformation like as

capitalist economic system and modern state system are necessary to overcome global environmental problems. To awaken people's eco-sensitivity is important steps. Iizuka (2000) reported in his project that the citizen's awareness and its pro-environmental actions play crucial role in making the environmental policy successful. Therefore, transfer student's viewpoint could prospect to make carbon neutral society in future. Hill and Ramsay (1977) mentioned in their article that some people may think of weed to take soil nutrient but they do have beneficial function. For example, many weeds protect topsoil from the eroding forces of rain, wind, and sun, especially when the crop cover is poor, and many weeds, particularly perennials, possess extensive root systems that penetrate deep into the subsoil, breaking it up and enabling the less vigorous roots of some of our crop plants to penetrate further into the soil, weeds have also been used as indicators of presence and quality of ground water, and weeds ability to reveal information about the properties of soils, particularly their nutritional status, pH, and presence of a hardpan.

Based on the results, learning about wild plants could improve students' ecological citizenship. Learning wild plants started from observe the land. When students observed the area, they are identified each plant and checked its character. Through that students could learn the relationship between soil conditions and plant interactions. Once they knew wild plants, they cherished each plant. Instead of weed, called wild plant or herb. After that, they started to learn how to use wild plants like soap, shampoo, fertilizer, repellent, and food. Then students realized that wild plants existed a lot near them. Also, they wanted to learn more about wild plants from their local wise. It made them to increase self-sufficiency and circulation of ecology that consistent with the research of Ali *et al.* (2012) found that a solution how to decrease carbon emission and reduce carbon footprint (Cho, 2018). Therefore, students are satisfied to get skills to use wild plants, as well as make roadmap of carbon neutral society. Because they could see the climate change holistically. Castillo (2022) highlighted importance of Education in his paper. He said that education institutions can play a key role in adapting to climate change by responding to climate crises. Through community extension, collaboration, and cooperation with local authorities, public health institutions, and other private organizations, meaningful service activities can be performed. Learning involves both knowing and acting. Thus, academic institutions can contribute to the development of ecological citizenship among students and community members and also ensure sound environmental practices for the benefit of all, especially vulnerable individuals. In IPCC (2021) Summary for policymakers mentioned that human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years. In other words, solution of climate change is in human. Karatekin and Uysal (2018) also mentioned in the article that people are looking for solutions to these problems for passion of a new world. It is the human being who put the world into this position, so solution is

hidden himself. If people learn to live according to the rules of ecology and they can harmonize their behaviour with the basic principles of ecology, a new hope for our world will arise. The people realize this hope must be concerned the ecological citizens.

The research found that learning about wild plant led students to understand the climate crisis holistically and found a way how to transfer to carbon neutral society. Further research suggested that how to implement this training program to improve ecological citizens in different age, occupation, area.

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