Curriculum Development for Sustainable Development in International Development Cooperation Training Program

Heejung Kim

A Thesis Submitted in Partial Fulfillment of Requirements for
degree of Doctor of Philosophy in Environmental Education
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for Doctor of Philosophy (Environmental Education)

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The examining committee has unanimously approved this Thesis, submitted by Mrs. Heejung Kim , as a partial fulfillment of the requirements for the Doctor of Philosophy Environmental Education at Mahasarakham University

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ABSTRACT

This research focused on the international development cooperation training program. This study conducted on Yonsei-Canaan summer program participants in Canaan Global Leadership Center, Wonju city, Korea. The participants are taking KOICA-Yonsei Master's degree program from 2016 to 2020. The data gathered for development curriculum from graduates (2016to 2019) on class reflection during the program opened and questionnaires. And the developed curriculum was applied with 2020 summer program participants. The results shows that the holistic approach works when participants accept the environmental problems as their own. And group workshop and field work make participant improve their environmental knowledge, skills, attitudes. On the final group work of decarbonize agriculture support them to think how to apply this knowledge on their work. All in all, this curriculum support participants in environmental education objects. The training center was work importantly because the role in training center emphasize self-sufficiency while they were stay at the training center. However, this research had limitation to gather that data from graduates due to COVID 19 lock down in the world.

Keyword : Curriculum Development, Sustainable Development, Student centered Education Place based learning

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TABLE OF CONTENTS

Page

CHAPTER 1
INTRODUCTION

1.1 Background

The world continues to face various critical challenges such as: human-induced climate change, the rapid depletion of natural resources, the frequency of natural disasters, the spread of (old and new) infectious diseases, the loss of biodiversity, the violation of human rights, increased poverty, the dependency of our economic systems on continuous growth in consumerism and so forth (UNESCO, 2009).

Last 2014, The International Panel on Climate Change (IPCC) published that Human influence on the climate system is clear, and recent anthropogenic emission of greenhouse gases are the highest in history. And October. 2018, IPCC adopted special report urges the world that limiting global warming to 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (IPCC, 2019).

However, to achieve IPCC agreement to limit temperature and global greenhouse gas emission, people awareness and change behavior should be followed. Because influenced and understand of climate change is different by region, social and economic status. Hwang (2017) mention that we need to know that the stages of climate change, the impact we receive from climate change, and our attitude to cope with it are not independent but are related to each other. Jung (2018) said that environmental education is the most important issue in solving the environmental problems, the environmental practice of citizens as well as adolescents is not getting better because they perceive non-self-environment as self-environment and show instinctive and active behavior. Lee, (1993) found that the process of personalization of environment was lacking. In

particular, a comprehensive inquiry strategy that encompasses the local environment, economy, and society is crucial to link school and social environment education and to understand and solve environmental problems from an integrated perspective. Kim, (2014) found Self-efficacy affects the adoption of pro-environmental behavior the most while pro-environmental attitude, the recognition of threats to environment and scientific knowledge on environment are also found statistically significant. With above research, environmental education of climate change needs holistic approach and educate self-environment to students. In fact, 15 years old Swedish student, Greta Thunberg, touched our heart through her climate action in 2018. She strikes schooling on every Friday and do protest on refusing school for the climate outside the Swedish parliament. And had speech on COP 14 in Katowice.

On the understanding, how can implement holistic approach in curriculum development based on climate change? Especially, training curriculum for international development cooperation. In Korea's escape from the vicious cycle of poverty and underdevelopment due to Human Resource Development (HRD). From its own development experience, Korea came to fully recognize the significance of HRD. Since Korea International Cooperative Agency (KOICA) established in 1991, supported a variety of international cooperation programs for HRD. Among HRD program, KOICA operate master's degree courses with leading Korean universities. In particular, this program has significantly strengthened the relationships between Korea and the student's home countries. From 1997 to 2015, the program has assisted a total of 2,598 students through 141 courses.

This research focused on one of international development cooperative training curriculum development used the integrated of Tyler (1969) and Taba (1971) theory of curriculum development design throughout the contents of program as a permaculture design (lecture in classroom and

field work) and the learning process of environmental education of UNESCO (1978) and (Gillett, 1977). Qualitative data took through individual in-depth interviews and participatory observation. Expectation of this curriculum development research support increase literacy of climate change and sustainable development as well as increase capacity of student's practical outputs.

1.2 Objectives of the study

The general objective of this research is finding out suitable curriculum of international development cooperation training curriculum. And determined what parameter emphasize international development cooperation training.

1.3 Research questions

1. How we can urges limiting global warming to 1.5°C above pre-industrial levels and related global greenhouse gas emission that International Panel of Climate Change (IPCC) suggested?
2. Are curriculum development affects student's literacy of global task on Climate change and sustainable development? Is training curriculum can approach to objectives of Environmental Education?
3. Through student centered curriculum design support increase student's capacity?
4. Through international development cooperation training program make students to design sustainable agriculture development under climate change era?
5. Is training curriculum affects host training center's philosophy?

1.4 Significance of the study

1. The abnormal climate change is constantly increasing. The world rase climate action and call we are in climate crisis era. If people live same like now, carbon budget left less than 10 years. The sadder issue is inequality. Unfortunately, the climate change assault nation and the damaged nation are different. The northern hemisphere nations start to declared to be a net zero country by 2050. And the surround nations study about carbon border tax for economic aspect.

2. Southern hemisphere nations need different perspective on sustainable development. Not just follow northern hemisphere nations but adjust and defend with nature. To learn from northern hemisphere nations failure during development.

3. This curriculum development for international training program can support students to open their environmental literacy and make sustainable agricultural society as well as increase their life quality. Not only that but also can be an educational model for South-South cooperation and sustainability.

Furthermore, as all the nations must approach to sustainable development goal, this curriculum can support other formal and non-formal environmental education as well as sustainable education can be applied. At last, as sustainable development goal number 17, partnerships for the goals, invigorate because this curriculum include group work from the environmental stage of awareness to participation.

1.5 Scope of the study

1.5.1 Group of the informants

- The informant of this research is students whom enrolled Yonsei-Canaan summer session from year 2016 to year 2020 around 80 students. Two different data gathered based on propose. First data gathering from students Alumni who

enrolled from 2016 to 2019 through student's reflection after the class and questionnaire through e-mail.

- The informants for the studying data gathering from students who enrolled year 2020 Yonsei-Canaan summer session with 17 partnerships enrolled.

However, number of population and sample is too small. Also, under COVID-19 lockdown, students were having hard time in their countries. Due to this unexpected situation, the data alumni student's data used from students' former reports. And received respondent of questionnaire. Another data was gathered from the students whom enrolled summer session in 2020. The data gathered by student's in-depth report, pre- and post-test, student's group output and observation. after the class. However, most of the students are government official or a researcher/an instructor in state institute working in his/her home country with a bachelor's degree or higher. They have more responsibility to work governmental duties. Although small numbers of population on this research but highly important of outputs in future.

1.5.2 Variables

- independent variable: The curriculum development through international development cooperation training program.

- Dependent variable: The learning outcomes through awareness, knowledge, attitudes, skills and participation in activities before and after the class of the Appropriate Farming Technology and Practice curriculum

1.6 Definition of terms

The definitions of each terminology concerning this study can be defined as follow:

1. Curriculum development is a process of improving the curriculum. Various approaches have been used in developing curricula using information and refection's of the

alumni who were enrolled the international training program of Yonsei-Canaan Alumni Students (2016-2019)

2. Sustainable development is the organizing principle for meeting students' development goals while simultaneously sustaining the ability of natural systems to provide the natural resources and ecosystem services on which the economy and society depend. The desired result is a state of society where living conditions and resources are used to continue to meet human needs without undermining the integrity and stability of the natural system after taking the international training course.

3. General information and characteristics are the needed information and characteristics related to curriculum development. The needed information was from the Yonsei-Canaan program, Yonsei-Canaan Alumni Students (2016-2019), and Students under the Yonsei-Canaan program (2020). Those data using for curriculum development and training programs.

4. International development cooperation training program is the program under priority of international development training center: Canaan Global Leadership Center. The objective of this institution was to eradicate poverty and attain sustainable development through changing the mindset of rural leaders, who, in turn, would spearhead the change of mindsets in their communities.

5. Curriculum evaluation is the analysis of collected data and develop curriculum from the appropriate farming technology and practice curriculum from the information of Yonsei-Canaan Alumni Students (2016-2019)

6. Yonsei-Canaan alumni students is who are enrolled under the international training program of Yonsei-Canaan from year of 2016 to the year of 2019

7. The appropriate farming technology and practice curriculum is curriculum was developed through the Permaculture Design (lecture in classroom and fieldwork) with 8 parts as follows: 1) Ethics and principles, 2) Seed (native seed), 3) Appropriate technology, 4) Agroforestry design (Soil

Nutrition, Crop rotation, Organic fertilizer), 5) Companion plant (Natural insect management, Organic repellent), 6) Post-harvest (Storage, processing), 7) Zoning (Maximize energy efficiency and build up sustainable lifestyle: ecovillage network and transition town), and 8) Marketing (on and off-market, local market), and use for international students who enrolled on the year of 2020.

8. Training process is the way of develop international students who enrolled in the program of appropriate farming technology and practice using lecture and field work (South Korea and student's country), country project implementation, and online follow up and supervision.

9. Program evaluation/ assessment is the follow up student's project presentation on awareness, knowledge, attitudes, skills and participation in activities before and after the education.

9.1 Students awareness is knowledge or perception of a situation or fact and concern about and well-informed interest in a particular situation or development after taking the course of the international program on appropriate farming technology and practice

9.2 Students knowledge is facts, information, and skills acquired by students through experience or education; the theoretical or practical understanding of a subject, and awareness or familiarity gained by experience of a fact or situation after taking the course of the international program on appropriate farming technology and practice.

9.3 Students attitudes is a settled way of thinking or feeling of students that is reflected in a person's behavior. after taking the course of the international program on appropriate farming technology and practice.

9.4 Students skills is the ability of students to do well, apply knowledge and experiences about the contents of the program after taking the course of the international program on

appropriate farming technology and practice in their own country.

9.5 Students' participation is the action of students taking part in knowledge and experience sharing after taking the course of the international program on appropriate farming technology and practice and do the project from their own country through online communication and other appropriated ways.

10. Student’s reflection is the student’s reflection after the class by using online communication and student’s online information.

1.7 Research framework

This study aims to finding out suitable curriculum of international development cooperation training curriculum. It also aims to determined what parameter emphasize international development cooperation training. The curriculum was developed by using information and refection’s of the alumni who was enrolled the international training program of Yonsei-Canaan Alumni Students (2016-2019). The international training program under role of Yonsei-Canaan. The analysis of collected data and develop curriculum from the appropriate farming technology and practice curriculum from the information of Yonsei-Canaan Alumni Students (2016-2019) using the integrated of Tyler (1969) and Taba (1971) theory of curriculum development design throughout the contents of program as a permaculture design (lecture in classroom and field work). The contents were follows: 1) Ethics and principles, 2) Seed (native seed), 3) Appropriate technology, 4) Agroforestry design (Soil Nutrition, Crop rotation, Organic fertilizer), 5) Companion plant (Natural insect management, Organic repellent), 6) Post-harvest (Storage, processing), 7) Zoning (Maximize energy efficiency and build up sustainable life style: ecovillage network and transition town), and 8)

Marketing (on and off market, local market). In order of the international development cooperation training under the curriculum development on appropriate farming technology and practice were done under established according to the learning principle of the environmental education. The environmental education is a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action (UNESCO, 1978). Including environmental education provides for all levels and in both formal and non-formal education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world (Gillett, 1977). Therefore, the researcher has compiled such ideas as a conceptual framework for this research which appeared according to the research process in Figure 1

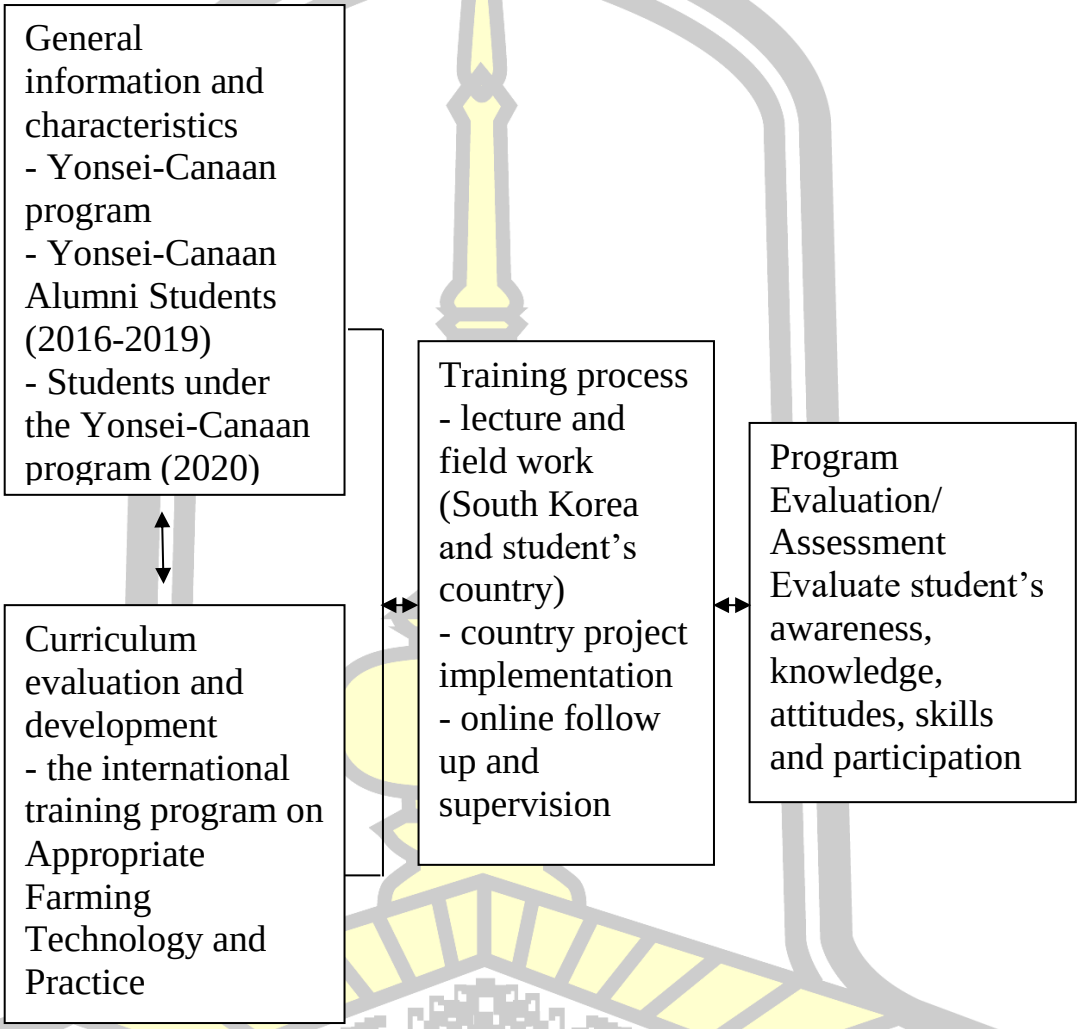


Figure 1. *Conceptual framework of the study*

1.8 Hypothesis

The holistic education improves student's literacy of environmental problem and sustainable development, based on learning increase student's learning potential after taking the course on appropriate farming technology and practice through

awareness, knowledge, attitudes, skills, and participation higher than before taking the course.

CHAPTER 2
REVIEW OF THE LITERATURE

In terms of review and related literature will be presented develop curriculum of conceptional review and theoretical literature related to this research. Also, how environmental education implement on sustainable development. It will be presented under the following topics.

2.1 Environmental Education
- 2.1.1 Learning
- 2.1.2 Awareness and Sensitivity
- 2.1.3 Knowledge
- 2.1.4 Attitude
- 2.1.5 Skills
- 2.1.6 Participation

2.2 Theory of curriculum development

2.3 Overview of sustainable development

2.4 Education for sustainable development

2.5 Information of international development training center: Canaan Global Leadership Center

2.6 Participants Yonsei-KOICA summer session

2.7 Training program in Yonsei-KOICA Summer in CGLC

2.8 Related researches

2.1 Environmental education

Environmental Education (EE) has been developing many years ago. Moreover, it was considered as continuous process of

outdoor education, and to respond to the world's growing awareness about environmental problems (Karama, 2016).

In the Tbilisi Declaration in 1972 proclaimed to defined and improve the environment for present and future generations has become an imperative goal for mankind. EE should provide for all levels and in both formal and non-formal education. EE properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world (Gillett, 1977). EE is a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action (UNESCO, 1978). EE enhances critical thinking, problem-solving, and effective decision – making skills, and teaches individuals to weigh various sides of an environmental issue to make informed and responsible decisions. The components of environmental education are 1) Awareness and sensitivity to the environment and environmental challenges, 2) Knowledge and understanding of the environment and environmental challenges, 3) Attitudes of concern for the environment and motivation to improve or maintain environmental quality, 4) Skills to identify and help resolve environmental challenges, and 5) Participation in activities that lead to the resolution of environmental challenges. Therefore, EE is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of hop to help solve these problems and motivated toward their solution (Stapp et al, 1969).

2.1.1 Learning

EE aims to induce social dynamics, first in the local community and subsequently in wider networks of solidarity, fostering a collaborative and critical approach to socio-environmental realities and an autonomous and creative grasp of current problems and possible solutions (UNESCO, 2002).

People keep deciding for or against regional and sustainably produced products at the market, at the grocery or in restaurants. But the decision to buy and consume something specific, the choice of a mode of transport (bus or rail, their own car, bike) or the decision to build a low-energy house hardly depend on information alone (Gertrud Hein and Lenelis Kruse-Graumann 2005).

Therefore, EE related place- Based Education. Teton science schools explain that PBL is anywhere, anytime learning that leverages the power of place and connects learners to communities and the world around. And encouraging students to reflect on and better understanding themselves and their role in the community. For example, on outdoor education James farmer et al., (2007) examined the long-term effects of an environmental education school field trip on forth grade elementary students who visited Great Smoky Mountains National Park. The day's activities included a visit to Clingman's Dome, the highest mountain peak in the park, hands-on learning activities, the group discussions led by a National Park Ranger. Students examined red spruce (*Picea rubens*) and Frasier fir (*Abies fraseri*) trees; discussed the role of the moss spider (*Microhexura montivaga*) before the forest ecosystem underwent change; participated in a tree identification, food web activities, and an insect and tree discussion; hiked a short lam wooly adelgid (*Adelges piceac*) on the Frasier fir. After the field trip researcher did interviews and Phenomenological analysis and found students changes. Fourteen of the 15 students discussed ecological and environmental tangibles that were derived from the program. And he mentioned to borrow environmental education philosophers that personal ecological understanding, the belief and understanding of how to make a direct personal contribution, an affinity to the place and a hands-on approach all work to foster environmental attitudes or behaviors.

2.1.2 Awareness and Sensitivity

Awareness to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problem (Duke University). Nihan (2015) reference that the Environmental awareness is; the individual's comprehending the social, historical, and natural environment, attaining a conscious sensitivity, the individuals' taking part in the decisions through non-governmental organizations with respect to the solutions of the problems encountered regarding the environment, making attempts in order to defend their rights and show reaction, understanding the requirement of using the environment without destroying it, perceiving the importance and indispensability of the natural life and natural resources for human life, and a human's showing interest in the events occurring in the historical, natural and social environment, his/her watching them and prioritizing savings in all consumption activities. Environmental sensitivity can only be achieved through effective and conscious environmental education, and children's pro-social behavior should behavior should also influence through observation, experiences and education, both a home and at school. On Emine (2019)'s research, he founds the environmental sensitivity can be created by performing different activities and projects occasionally.

2.1.3 Knowledge

Environmental knowledge is the amount of information individuals have concerning environmental issues and their ability to understand and evaluate its impact on society and the environment (IGI Global). Norris (2016) learn from his research positive attitude and high level of knowledge reveals that the human and material resources in the institution of study have a great impact on the students. Jacqueline (2004) had a series of structural equation analysis indicates that the three knowledge forms exert different influences on conservation behavior: Action related knowledge and effectiveness knowledge have a direct effect on performance. In contrast, system knowledge is

more remote from behavior, exerting only a mediated influence on it by way of affecting the other two knowledge types.

2.1.4 Attitude

Oxford defined Environmental attitudes are important. It is not always, determine behavior that either increases or decreases environmental quality. Environmental attitudes have grown stronger, the question as to what determines environmental behavior has become increasingly important, as a large and growing literature attest (Bradley, 2006).

Victor et al., (2015) learn that the attitude of students on taking personal responsibility in address environmental problems was not pro-environmental conservation. As far as student will wish to see a conserved and well taken care of environment, the study showed that they will prefer other people do the work and not themselves.

2.1.5 Skills

Skill is one of the components of environmental education to identify and help resolve environmental challenges. Socially critical skills are essential for an understanding of the problematical concept of sustainability. Furthermore, achieving sustainability requires the development of politically literate individuals, who have the critical skills to understand the complexity of environmental problems and solutions and the ability to participate individually and collectively in the resolution of environmental problems (Daniella Tilbury, 2010).

As we are under climate crisis, environmental and Low Carbon living skills needed. Mike (2015) interviews with a selection of twenty participants who are involved in the formation and /or development of Green skills. And the data shows that the organizations and the training providers are motivated to develop and/or deploy green jobs and green skill for a range of different reasons. These include the making of a favorable business case, environmental beliefs about conserving the finite resources of the planet and for health and wellbeing reasons.

2.1.6 Participation

The word participation means taking part, sharing or being part of, and it carries with it an active component (Vanda Carrreira et al., 2016). Environmental education as a lifelong learning, the objectives include active citizenship, personal fulfilment, and social inclusion, as well as employment-related aspects (Michaela et al., 2018).

In Public participation can also improve implementation by increasing the legitimacy of the decision-making process and, in so doing, reducing conflict (Laura H. Berry et al., 2019).

2.2 Theory of curriculum development

Definition of curriculum used as plan for learning by Hilda Taba (1962). Curriculum development is focused on the improvement and innovation of education.

Ralph W. Tyler, as known as educator, his objectives curriculum model has been a strong influence in the field of curriculum development since its publication in 1949 (Vaughan, 2018). He highlighted the need of learning experiences as part of the curriculum together with Dewey. William (2017) mentioned Tyler's rationale was remarkable in its time for its embrace of three curriculum sources, its conception of education essentially as experience, its approach to assessment as evaluation rather than as measurement, its approach to curriculum development as a problem-solving process, and its commitment to teacher participation in the development of curriculum and instruction. The curriculum model of Tyler consists with five steps. 1) Data collection: from learner, contemporary life outside of school and subject matter. 2) Identifying numerous general objectives: the planners refine though two screens (the philosophical screen and the psychological screen) with identifying four fundamental questions to develop curriculum. 1) What education purposes should the school seek to attain? To setting objectives, 2) what educational experiences can be provided that are likely to attain

these purposes? To get learning experiences and contents, 3) how can these educational experiences be effectively organized? To organize learning experiences, and 4) how can we determine whether these purposes are being attained? To assessment of curriculum.

But by Smith and Lovat (2003), critics due to the model did not reflect how teachers develop curriculum as in reality this process is constantly changing and evolving. Also, and Chen et al. (1996) have started that the model over emphasizes measurable objectives and the choice of objectives are often limited to behaviors are which can be easily quantified. This means many moral or ethical objectives, particularly those from the affective dimension such as increasing respect for others cannot be included in measurable objectives and might be ignored because they are too difficult to assess.

Hilda Taba believes educational curriculum should focus on teaching students to think rather than simply to regurgitate facts (Wikipedia). Edgar Krull summaries that many of Taba's ideas on curriculum design can be considered as a further elaboration of Ralph Tyler's rather psychological principles of curriculum development: attributing to them a more pedagogical and practical nature. This is well evidenced by reconsidering the meaning and nature of Tyler's (1969) rationale of curriculum design: (1) stating educational objectives; (2) selecting and (3) organizing learning experiences; and (4) assessing the achievement of objectives. In her version, Taba introduced notions of multiple educational objectives and four distinct categories of objectives (basic knowledge, thinking skills, attitudes and academic skills).

She developed a Grades 1 through 8 social studies curriculums organized around teaching-learning units (Taba, 1971). 1) diagnosis of learners needs and expectations of the larger society, 2) formulation of learning objectives, 3) selection of the learning content, 4) organization of learning contents, 5) selection of the learning experiences, 6) organization of learning

activities, 7) determination of what to evaluate and the means of doing it, and 8) checking for balance and sequence. Taba's strategies for encouraging students to think focus on the teacher as the mediator rather than the teacher as the lecturer. When utilizing the Taba approach, the teacher leads the discussion but encourages the students to share their opinions and to relate their own ideas to their peers' ideas. The teacher must not judge the students by their answers and can neither agree nor disagree with their responses. The teacher's role in the discussion is to encourage the students to expand on their classmates' ideas or to ask students to clarify their own ideas.

2.3 Overview of sustainable development

Sustainable Development Goals (SDGs) of Agenda 2030, adopted by the United Nations General Assembly (UNGA) in September 2015, now firmly in place, attention has shifted to their implementation (ASA Persson et al., 2016). Implementation of the SDGs framework commenced at the beginning of 2016, and there is emerging international practice and a growing catalogue of related reviews, assessments, guidelines and scientific publications. (Cameron Allen et al., 2018)

The SDGs aim to achieve decent lives for all on a healthy planet by 2030, To operationalize UN three guiding principles, and adopt the for approaches to work. The principles are 1) Human right – based approach, 2) Leave no one behind, and 3) Gender equality & women's empowerment and approaches to 1) alignment with int. norms and standards, Equality and non-discrimination, Active and meaningful participation, and robust accountability mechanisms.

The SDGs are 17 goals and 169 targets. And the 17 goals as follow 1) No poverty, 2) Zero hunger, 3) Good health and wellbeing, 4) Quality education, 5) Gender equality, 6) Clean water and sanitation, 7) Affordable and clean energy, 8) Decent work and economic growth, 9) Infrastructure, industry and

innovation, 10) Reduced inequalities, 11) Sustainable cities and communities, 12) Sustainable consumption & production, 13) Climate action, 14) Life below water, 15) Life on land, 16) Peach, justice and strong institutions, and 17) Partnerships for the goals.

2.4 Education for sustainable development

Education for Sustainable Development (ESD) is holistic and transformational education which addresses learning content and outcomes, pedagogy and the learning environment. It achieves its purpose by transformation society (UNESCO). Stefania Giannini the UNESCO assistant director – General for Education mentioned in ESD roadmap that ESD was born from the need for education to address growing sustainability challenges.

Koichiro Matsuura (former director-general, UNESCO) addressed that ESD is seen not only as an end in itself but also as one of the most powerful instruments for bring about the changes required to achieve sustainable development.

ESD for 2030 towards achieving the SDGs is the global framework for implementation of ESD from 2020-2030. As the current climate emergency and other environmental sustainability crisis are the product of human behaviors. The international Panel on Climate Change (IPCC) warns that in order to contain the effect on global warming to 1.5°C until the end of this century compared to the 2°C scenario regarded as catastrophic, we need raid, far-reaching and unprecedented changes in all aspects of society.

Thomas Hoffmann and Hannes Siege mentioned that an international consensus could be reached with the following set of eight competencies published by UNESCO in 2017. The eight competencies are 1) Systems thinking competency, 2) Anticipatory competency, 3) Normative competency, 4) Strategic competency, 5) Collaboration competency, 6) Critical

thinking competency, 7) Self-awareness competency, 8) Integrated problem-solving competency.

2.5 Information of international development training center: Canaan global leadership center

Canaan Global Leadership Center (CGLC), established in 2008., as specialized institute for global leadership training of Canaan Farmers School in Korea. Canaan farmer's school which specializes in mindset change and agriculture programmers. Canaan Farmers School establishment in 1931 and reputed to have played an instrumental role in leadership and agriculture training in the early stage of Korea's economic development. The education of Canaan Farmers' School focuses on the changes in trainees' mindset, attitude and lifestyle. In this regard, its education goes on very strong and demands more disciplined way of living of trainees. (CGLC, http://cglc.or.kr/)

The objective of this institution was to eradicate poverty and attain sustainable development through changing the mindset of rural leaders, who, in turn, would spearhead the change of mindsets in their communities. The school's methodology was adopted later in the model of the new village movement (saemaul undong) that became a national campaign in South Korea from 1970. The new village movement became an icon of a successful community driven, self-help rural development endeavor of Korea that contributed to its overall success in economic development.

Canaan Global Leadership Center trains leaders of developing nations to eradicate poverty through organic agriculture and sustainable development through the principles of work, service and sacrifice. In the Republic of Korea, over 700,000 (2015) people have been trained. Canaan Farmer School has opened centers in Bangladesh, China, India, Indonesia, Myanmar, Palestine, the Philippines and Uganda.

Leadership training starts with a proper mind. Proper mind comes with body. It's meaningless if they don't put it into practice. During training there are strict restriction of living style. For example, three liters of water to wash the face. Three rubs with soap. 4mm of toothpaste and 70cm of toilet paper. Also do exercise such as running with yell "mind reform" and "you can do it" while running.

The focus of training mindset is pioneering spirit. Pioneer have to give up your honor, good and advantages. Kim youngki. Farmer and the founder of Canaan farmer's school, he cultivates barren land. At the Canaan school, lectures on organic farming and corruption were mixed with mornings spent in the fields planting bags underground to nurture useful micro-organisms, among other practical lessons in how to apply what they had learned. Material support is prohibited. That is a rule of the farmer's school.

Figure 2 Worldwide pioneers (alumni of CGLC)

Figure 3 CGLC Goals for Training

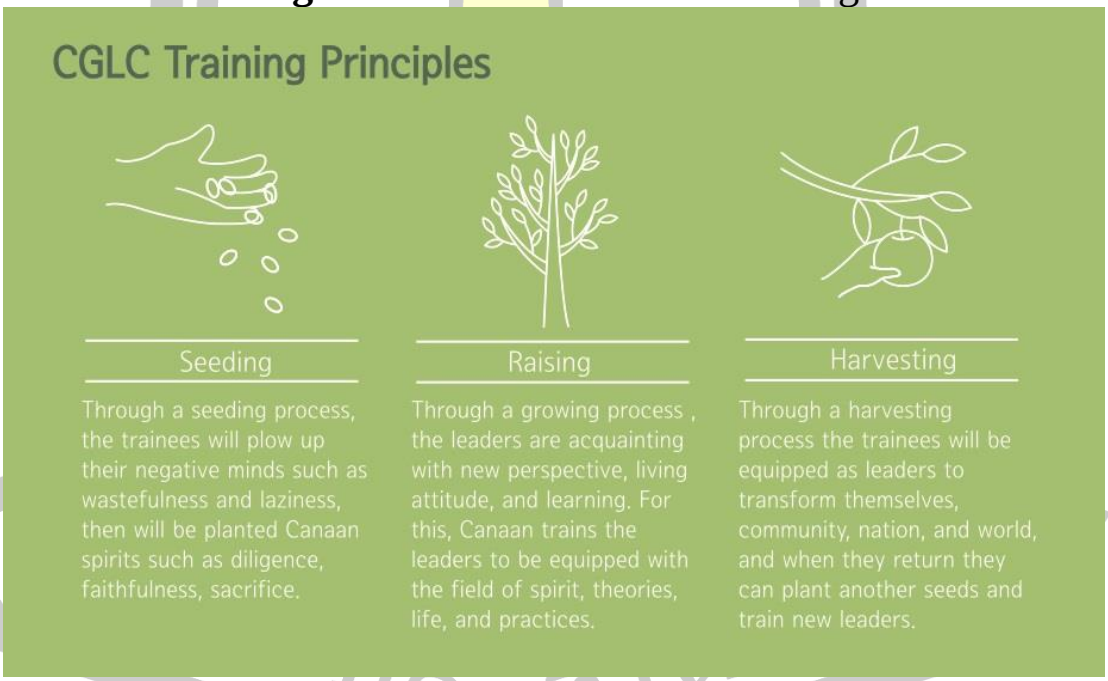


Figure 4 CGLC Training Principles.

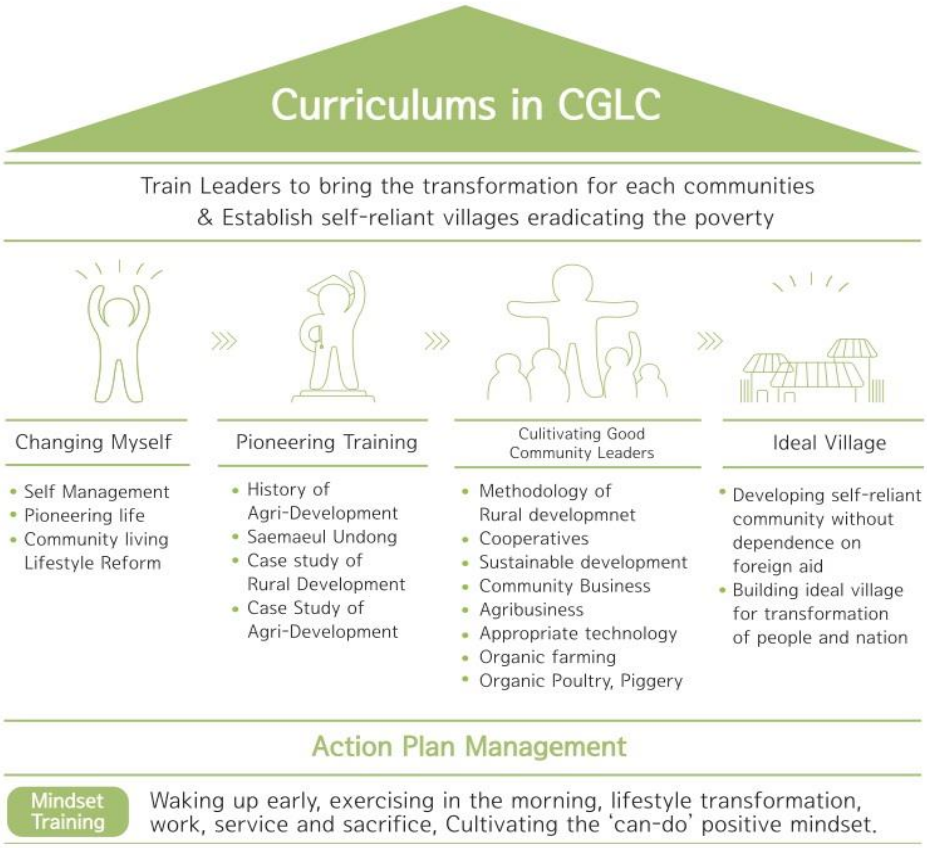


Figure 5 Curriculum in CGLC

2.6 Participants of Yonsei-KOICA summer session

According to website of Yonsei University (http://koica.yonsei.ac.kr/) founding out of the information of sample group is students who enrolled KOICA -Yonsei Master's Degree Program in Community Development Leadership. Yonsei-KOICA Master's Degree Program in Community Development is operated by the Graduate School of Government, Business and Entrepreneurship at Yonsei University Wonju Campus in cooperation with KOICA (Korea International Cooperation Agency).

The goal of this program is to equip students with the capabilities of designing and implementing new policies and programs in the context of national development policies through benchmarking Korea's Saemaul Undong (new village

movement) experiences. Also, this program will be run to make students more knowledgeable of scientific research methodology necessary to solve diverse problems existing in their government systems and rural communities.

The program curriculum was designed with the following intentions. Fall and winter semester focus on the theory learning and spring semester concentrates more on the application of Saemaul Undong spirit and principles in the daily life as well as its implementation with Korean village people near Canaan Global leadership Center (CGLC). Fall semester of the second year will ask students to think over what they should do to apply Saemul Undong to their own communities and societies. Yonsei University, with its affiliated organization such as CGLC, successfully completed Master's Degree Program on Rural Society Leadership Development for Global Poverty Reduction Program for the past 4 years. From 2014, students from Master's Degree Program on Community Development Leadership have been trained at CGLC during a summer session.

CGLC summer session hold 6weeks from June to First week of August. There are two curriculums such as Appropriate Farming Technology and Practices and Cooperative Practices. Candidate’s eligibility:

- Have nationality of countries designated as cooperative with Korea.
- Be government or government relevant officials and researchers working in developing countries.
- Be qualified in regional, rural or agricultural development fields and the ability to study them
- Have a Bachelor’s degree officially approved by the government in partner countries.
- Private sector employees are not eligible.
- Have sufficient command of both spoken and written English in order to take classes conducted entirely in English.
- Be under 40 years old in good health, both physically and mentally, to undergo the course.

- Not have experienced the same or similar KOICA's fellowship programs previously.
- Fulfill the requirements for Graduate School of Government, Business and Entrepreneurship, Yonsei University Wonju Campus and KOICA.
- Former dropouts of programs similar to KOICA Scholarship Program are ineligible.

2.7 Training program in Yonsei-KOICA summer in CGLC

Main subject in CGLC summer session consist with this below;

Table 1 Main subject in CGLC two subjects in summer session

Subject	Appropriate Farming Technology and Practices	Cooperative practices
Lecture hours	48 hours	48 hours

Subject	Appropriate Farming Technology and Practices	Cooperative practices
Context	Definition of organic farming and differences when comparing to conventional farming Ideal or the most suitable farming method for developing rural areas in order to achieve community development and increase of farm productivity Relations of farming and nature, roll of human beings as users and consumers of nature production Understanding and practices of appropriate farming technology, small scale farming and permaculture	Understanding of the importance of social capital in community Understanding and practicing discussion, debating and facilitation skills as leadership capacity Experiencing and visiting cooperatives, case studies and activities as a community Understanding and practicing self-reflection, thoughts and idea sharing among community members. Processing and simulating cooperative action plan idea development

Besides form this subjects CGLC training program consist with lifestyle training. I mentioned above, CGLC Leadership training starts with a proper mind. Proper mind comes with body. It's meaningless if they don't put it into practice. Every in the morning they do exercise to manage sound body. As they exercised, they do shout the slogans. Also shout the slogan before eat to remembrance. Slogan shown in box below.

Table 2 CGLC training slogan

Slogan Items	Slogan Items
I work first	Pioneers are not born overnight
I serve first	I have seen my sweat on the forehead
I sacrifice first	I confirm my sweat
Let's learn until we know	The less I sweat, the more I weep
Let's devote ourselves to work	The more I sweat, the less I weep
Let's serve in humility	If I lost money, l lose a little
Change myself first.	If l lose honor and credit, I lost much
Change now first	If l lose health, I lost all.
Change small things first	Today is the first day of the rest of the days left
Change doable things first	Today is the first day of the rest of my life.
Change doable things first	Take courage, my country
Change until the end	Take courage, my people
Pioneers must be dreamers	
Pioneers must be committed	Table slogans
Pioneers must be devoted	
Pioneers must be strong-willed and patient	Do not eat to eat, but eat to work
Pioneers must be brave and decisive	If you don't like to work, do not eat
Pioneers must be passionate and faithful	Work at least 4 hours for each meal.
Pioneers must run	
Pioneers must sweat and weep	
Pioneers must be knowledgeable	
Pioneers must be maintaining a peaceful family	

This curriculum development research will be focus on Appropriate Farming Technology and Practices among CGLC training curriculum. The researcher is the one who modified

curriculum contents since 2016 and willing to develop. Curriculum influenced by Permaculture design and self-sufficiency theory.

Table 3 Curriculum of Appropriate Farming Technology and Practices.

Chapter	Context
1	Introduction to Appropriate Farming Technology and Practice
2	Permaculture Design Natural farming Agroforestry Companion plant Post-harvest Zoning Marketing
3	How we can to group project?
4	Design project
5	Present group project

2.8 Related researches

Sustainable Agriculture is an integrated system of plant and animal production practices having a site-specific application that will over the long-term satisfy human food and fiber needs (USDA). The COVID-19 pandemic has underlined the importance of a robust and resilient food system that functions in all circumstances, and is capable of ensuring access to a sufficient supply of affordable food for citizens. It has also made us acutely aware of the interrelations between our health,

ecosystems, supply chains, consumption patterns and planetary boundaries. It is clear that we need to do much more to keep ourselves and the planet healthy. The current pandemic is just one example. The increasing recurrence of droughts, floods, forest fires and new pests are a constant reminder that our food system is under threat and must become more sustainable and resilient (European Commission, 2020). LIU (2012) aimed to explore ways to develop low-carbon agriculture that is characterized by low consumption of energy and resources, low inputs, and low pollution. Low-carbon agriculture has attracted a lot of attention, especially facing climate change, with the purpose to enhance current agricultural production and management systems.

Lee et al., (1998) responsible environmental behavior of Youths who will live in the 21C needs the 'Personalization of Environment', which means the process or the result of awareness to the non-personal environment as the personal environment to show the responsible environmental behaviors through the intended physical and psychological contacts to environment.

Ritz, et al. (2019) study on training in agricultural technologies: a new prerequisite for smart farming, It was found that Most of the technological innovations in agriculture enter the farm through agricultural equipment, to ease farmers' decision-making processes. The ultimate goal of smart farming is to make a better use of natural resources to reduce farming trade-offs, thus meeting the society's expectations for sustainable development. The continuously growing number of agricultural technologies aims to contribute to achieving this goal, yet deeply changing the human-machine interactions. This opens new opportunities and challenges for both equipment manufacturers and farmers. They are therefore required to expand their knowledge to master smart farming tools, currently underused. Two complementary questions shall then be answered: first, what are the available tools for farmers with

limited time, variable education level and when decision-making occurs in a context of bounded rationality and framed capacity for action? Second, on a more prospective note, which direction should take initial and vocational trainings about AgTech in view of the above? This paper uses the French example to discuss available tools within the education ecosystem and propose some recommendations to facilitate deployment of smart farming, with a focus on the need to reconnect education and training about technological solutions and their use on the farm. Altogether, we discuss how the deployment of smart farming requires positive, inventive and integrated vision for the appropriate use of all technical and scientific means, promoting an open collaboration between all actors, with a culture of innovation and entrepreneurship.

Sjakir, et al. (2015) study on learning and technology adoption Impacts on farmer's productivity. The results found that the integrated farmer field school program was implemented to empowered farmers with scientific knowledge, skills, positive attitudes and suitable technology. However, the impact of this program on farmer's productivity has not been comprehensively investigated. Thus, this research examines the farmers' participation in the learning process, technology transfer, adoption of new technology and productivity. This study was conducted in Kabupaten Maros, South Sulawesi, and the total sample size was 168 farmers who have participated in this program. A survey research questionnaire was distributed randomly to the participants from four selected villages after the program. Descriptive and multiple regression analyses were carried out on the data. The results showed that the integrated farmer field school program improved the farmers' knowledge and that extension services were effective in transferring technological expertise. The empirical evidence showed that farmers who participate in the program have significantly increased in paddy productivity. This implies that program is useful to fill gaps in local knowledge with the dissemination and

adoption of new agriculture technology. To further improve the farmer field school program, appropriate technological innovations should be identified and issues relating to farm quality and the availability of credits to enable farmers to purchase agricultural equipment and supplies should be addressed.

Singh and Singh (2017) study on traditional agriculture: a climate-smart approach for sustainable food production. The results found that Sustainable food production is one of the major challenges of the twenty-first century in the era of global environmental problems such as climate change, increasing population and natural resource degradation including soil degradation and biodiversity loss. 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. It jeopardized the ecological integrity of agroecosystems by intensive use of fossil fuels, natural resources, agrochemicals and machinery. Moreover, it threatened the age-old traditional agricultural practices. Agriculture is one of the largest sectors that sustain livelihood to maximum number of people and contribute to climate change. Therefore, a climate-smart approach to sustainable food production is the need of hour. Traditional agriculture is getting increased attention worldwide in context of sustainable food production in changing climate. The present article advocates traditional agriculture as a climate-smart approach for the sustainable food production and also deliberates the correlation between climate change and agriculture.

Shutaleva et al. (2020). Study on environmental education for sustainable development in Russia. It was found that the Environmental education is lifelong learning and, thus, not only for children and young people. The system of continuous environmental education for sustainable development should include a generalizing ideological course at each stage of

education at school and university levels of education. The system of continuous environmental education, upbringing, and enlightenment in the Russian Federation has not yet been finally formed; it is developing. The vector of development of environmental education in Russia is set by international, national, and regional environmental and natural resource characteristics in the context of the country's modernization. The importance of the development of environmental education lies in ensuring environmental safety as an essential component of preserving life on the planet and a decent life for present and future generations of people. Today, the quality of environmental education of the population for sustainable development largely depends on access to information and communication technologies. Therefore, teaching methods based on information and communication technologies, as well as innovative teaching methods based on the use of an interdisciplinary approach to sustainable development, seem promising. This approach allows forming a holistic vision and understanding of social, political, economic, and environmental problems in the minds of schoolchildren and students. In the current conditions of the spread of the COVID-19 pandemic and changes in all spheres of the daily and professional life of the planet's population in general, and the population of Russia in particular, it is impossible to provide an effective educational process in other ways.

CHAPTER 3
METHODOLOGY

This chapter explains how the research goals has been achieved, how the data was obtained, unit of analysis, research design, locale of the study, population and sampling procedure, method of data collection, research instrument, method of analysis and level of significance. Four topics will be discussed and they are as follows:

3.1 Population and samples
3.2 Research instruments
3.3 Research procedures
3.4 Data analysis and statistic used

3.1 Population and samples

3.1.1 Population

The population of this study are 86 students who enrolled Yonsei-Canaan summer session from the year 2016 to year 2020. The students come from 33 different countries. Those students were Alumni who enrolled from 2016 to 2019 through student reflection after enrolled and attain the program as an important group of informants who giving data for the development of research instruments.

3.1.2 Samples

The samples of this study were selected by purposive sampling. Seventeen (17) students who were enrolled and attain the program in the year 2020 Yonsei-Canaan summer session were selected to implement the curriculum on the title of Appropriate Farming Technology and Practice.

However, number of population and sample is too small. Also, under COVID-19 lockdown, students were having hard time in their countries. Due to this unexpected situation, the data from alumni student's used from students' former reports. And received respondent of questionnaire. Another data was gathered from the students whom enrolled summer session in 2020. The data gathered by student's in-depth report, pre- and post-test, student's group output and observation. after the class.

However, most of the students are government official or a researcher/an instructor in state institute working in his/her home country with a bachelor's degree or higher. They have more responsibility to work governmental duties. Although small numbers of population on this research but highly important of outputs in future.

Table 4 Number of summer session participant students from year 2016 to 2020.

Counties	2016	2017	2018	2019	2020
Afghanistan		1			
Azerbaijan					1
Bangladesh			1		1
Cambodia	2		1		1
Cameroon			2	1	1
DR Congo				1	
East Timor					1
Ecuador			1	1	
Egypt	1				
Ethiopia		2			2
Fiji	1				1
Ghana		2	1	2	1
Hitie	1				
Honduras				1	
Kenya	1			1	1
Kirgizstan			1		
Indonesia		1		1	
Laos	1	1	1		1
Madagascar	1				
Myanmar		1	1		
Nepal		1	1	2	
Nicaragua		1	1		
Pakistan		1		1	
Philippines		1		2	2

Counties	2016	2017	2018	2019	2020
Rwanda	1		1	2	1
Senegal	1	1	2		
Solomon			1		
Sri Lanka	2	1		1	1
Tanzania	1	1	1		
Togo	1				
Uganda	1	2	1	1	1
Vietnam			1	1	1
Zimbabwe	1				
Total	**16**	**17**	**18**	**18**	**17**

3.2 Research instruments

The instruments of this study were use as follows:

1. In-depth interview schedule. It was designed using guide questions for gathering the needed support data for curriculum development within the group of informants who were enrolled in the program of Yonsei-Canaan Graduates from the year 2016 to the year 2019. The quality of the in-depth interview schedules was submitted and proposing to the advisors and experts to determine the consistency of inquires with the purpose of data collection. Also, the evaluation form for curriculum development was used to gathering data with the level of agreement of alumni who were enrolled and attained in the program as follow: (Roungprapan, 2000).

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

2. The curriculum on the title of Appropriate Farming Technology and Practice Climate crisis and sustainable agriculture (Permaculture Design). It was designed based on

information of interview data and the related secondary data. The curriculum was developed through the Permaculture Design (lecture in classroom and fieldwork) with 8 parts as follows: 1) Ethics and principles, 2) Seed (native seed), 3) Appropriate technology, 4) Agroforestry design (Soil Nutrition, Crop rotation, Organic fertilizer), 5) Companion plant (Natural insect management, Organic repellent), 6) Post-harvest (Storage, processing), 7) Zoning (Maximize energy efficiency and build up sustainable lifestyle: ecovillage network and transition town), and 8) Marketing (on and off-market, local market).

The quality of the curriculum on the title of Appropriate Farming Technology and Practice Climate crisis and sustainable agriculture (Permaculture Design) was submitted to the advisors to give advice all about the curriculum. Also, It was presented to five scholars and experts to assess the consistency of the content with the study objectives. Including giving suggestions for improvement.

3. The evaluation/ assessment form for Appropriate Farming Technology and Practice. It was designed with 5 form as follow:

3.1 The evaluation/ assessment form of awareness of climate change, sustainable development and sustainable agriculture.

Level of students' awareness were rated as follow: (Pimentel, 2019)

Scale	Score	Description
2.34-3.00	11-15	High
1.67-2.33	6-10	Moderate
1.00-1.66	1-5	Low

3.2 The evaluation/ assessment form of knowledge of climate change, sustainable development and sustainable agriculture.Level of students' knowledge were rated as follow: (Roungprapan, 2000).

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

3.3 The evaluation/ assessment form of attitudes of climate change, sustainable development and sustainable agriculture. Level of students' attitudes were rated as follow: (Roungprapan, 2000).

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

3.4 The evaluation/ assessment form of skills of climate change, sustainable development and sustainable agriculture. Level of students' skills were rated as follow: (Pimentel, 2019)

Scale	Score	Description
2.34-3.00	11-15	High
1.67-2.33	6-10	Moderate
1.00-1.66	1-5	Low

3.5 The evaluation/ assessment form of participation of climate change, sustainable development and sustainable agriculture. Level of students' participation were rated as follow: (Roungprapan, 2000).

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

Program Evaluation/Assessment is the follow-up student's project presentation on awareness, knowledge, attitudes, skills, and participation in activities before and after the education. According to the quality of those program evaluation/assessment forms. It was done with the design of the form under advice from advisors and giving to five scholars and experts to assess the consistency of the content with the study objectives. Including giving suggestions for improvement. The researcher was improved the evaluation/ assessment form followed all suggestions and used it for gathering data during program implementation in the year 2020.

3.3 Research procedures

The flowchart shows the steps of research process. At the beginning of the study researcher asked students to submit the reflection such as 1) what do you learn from the class? 2) What was impressed? 3) What is your expectation of next class? 4) And anything that you want to say about the class. Student's reflection has been collected since 2016. Therewith researcher send questionnaire to alumni student who enrolled Yonsei-Canaan summer program from 2016 to 2019 to improve curriculum. The developed curriculum was implemented in Yonsei-Canaan summer program in 2020. However, the developed curriculum has been adjusted after students pretest and student's reflection. The assessment of student's environmental ability was done by posttest and evaluate curriculum. Also adjusted curriculum undergo Scalars and got suggestions.

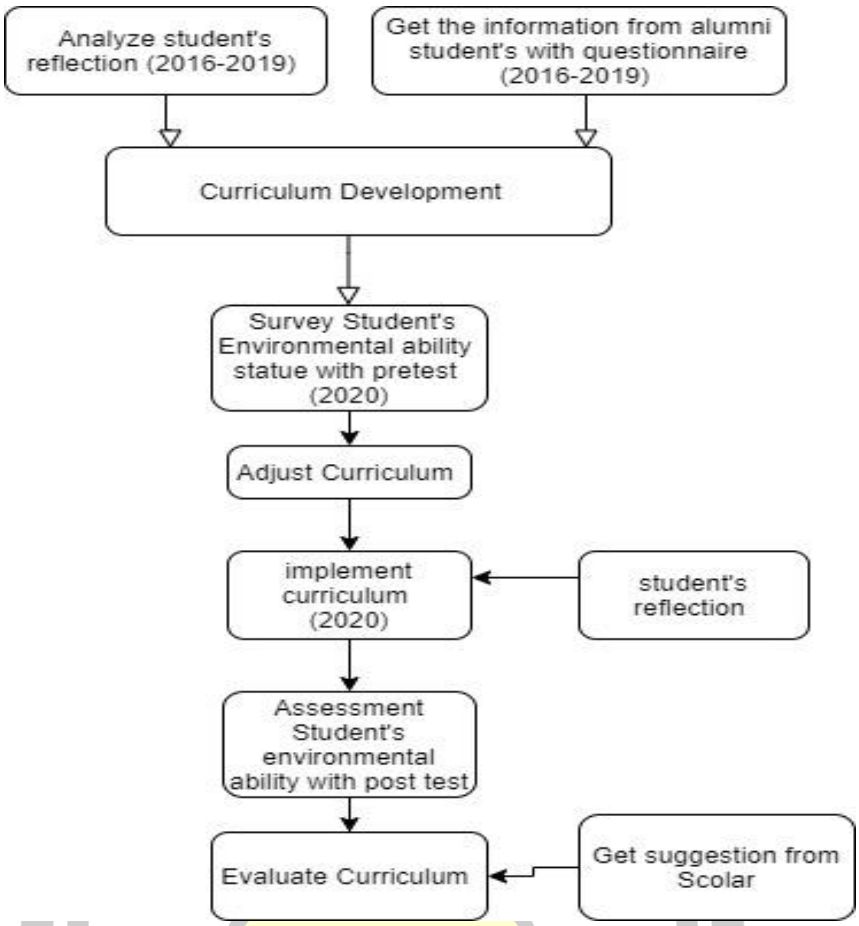


Figure 6 Flowchart of research process

3.4 Data Analysis and Statistic Used

For data analysis, the researcher uses a computerized ready-made process. The statistics are used to analyze the results as follows.

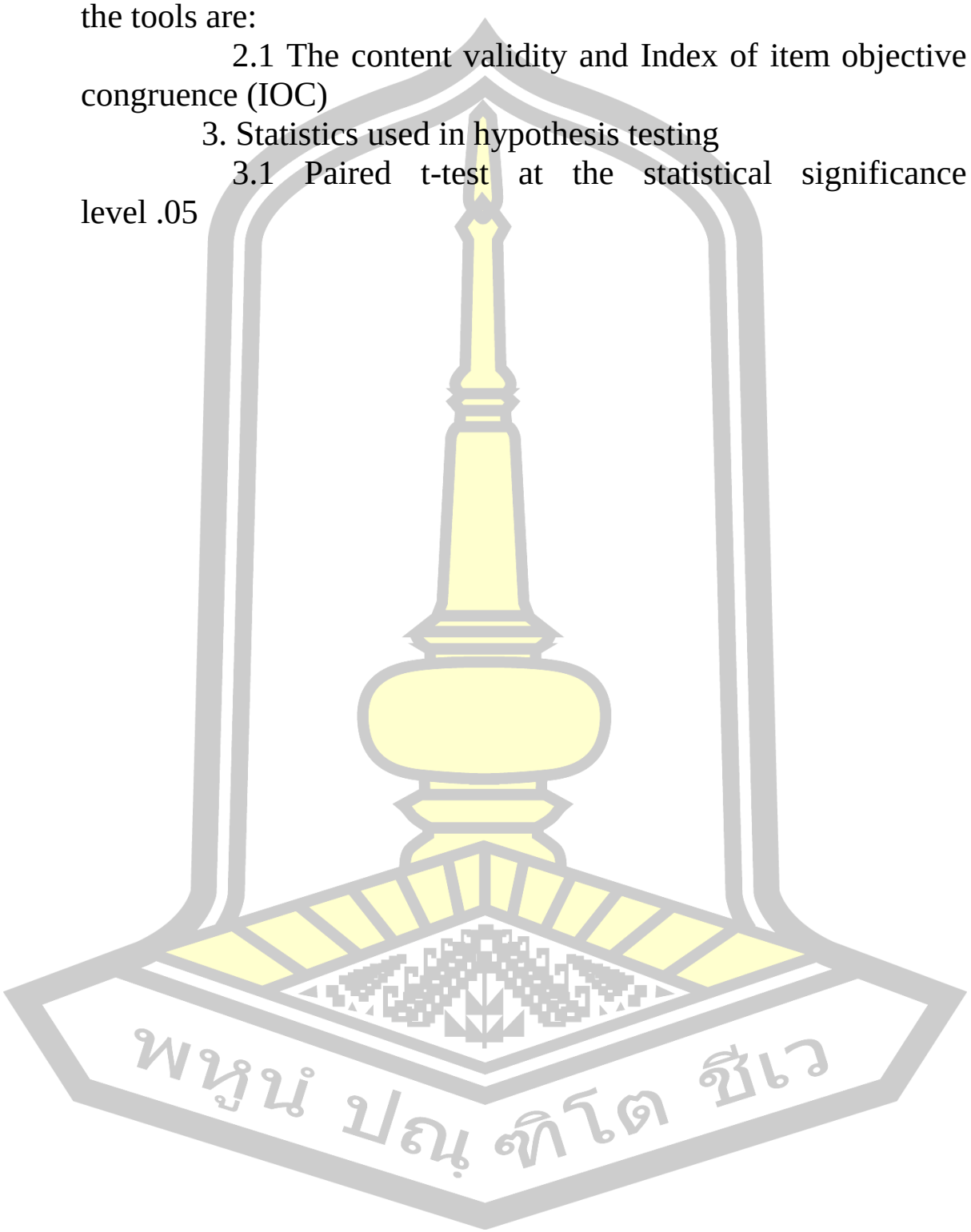
1. Basic statistics are
   1.1 Frequency
   1.2 Percentage
   1.3 Mean (Arithmetic Mean)
   1.4 Standard Deviation
   1.5 T-test (Paired-t-test)

2. The statistics used in the analysis for the quality of the tools are:

2.1 The content validity and Index of item objective congruence (IOC)

3. Statistics used in hypothesis testing

3.1 Paired t-test at the statistical significance level .05



CHATER 4
RESULTS OF STUDY

The finding of the study is grouped into 2 parts with curriculum evaluation and implementation. First evaluation part had 2 different section in student's evaluation in data and their founding from the class and expectations. Student's reflection on class were implemented in 2020 curriculum. Second part of implementation discuss based on researchers' questions and objectives as like: 1) Accepting Environmental Crisis as one's problem, 2) Approach to Environmental Education Objectives, 3) Curriculum implementation on appropriate farming technology and practice, 4) Effect on Student Centered education, and 5) Interrelationship with effect of curriculum with host training center.

4.1 General information and characteristics

4.1.1 Yonsei-Canaan summer program Characteristics

Yonsei-Canaan summer program is part of Yonsei-Korea Mater's Degree program. Canaan farmer's school were originated of Canaan Global Leadership Center (CGLC) is the specialized in New village Movement. CGLC affiliated with Yonsei University and running summer program.

Therefore Yonsei-Canaan Summer Program participants are students of Yonsei -KOICA Material program students. This degree program started since 2011 as Master's Degree Program and 39 Master's degree students on Rural Society Leadership Development for Global Poverty Reduction. The program title changed into Master's Degree Program on Community Development Leadership from 2014 to 2016 and had 51 Master's degree graduates. On 2017 the title changed into Master's Degree Program in Community Development and increase students' number up to 36. From that year, the Canaan-

Yonsei summer program were joined who willing to learn practical work.

Researcher joined this summer program since 2016 as a lecturer. The data were gathered since researcher teaches and use for curriculum development.

4.1.2 Students Characteristics

The students are mostly work in the government or related government work. All students were selected scholarship students and the age below 40years old mostly. The students who joined Yonsei-Canaan Summer programs were 86 students from 33 different nations. The oldest student was born in 1973 and youngest was born in 1994.

Among the students more than 90% of students were works in government and around 40% were work for the rural development. Around 10% of them are work for the Agriculture, Cooperative and Education. And the other works are Employment, Research Center, Technical and service and sustainable development. Gender proportion of the students were 60% of male and 40% of female. Among the student's nationality, 49 % are come from the Africa Continent, 43% are come from the Asia Continent and 5% from the America territory and 3% from the Oceania territory.

4.1.3 Student's lecture evaluations

This curriculum has been improved since 2016 when the researcher start to teach in Canaan Global Leadership Center(CGLC) for KOICA-YOMSEI summer session. The evaluation has done by (CGLC) Since 2016. And The curriculum of 2020 has been improved by graduate student's reflections right after the lecture and while they work in the home country.

Table 5 Result of Student's lecture evaluation. This evaluation source from CGLC. Satisfaction Scale of 5

Items	2016	2017	2018	2019	2020	Average	Description
I think this lecture is relevant to the program objectives	4.13	4.53	4.7	4.74	4.82	4.58	Very High
I think what I learned from the lecture can meet the needs of my community	4.00	4.41	4.64	4.53	4.76	4.47	High
I think what I learned from the lecture can be applicable to my community.	4.00	4.29	4.64	4.63	4.65	4.44	High
I think what I learned from the lecture can contribute to economic development in my community	3.88	4.24	4.35	4.68	4.53	4.43	High
If I apply knowledge and (or) skills from the lecture to our community, I think it is	3.81	4.29	4.52	4.47	4.53	4.32	High

Items	2016	2017	2018	2019	2020	Average	Description
possible to sustain our economic growth.							

Legend:

Scale	Score	Description
4.50-5.00	5	Very high
3.50-4.49	4	High
2.50-3.49	3	Moderate
1.50-2.49	2	Low
1.00-1.49	1	Very low

Table 5 show the results of student's lecture evaluation. Most of students Satisfaction on the lecture is relevant to the program objectives was very high level with average score of 4.58, follow by the lecture can meet the needs of my community, the lecture can be applicable to my community, the lecture can contribute to economic development in my community, it applies knowledge and (or) skills from the lecture to our community, and it is possible to sustain our economic growth (average of 4.47, 4.44, 4.43, and 4.32) respectively.

4.2 Graduate student's curriculum reflection after the class and graduate.

4.2.1 Student's reflections of curriculum (From year 2016 to year 2019)

In 2016

- learn more on how to design garden through permaculture, do more practical in the garden, planning and analyzing the situation before implementation or before carrying out the work.

- To get information on organic farming & management systems

- One important aspect pointed out was a diary and journal keeping. It is important to monitor the progress and it can be very helpful to correct past recorded mistakes.

- How to make use of the keyhole-planting on a compost heap

- How to reclaim a steep slope

- In area where animal manure is scarce and expensive, is there an alternative organic fertilizer that can be used that is cheaper? Such areas may be peri urban areas or even in urban areas: some people may want to do back yard farming

- I hope to learn how we can collect water for use in the dry season.

- Weeds are steward of the soil and they can enhance biodiversity, I would therefore want to learn how we can plant crops and at same time making use of the weeds.

- Restoration of soil ecosystems

- Minimizing costs in farming

- Appropriate energy saving techniques for developing countries

- Reality of GMOs and food safety

- Large scale of farming

In 2017

- When our children grow up and see how irresponsible and unworthy, we have been in terms of waste management, what do you think will be their reaction yet we keep telling them that we love them? Is this real love for them?

- I suggest that permaculture movements be promoted in developing countries, so as to control further disgrace upon the environment.

- Why are developed countries reluctant to donate farming technologies in developing countries? How best can foods be distributed to solve the crisis of global food shortage?

- I will return to my country I anticipate applying practically permaculture principles in farming. I will teach

farmers on the better ways of improving soil fertility and avoiding the use of chemical fertilizers. I will start with my home garden.

- My target is established organic farming practice in youth training center where I am working right now. My purpose is to produce organic farm entrepreneurs to the society by establishing the organic farming practice in my youth center.

- We are only starting so I am looking forward to knowing more with actual application because that is where I learn more.

- Individual action like example above cannot change the whole world, but if there is no start, then there will never change. Not only for our future generation but if we are not start changing, we also already get affected by this environmental issue. We should and must care more to our earth!

- I will say Permaculture encourages us to be resourceful and self-reliant. Permaculture tackles how to grow food, build houses and create communities, and minimize environmental impact at the same time.

- Is possible to use quality seeds which are developed through research institutions in permaculture? or we only used domestic seeds which only exist in the area?

In 2018

- The daylong session was well designed, pre-planned and completely participatory and interactive. Two-way of learning process was applied using group works, question-answer, debating and so on. Most importantly, we understand that, permaculture is not for making design only, rather it helps us to get interacted with our own environment. Another learning point is that, learning and understanding is good, but practicing in daily life is more important for our own survival.

- What I expect to learn also is how to overcome some of insects that destroys some root crops or crops in general, for

example I grow at time sweet potatoes but when I harvest it, I discover you can't eat it because there are maggots inside. Also, the corn leaves at times are destroy by some insects which automatically causes the corn not to produce.

- Reinforce permaculture ideas with more information on successful case studies; in addition to the practical case undertaken to understand how the system works

- I believe that I will always agree with a holistic vision of development where we give a broader vision than conventional to the groups of people with whom we share. Based on the principles and ethics of the knowledge that find out the sustainability.

- Personally, I have no complaint and comment for Your method of teaching lectures! Moreover, I liked how you put the question (why, what and how it is established). After your lecture, after returning to my country Kyrgyzstan I will apply all the knowledge and technology to preserve nature. In addition, shall strive to disseminate the knowledge gained and the main to change their attitude towards nature!

- Perusing economic development of our nation, we are destroying our environment in very bad manner due to globalization. As globalization is destroying nature by CO2 emissions from industries, creating gap between rich and poor people as well as affecting survival of people ultimately crisscrossing the planet. It is also destroying language, culture and livelihood of people.

- I had this project in my mind to introduce young people to farming and with this project we are making I am is a starting point for me.

- I will learn the farming technology that I use will use help my people to increase the agricultural productivity in sustainable manner and to reach the yield of high quality and healthy

- I need more skills on how to apply organic fertilizer during the planting phase and the growing phase and also the application of IMO to the plants.

- My expectation is to change the lifestyle of my community by teaching to them new appropriate technologies which are cheap to them and permaculture which will be helpful to them especially in planning for their current situation and their future development.

- I expected a standard format for making farm policies of any farm project since the policies act as guiding principles. That's policies give direction on how activities should run. This also legalizes the activities since the constitution is binding and is commissioned by the magistrates' office that's for the case of Uganda.

In 2019

-Through these studies, work and practice, this helped me to understand and increase more knowledge about plants, techniques to create good vegetable beds, cultivation techniques and crop care. Since then, I have been able to understand the daily hardship of farmers to work in the fields with extreme weather conditions I think this project is really interesting, meaning and necessary for this generation and also the future. We have to ready to change from small things to big things for aiming the self-sufficient and food security."

- As Development Officer in the SME and Textile Development Division of the Ministry of Industry and commerce, we have formulated National Policy Framework for SME Development and its Action Plan in collaboration with the other relevant parties. Accordingly, The Implementing Agencies coming under the preview Ministry implement several SME development projects related with intervention areas recognized by policy framework.

- It was a good experience for me of making bed, alley and plant herbs. In our country normally we didn't make alley.

We just plant the herbs. I also feel the difference of so modified tools which increase efficiency in working in the field. We have in our country but they are not really as users friendly as here while working the field.

- The following are subsections of what I want to learn: Relationship between Permaculture designs and Sack gardening. Basic agricultural practices which I can apply in my local area. More advance techniques. How can developed countries with minimal resources can they emulate Canaan Farming style. Application ways of Canaan GOLDEN CIRCLE METHOD in my Rural Village. Fertilizers, harvesting, storage, treating and marketing.

- The class was a mix or dynamic and participatory which seek to engage everyone for ideas with critical thinking abilities. I feel it should be run as such to avoid boredom is to say.

- This day was very beneficial because it allowed us to connect the theory with the practice on farming since most of the participants had never had a practical experience of agriculture.

- The field was also interesting; I had gone farming before but it was not as detailed as the class was. I learned about basics of farming practically on the field (soil tests, Weeds in the farm, sun, slope, water issues etc.) Practical farming which was done. I felt that there is a need to get actively involved in actual farming again. I haven't done practical farming in a long time and so it was a bit hectic.

- This class has met my expectations and gone beyond. I feel like I have learnt a lot in a short period of time. The class was interactive, and the videos were constructive. I especially enjoyed the start of the class because it starts with major global issues especially on the environment and narrowed down to its linkages with agriculture.

- I would like to learn how the dimensions of food security (Food availability, Food access, Utilization and Stability) are interlinked and how each affect sustainable

development (In striking the balance between social, economy and environment)

- I really appreciate this kind of discussion. It made me think of what I really stand for. Moreover, I just realized that it is also difficult to defend something you do not fully believe in. It is also difficult to defend something you are not fully aware of or knowledgeable of. In the end, it is always better to learn something, and from this activity, I learned a lot.

- Thanks for an awesome teaching method. Hard work and perseverance. More than that, I have created the real meaning of TEAM which stands for Together WE Achieve More. From this, I am more than grateful to be able to experience the entire process, to get in touch with nature, and to appreciate the hard work of our farmers and the food that is prepared and eaten to nourish our bodies.

4.2.2 The student's refection data for curriculum development

Researcher focused curriculum development as practical uses by students. With this wish's researcher sent questionnaire to 67 graduate students except one who passed away few years ago. The answer of questionnaire returned 14 only due to COVID-19 lock down. Researcher asked 3 questions that below:

Have you ever implemented what you learned from "Appropriate Farming Technology and Practices" class in your summer session in CGLC? If yes, can you please explain what was it?

12 students answered they are practiced in their work and home at least hobby. But 2 students were move into another department so not yet applied.

I've used this for basic family and community food security where we can enjoy fresh products from the farm and backyard garden. (Fiji, 2016)

I have started some vegetable farming and However, it was not succeeded as I expected due to the lack of supervision after restating the office work. In general, I do not involve in agriculture for my office work. Usually, I involve in all steps of the project Cycle (project management) for fulfilling my office task. However, I got plenty of knowledge on agriculture during your lecture, unfortunately, I have not had much time to implement the learning points. (Sri Lanka, 2016)

I had a project for some community students to involve in income generating activities in gardening to grow different types of vegetables. After Canaan I am more on helping community women to design their project and find strategies to boost their businesses. (Senegal.2017)

I shared a skill learned in Canaan in corn production value chain whereby farmers have been capacitated on postharvest technology and corn marketing at national and cross border. (Tanzania, 2017)

I tried. I am living in rented house in capital city so it's kind of hard to do farming, no land available. Also, I work until late at office and have a lot of business trip so time management to taking care of plant is very hard. I do farm for hobbies for now, I make compos from my leftover food and make mini garden with easy plant that not required a lot of treatment. (Indonesia, 2017)

I tried, but only in our backyard. Not for very long also because of work and new born baby. Was not able to manage farming. (Philippines, 2017)

Work with farmers and make bio fertilizer used by microorganism and Tithonia leaves. Initiated Neem seed oil project and Neem Cark for animal food. (Cameron, 2018)

Actually, the men power in the field of management/leadership is more needed in the situation/circumstances of Afghanistan, so that I was hired for such a busy position in the field of management. But still I'm engaged with formers for forming in the campus of the university I work. (Afghanistan, 2018)

*Plant variety of seeds in 25*25 Mt land of family owns. (Nicaragua, 2018)*

I made snail garden in the office quarter garden and growing some vegetables. (Nepal, 2018)

I tried companion planting in the backyard of my home (Kitchen garden). I wanted to grow many crops in one area while trying to avoid the use of pesticides and insecticides. (Rwanda, 2019)

The implementation is mainly focused on the area of re-echoing that was done in a learning exchange and sharing of best practices. As part of the development work force and coming back to the Philippines with my learning in South Korea, the earnest approach in sharing knowledge is to re-echo through workshop and lecture series to be followed by grant/seed fund approaches that the community can apply and implement their proposed project wherein the lecture on appropriate farming technology and practices are encapsulated. (Philippines, 2019)

Are any agricultural skills you need badly, but you didn't learn? Can you explain what is that?

Irrigation and keep longer moisture in the soil.

Natural fertilizer and make healthy soil and soil testing

Agricultural system

Agrobusiness, marketing and technical farming
Hydroponic
More filed work from prepares the land, seeding, monitoring up to harvest

Do you have any suggestion to add more curriculum context in "Appropriate Farming Technology and Practice" to solve your problems and obstacles?

Learn how to implement people's idea without government support.
How to keep bio fertilizer for a long time
Make output
Manure preparation and natural pesticides preparation
Develop more training of Permaculture design to face climate change
Designing and managing for community and training center
Natural pesticide and fertilizer to make more Organic crops will be harvest and win the market and fir trade
Hydroponic and rural farming, urban farming
Select particular place and assessment and focused practice. Make output.
Horticulture, commercial agriculture farming

Through these answered, researcher modified with time sharing by filed practice like land preparation, observation, seeding, bedding, mulching, harvesting and post-harvest. Also use wild plants to make food and daily products. Group workshop also changed from climate change literacy and aware of sustainable agriculture up to decarbonize agriculture to survive under climate crisis era. At last, let students to try to understand each other and cooperate each other for further interrelationship.

After the all class finished the students in 2020 evaluate curriculum method that researcher used. The data shows as below:

Table 6 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			
Golden circle method	4.53	0.624	Strongly agree
Budget analysis with self-sufficiency and depend	4.59	0.618	Strongly agree
Make sustainable cloth production	4.41	0.712	Agree
Make farm planning	4.76	0.437	Strongly agree
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	4.63	0.414	Strongly agree
2. Please check if below practice helps you to understand the subject			
Harvest potato	4.76	0.437	Strongly agree
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

Items	Mean (n=17)	S.D.	Description
To learn footsteps as a measurement tool.41	4.65	0.785	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
Seeding management	4.76	0.437	Strongly agree
Make rocket stove	4.65	0.606	Strongly agree
Produce product from wild plants	4.88	0.332	Strongly agree
Total	4.76	0.277	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

Table 6 Shows the educational methodology evaluation by students. Section number 1 is group workshop methodology and number 2 is field practice methodology. The group workshop methods were 1) Golden circle method, 2) Budget analysis with self-sufficiency and dependency, 3) Make sustainable cloth production, 4) Make farm planning, 5) Research wild plant production, and 6) Make roadmap to cut the CO2 emission. Among the group workshop methods, the data shows that students were strongly agree on methodology helps to understand the lecture with mean of 4.63 respectively. In the considered individually, it was found that the method of Make roadmap to cut the CO2 emission is the highest score followed

by mean score 4.88, respectively. And the lowest method is the Make sustainable cloth production by mean score 4.41.

4.3 The implementation discusses based on researchers' questions and objectives

4.3.1 Accepting Environmental Crisis as one's problem

Over the last few decades, unprecedented global, population growth has led to increased demand for food and shelter. At the same time, extraction of natural resources beyond the Earth's resilience capacity has had a devastating effect on ecosystems and environmental health. Furthermore, climate change is having a significant impact in a number of areas, including the global hydrological cycle, ecosystem functioning, coastal vulnerability, forest ecology, food security, and agricultural sustainability. According to the intergovernmental Panel on Climate Change (IPCC), only immediate and sustained action will prevent climate change causing irreversible and potentially catastrophic damage to our environment (Rajeev Pratap Singh et al., 2019).

One of the challenges of this study are how let students to accept climate crisis as their own crisis. At the beginning of the class, researcher need to know student's thought of sustainable agriculture. Process to get student's first thought is let them to make a group and give same time for speech, summery of speakers and get keyword from summery of speakers. And put keyword in Simon Sinek's Golden Circle Chart why, how, what and researcher added who. The figure and table show student's first thought of reason of unsustainable agriculture and solution to sustainable agriculture (Figure 7 and Figure 8).

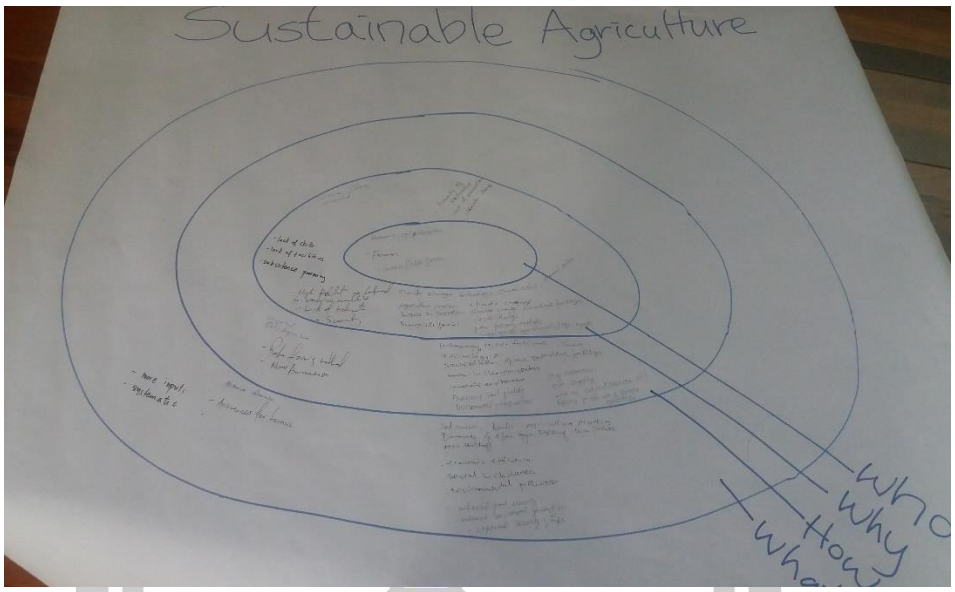


Figure 7 Student's key words in modified Simon Sineks's Gold Circle Chart

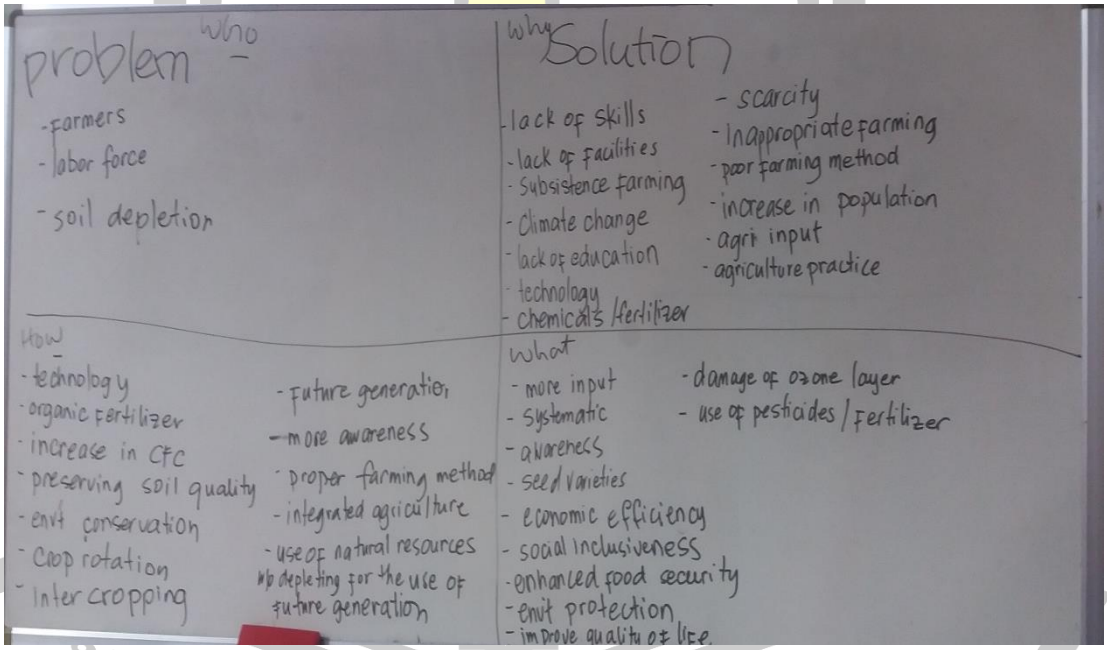


Figure 8 Arrange key word from the chart.

Table 7 Student's first thought of reason of unsustainable agriculture and solution to sustainable agriculture used by Simon Sinek's Golden Circle Chart.

	Reason of Unsustainable Agriculture	Solution to Sustainable Agriculture
Group 1	- Farmers/Laborers' lack of knowledge and skills on sustainable farming leads to use of methods which are harmful to the environment as a whole. - Farmers' use of chemicals to produce more destroy other living organisms which makes the soil unproductive in long run.	- Farmers/Laborers' awareness and education contribute more sustainable farming practices. - Proper farming method like the use of organic fertilizers help in maintaining soil fertility.
Group 2	- Soil depletion due to inappropriate farming may be addressed by using proper farming methods in order to create enhanced food security, economic efficiency that will eventually lead to improved quality of life. - Farmers use harmful chemicals for agricultural production, hence, the need to increase awareness to protect environment. - Farmers use poor farming due to lack of skills, which may be solved by increasing awareness on the use of proper farming methods.	- Less labor force as most youth do not engage in agriculture for increased production, which can be solved through increasing awareness and by changing mindsets. - Farmers' awareness on the use of natural resources without depleting them for future generation improves environmental protection.
Group 3	- Farmer's lack of facilities to practice proper farming	- Farmers should be educated on the

	Reason of Unsustainable Agriculture	Solution to Sustainable Agriculture
	method, leading to overuse of chemical substances. - Poor labor force leads to inappropriate farming method. - Soil depletion is as a result of overuse of chemical fertilizer.	integrated agriculture to enhance food security. - Farmers should be educated to practice proper farming method. - Farmers need to gain awareness on environmental protection
Group 4	- Farmer's lack of skills and proper farming methods damages the ozone layer - Labour force lack of education will affect the future generation and economic efficiency - Soil depletion and poor farming methods does not enhance food security	- Farmers adopting good agriculture practices and technology will protect the environment - Labour force use of appropriate farming methods will lead to improved economic efficiency - Preserving soil quality through integrated agriculture leads to enhanced food security

Table 7 showed the student's first thought of reason of unsustainable agriculture and solution to sustainable agriculture used by Simon Sinek's Golden Circle Chart. It was found the after presentation of group work, student's key word of 'Who' is only Farmer, Labour and Soil depletion. Researcher had question itself how let students involve themselves in sustainable agriculture. Because as Lee (1993) states that the environmental education strategy through personalization environment was an effective strategy to change the awareness, attitude and behavior toward the environment compared with a traditional teaching strategy. As most of the student's are

worker, researcher try to relate their consuming habit into sustainable agriculture.

Researcher give five categories to analysis their living expenses and define self sufficiency and dependency with their salary. This work has done by oneself and get average in group. And present into percentage. The result shows in table 4.4.

Table 4.4 Student's monthly salary analysis and present group average with percentage.

Group	Food		Cloth		Housing		Health		Transportation	
	Self-sufficiency	dependence	Self-sufficiency	dependence	Self-sufficiency	dependence	Self-sufficiency	dependence	Self-sufficiency	dependence
1	35 %		11.25%		28.75%		15%		10%	
	0%	100%	0%	100%	0%	100%	0%	100%	0%	100%
2	32.5%		22.5%		20%		11.25%		13.75%	
	12.5%	87.5%	47.5%	52.5%	10%	90%	23.75%	76.25%	6/25%	93.75%
3	30%		21%		20%		12%		14%	
	8%	92%	0%	100%	40%	60%	0%	100%	0%	100%
4	40%		18.75%		18.75%		13.75%		8.75%	
	60%	40%	27.5%	72.5%	78.75%	21.25%	17.5%	82.5%	32.5%	67.5%

Leo et al., (2019) states the industrial agriculture system consumes fossil fuel, water, and topsoil at unsustainable rates. It contributes to numerous forms of environmental degradation, including air and water pollution, soil depletion, diminishing biodiversity, and fish die-offs. Lazaroiu (2019) mentioned that Rana and Paul (33) suggest that demand and supply impediments that adversely impact consumer attitude with regard to additive-free products encompass costs involved to

decrease the agricultural chemical utilization, premium price, insufficient availability, and inconvenience in producing organic manure. In the environmentally friendly food market, brand equity significantly shapes the perceived quality and consumer purchase behavior. Environmentally friendly food is an appealing suggestion in a specific market where consumers are health aware and plan to eat safe, wholesome, and organic goods. Pham et. (34) note that encouraging consumer buying behavior of organic foods is essential to environmental sustainability.

Thogersen (2010) reported that the analyzed data are published research on why consumer purchase of organic food products differs between countries. As expected, organic food's share of total food consumption depends heavily on political regulation, including legal definitions and standards, financial support to farmers, and a national labeling system. Other important structural factors are soil conditions, an effective and efficient distribution system, and the size of the premium price demanded for organic food products. Macro factors such as the food culture and the culture's level of post materialism and environmental concern play an additional role. The evidence suggests that, together, macro and structural factors such as these are more, and probably considerably more, important for the sustainability of food consumption than are individual-level attitudinal variables

> *Why we choose easy way all the time to eat even not cultivating a seed. ...I understood that how painful is taking harvest and how easy is to consume. Consuming is inseparable part of communities especially who live in the urban areas, but wasting the food is the most common thing in the urban areas as well. These problems are the consumers' problems but the farmers' problems also influence today's world reality. Soil depletion is the biggest problem in everywhere of the world. We cannot purely blame these people for environmental damage to soil, but they are the most affected people who work with soil. Farmers, the other stakeholders too such as consumer or policymaker should share responsibility on fair share. (Azerbaijan,2020)*

The agricultural sector has played an important role to fostering economic growth and alleviates the poverty, therefore, to achieving agriculture sustainability, the holistic approach and diversity development is needed to be implemented, most importantly, strengthening the awareness of people on agriculture sustainability by putting in real practice. (Cambodia, 2020)

In this section I have experienced how to make more interactive group discussion by giving a chance for each member of the group and listing of individuals perspective on the same topic. Self - analysis: in my life the most difficult thing is self-analysis but from today on I have found that how to analyze myself regardless of spending income as well as how to reduce cost of consumption by supporting self-harvesting. (Ethiopia)

Who includes people and government bodies involved in agriculture for example; farmers, policy makers, consumers and labor force? What addresses the specific key issues in agriculture, for example economic efficiency, food security, environment protection, improved quality of life among others. Why identifies the cause of the problems in agriculture such as lack of education and skills, inappropriate farming methods, use of chemical fertilizers amongst others? How points out the possible solutions to the problems identified such as use of technology, use of organic fertilizers, environment conservation and education etc. (Kenya, 2020)

Reflecting on this makes me sad and feel bad about myself at the same time because I realize that I don't do much for attaining sustainable agriculture. The activities like the discussion and reflection on these questions, and the analysis of budget make me realize how much I contribute to the problem. It saddens me that

in as much as I want to become an advocate of sustainability, I fail to recognize how much I contribute on making the environment suffer because of irresponsible consumption. (Philippines, 2020)

When we were asked about sustainability and agriculture, I thought answering these questions was easy but it was not, as there were things that should be reflected on. We took some time but for me, more than answering the questions, the more important lesson that may be learned from the activity was the development of listening skills, or relearning it. (Philippines,2020)

4.3.2 Approach to Environmental Education Objectives

Tbilisi Declaration (1977) states that the goals of environmental education are: 1. To foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas; 2. To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment; and 3. To create patterns of behavior of individuals, groups, and society as a whole towards the environment.

Hein and Kruse-Graumann (2003) explained Sustainable development requires diverse and life-long learning processes that are concerned not only with acquiring abstract knowledge, but also continuous building and reinforcement of wide-ranging sustainability skills. Learning for sustainability must encourage the acquisition of new sustainable (e.g., resource-saving, prevention-based) life styles (consumption, mobility, living preference, etc.) for all groups in society in their different living and working situations beyond the narrower educational landscape (school, basic and advanced training).

Curriculum applied the Tbilisi Declaration educational stages: Awareness, Knowledge, Skill, Attitude and Participate. In the class, during sustainable discussion and self-analysis of student's budget, students start to aware their thought. Second,

after learn permaculture ethics, Principles and domain, students start to learn whole process of agricultural product processing's and learn caused of pollution.

4.3.2.1 Awareness

Filed observation increase student's awareness and sensitivity of environment. And know the whole process of produces will help students understand social system.

Field observation

I would like to say that it was the best part of lecture for me. .... Even though it is my daily routine to listen to nature every time I feel like I experience something new. I love nature. I love being part of it, but never thought to learn the wild plans name by heart...Farming is the part of the lecture. I like to practice it more. Because of this we take the barrier between office worker and farmer. Even though I work for Ministry of Agriculture when farmer comes to our office, we have invisible barrier while communicating. We insist not to understand how farming is difficult, but we require more from them. This time after small practice I will feel my farmer deep inside. I will not evaluate their job apart from ours but instead as a complex with my job. (Azerbaijan)

Today, I learned how important it is to observe the field I want to use for agriculture. From the type of herbs, and how it grows, we can make out what type of crop would be suitable for that particular land. The factors like surroundings, soil, type of animals that roam around, and location of the land can be a big factor in farming. This was great learning experience for me to try in my country. (Bangladesh)

This is the very interesting process that I have learnt on how to conducting the comprehensive observation of land before the farming (East Timor)

I found it as the most impressive which led me to think before implementing the project, I must know that existing field biomass. This is the most important thing but always we ignore it. (Ethiopia)

Observing a site yesterday was also a good activity. … But doing the observation, ideas can run and keep running on one's mind about what and how things can be done. But I think, 15 minutes is not enough to observe though I understand also that we have also been there and we are pressed with time. Maybe the activity can be done as a homework so student can go there on their own or in pair to observe. I think we are a big group yesterday when observing and we lose focus. (Philippines)

Today we can see that some developing countries have implemented this farming strategy which brought an effective farming system. This technique of farming aims to develop a holistic land-use management system for the production restoration, conservation and improvement of land and water resources and the overall ecosystem. The slope farming system provided lots of advantages such as effectively controls soil and water loss, improve forest and grass growth, multi-function, reduce labour force and save time Through this activity, I gained new knowledge and experiences on how to design farming system in my house, office, community and school. These experiences of knowledge where we can apply and adopt. (Cambodia)

I have learnt that this is a very important thing that must be considered before we start farming. In Fiji, most farmers just practice subsistence farming without proper planning which led to lower productivity. One new idea that I learnt in Farming planning was the use of mulching. This was also a great idea that I have learnt from the class. (Fiji)

The younger generation also does not find farming attractive. Farmlands are now converted to business establishments, condominiums, amusement centers, malls and other recreational facilities. Aside from these situations, there is one threat that is more alarming for me, which was affirmed this morning at the lecture: Machines continue to replace farmers, thus, building relationship with each other through farming somehow faces a threat. (Philippines)

In this lecture I have found an idea about how to classify the resource into different group of production and how to allocate time for daily, weekly, monthly, and yearly. In the future I hope I will try to allocate my resource with the principle of zoning. To be sustainability in my opinion zoning is the best concept. The principle of zoning can be applied to in all activities of human life. (Ethiopia)

Today the lecture and activities are good. professor your lessons learned are importance, but I think we do not have much time to discuss all of the lessons could you just explain brief the lessons then give us the materials like that. (Laos)

Analyze steps of clothes production and make Sustainable clothes production system.

Figure 4.3 Group presentation of Sustainable Clothe Production

From this activity I could learn the process of sustainable cotton production starting from growing stage until it reaches the final consumer. (Bangladesh)

Agricultural activity as well as agricultural policy cannot be realized individually. It needs to integrate the other fields in order to obtain sustainability. We worked on the project as a group for making sustainable cloth production by considering seven important principles of permaculture. … Though it is very difficult to satisfy seven principles in one project but even to be taken into consideration 3-5 principles by every producer we will not face with these challenges today as a world. Unconscious consumerism is the biggest problem of each country as unconscious production. We should learn as a consumer to

become more careful about each product we buy. I want to be part of change. … I immediately thought that when I go back to my country, I will definitely make a conference or workshop making awareness about existence of this approach. Since I am working for Ministry of Agriculture the employees are not aware of this concept. (Azerbaijan)

The discussion activity has provided lots of knowledge on how to design sustainable development for the community to avoid the effects of the environment and maintain a healthy green planet. Through this experience, it showed that to proceed sustainable development, it needs integrated mechanisms and diversity of approach to accomplish the goals, moreover, everyone has to involve actively to ensure the goal will be accomplished. (Cambodia)

How in my current ways I am contributing to the destruction of the world? But yesterday, my realization is more on being part of the solution and there are many ways to do so. (Philippines)

This is really impressed me because most of the time we neglect these factors as we focus a lot on subsistence farming. (Fiji)

We should always be mindful and develop critical thinking to at least research on where the resources come from… One more realization is the fact that our lifestyle affects the environment. What we have now in our hands were unimaginable five or 10 years ago. What we have today may be nothing but a thing of the past 5 or 10 years from now. I am not from the agricultural sector but starting from the first class, I take things by heart. I know my knowledge on agriculture is limited, thus, I want to compensate these shortcomings by listening to the professor and tirelessly

taking notes. In the practical application of the learning techniques, I know my mobility is also limited as I have mild scoliosis and backpains that I do not want to force myself as it may harm me even more, but I am trying. I am not strong, but at least I am willing. (Philippines)

From now on, I should change myself as my habit. When I use anything, I need to think about earth, people, and fair shares. Moreover, I also want to share with my family, my friends, my colleagues and my students what I have learned from the lecture today. (Vietnam)

4.3.2.2 Knowledge and skills

Lectures of Sustainable Agriculture under Climate Crisis Era was done in class and field. The curriculum gives basic information of the climate change phenomena and effect in Agriculture. Through that knowledge student practice in the field to increase their skills.

Potato harvest

Figure 4.4 Potato harvest

I am also really excited to harvest potatoes in the field. It was the first time for me to see how potatoes have planted and harvested.

It showed that the participants are hand in hand to work together and unite to achieve the fieldwork quickly as one family. For calcium fertilizer, it also another new knowledge. We can make an important fertilizer by using eggshell with vinegar and just keep for 7 days, so that we can use it for our crops or plants. This method is an easy way and did not require much wage and resource where farmer can find after using eggs. (Cambodia)

I have a first lesson learnt today on practical harvesting the potato in field. It was very interesting and I wish to learn more how the process of preparing the seed and planting in the future. (East Timor)

Previously I do not have any experience on potato harvesting activity practically and the storage of it. But today I have learnt the harvesting and storage of potato. (Ethiopia)

I had no experience in potato harvesting activity and how to store them. Today I learned the potato harvesting and storage. (Sri Lanka)

Make liquid Fertilizer

Figure 4.5 To make Fresh plant liquid fertilizer and calcium liquid fertilizer

The organic compost practical is also very useful experience to apply in our community. Farmers can use natural resource, materials around their house to produce composts by themselves. (Cambodia)

I appreciated the fact that I learned many new techniques in the production of compost manure. (Cameroon)

I think the way farm planning is imparted to us is comprehensive. I just want to add or suggest to have more detail on how they are done. For instance, students would appreciate if each part are seen on actual. We have done land preparation, but I think there can be more to discuss about land preparation if we do it on actual. I understand that we did clearing, made liquid fertilizer and got green manure for earthworms, but actual application may also be done on the day so it will be more appreciated. I also understand that since we made the fertilizers, we can actually apply them once they have fermented but again, I think it will be more appreciated if it is done on the day of our lecture. (Philippines)

With the existence of green vegetation in tropical Africa, green manure is easy and cheap to make. Alternative available materials can be thought of to make green manure. Human waste can be used to produce manure if culturally accepted. (Uganda)

This was the first time to learn about doing liquid compost. I believe this will be very helpful in my country because it uses only natural plants and water. (Fiji)

We cleaned the land from the wild plants and grass. This work reminded me that no matter how much we feel tired physically in that amount our body relax itself. ...Especially, in urban areas we

should put similar activities even though not for making business or gaining money and self-sufficiency but for necessary activity for our mental and physical health. In my workplace we have small garden with full of flowers but I wished to see there some vegetables as well. First of all, time by time we can be busy just watching how the things we eat grow and transform, secondly, we should appreciate their existence with us while seeing and understand their value. Plants have life too. We should know about them more. We should see the process….. Now, kids cannot recognize what they eat even according to veggies and fruits appearances. I like to be at farm. Every urban citizen should come to farms as excursions and schoolkids as well at least one time in a year spending whole day with the activities with farmers. It is necessary. I liked the techniques which provided us by lecturer during the class. I will try to practice what I learned from class in my daily life, especially utilizing everything. (Azerbaijan)

Daily product making

I could have never thought about soap making or other household stuff without using chemicals on our own. When we did it and used it, I felt overwhelmed by the result. This is the same shampoo we buy with a lot of chemicals inside harming our bodies and the nature as well. I could not imagine that it might be that easy to get the same result may be better for 30 minutes. I told about this my friends and my family first when they were also surprised and asked me recipe. Therefore, I used in the morning the handmade toothpowder too. Since it is not new to me, my grandmother brushed her teeth with household sodium all the time and when I want whiter teeth, I also do it adding several drops of lemon to powder but still this technique is different and except I think about doing this not sometimes after lecture but on daily basis. (Azerbaijan)

For the first time I had the experience of making sustainable and chemical free soap and shampoo. It was privilege to see how natural herbs that is available around us can be useful ingredient for making soap and shampoo. (Bangladesh)

Another interesting lesson is soap and shampoo production technique. It is very helpful for farmers as well as ourselves to produce for generating more income and self-sufficiency to reduce the expenditure. For the community, farmers can produce for their own consumption and sell from the surplus to increase more income. (Cambodia)

In this session, I wish to have a description of item and the process of making the soup and shampoo and I am interesting to learn more about it. (East Timor)

The harvest of potato and the preparation of soap and shampoo just from natural herbs was my first and wonderful experience. (Ethiopia)

Now a days this product is a daily consumption of peoples in the world. Therefore, to prepare it with the available material and simple method decrease burden of our cost to this product. This section was very interesting to me. (Ethiopia)

It was an exciting class with a lot of knowledge sharing. (Kenya)

I feel happy to learn how to make soap and shampoo which will not harm the environment. This is a good start for me knowing that we use a lot of chemical-based soap and shampoo daily, and a lot of suds are drained in the water which contributes to water

pollution too. These things are easy to make, and there are other things which we can make on our own which will not hurt the environment. Little by little, we can do it. (Philippines)

For the first time I had the experience of making sustainable and chemical free soap and shampoo from natural resources available around us. It was privilege to see how natural herbs that is available around us can be useful ingredient for making soap and shampoo. (Vietnam)

Make rocket Stove

Figure 1.6 Make rocket stove with mud

Even though we failed for the first time I hope we succeeded for the next try. I am curious to see and to bake in the stove too. (Azerbaijan)

For clay stoves practical activities, it also inspired me to gain more useful knowledge and experimental. Since I have been used this kind of stove in my country but I did not know that we can make it with just simple soil and grass. So, it is very impress. (Cambodia)

This section is the most important thing in environmental protection and health of the population. When we produce and promote the stove, we are minimizing the use of forest plant by efficiently use of the heat produce by specific wood rather than fragmenting the heat into different direction. Therefore, this will enhance the efficiency of cooking food and minimizing the soot which have an impact on the vision of individual who use wood for cooking. Especially in rural community our mothers and sisters are suffering in this problem. (Ethopia)

This was a new thing to me and I believe that this will really help many rural farmers in my community. (Fiji)

About the rocket stove, it's also a nice idea. But I'm thinking about its durability as compared to having a stove molded with cement. Though on the second thought, having the rocket stove made from soil, water and grass is really very easy and if it breaks, it can just return to the ground as soil, which makes it more environment friendly, i think. (Philippines)

The energy efficiency of rocket mud stove saves the firewood that would be consumed using the three stone fire stoves. I feel that using clay mixture would provide more insulation. (Uganda)

It is the most efficient solution in land limited community. But getting the material especially the pot in developing country is challenging. (Ethiopia)

4.3.2.3 Attitude and participate

Based on knowledge students enlarged their thought based on oneself to the society. Zone planning, Farm design (house, school, community and office), Make agricultural product by wild plants, and make road map to decarbonizes agriculture will support student to understand environmental attitude and participation.

Make product from wild plants

Figure 4.7 Product from wild plants

Table 4.5 The group workshop to make product from wild plant.

Group	Plant	Product	Use
1	Dandelion	Tea Pancakes	Reducing cholesterol, regulating blood sugar, reducing inflammation, lowering blood pressure, Aiding weight loss, reducing cancer risks, boosting the immune system, providing antioxidants, aiding digestion, keeping the skin healthy
2	Mulberry	Mulberry body scrub	Exfoliant Relieve dry skin For soft and glowing skin
3	Creeping wood sorrel	Salad And medicine	Treatment for Stomach disorders; Treatment for Intestinal, liver, and stomach inflammation; Treatment for Wound healing, burns and skin eruptions; Stopping bleeding; Killing germs (antibacterial). Treatment for Hookworms Treatment for Influenza, Vaginal wash, Treatment for Urinary tract infections, Treatment for Enteritis, Treatment for Diarrhea, Traumatic injuries/Sprains Treatment for Poisonous snake/insect bites
4	Pig weed	Juice	Good for constipation, act as weight controller, cures dysentery and diarrhea, improve brain health, remedy for jaundice and reduces cholesterol level

It is very important thing in life to apply what you learned in practice. We already had some knowledge from previous classes how to use wild plants but never applied it. This time we prepared well in order to show wild plants are not weeds or in other words useless for human beings in terms of food. That is true that the wild herbs are used as medicine in almost every country but not very common to locals. For

instance, I want to start with dandelion. I cannot imagine that I would do pancake from dandelion or tea. Our group mates searched and made a conclusion that it is possible indeed. Because of rain almost spoiled them, we had difficulties to collect many of them that is why I had enough with few edible samples of dandelions. However, we could have made jelly from it as well. Those wild plants are everywhere. I do not say that I will collect them every day but I understood that I need to collect them once in a year in order to make tea which is useful. Besides, I can replace my tea habits from consumerism to self-sufficiency which proves that we can make tea out of dandelion or any other familiar wild plants which are free. Especially, the flowers can be good decoration inside any food such as cookies. I should have admitted that the taste of stove which comes from smoke makes every food more delicious such as simple meal like fried potatoes. We are not able to do it in our apartments but sometimes we can also practice it as fun activity as well as useful activity in order to reduce CO2. Generally, I enjoyed that class very much because we had fun and at the same time, we learned useful things from our colleagues such as making our own scrub and etc. with simple recipes. (Azerbaijan)

In the afternoon we prepared different dishes and medicine out of wild plant. This was learning experience because I didn't know that so much could be done with wild plants. Each group had to select a plant and plane any dish or medicinal use of the plant. We also learned from other groups about their wild plant. … This experience was fruitful to learn about wild plant uses and the essence. For my impression was that working in group I could learn the use of plant in different country in different ways. We are surrounded by many wild plants that we do not know about the uses. Today I get to learn the uses of these wild plant and the uses in daily life. I wish to apply these back on my return. (Jeffery, Bangladesh)

Through this group work experienced, I realized that some weeds are very useful and we also can make money if we know how to take advantages of that. This practice has taught and pushed me to do more research for my organization. In this regard, I can see that each group had produced an outstanding product which I have never seen and tried it before. I have never thought that the weeds can produce into other

products and very healthy and useful because generally people just ignore and not even take a look at those weeds. Most importantly, if the farmers can convert something from the simple weeds to valuable production, so they also can earn extra income to support their family too. Moreover, some weeds are not only can convert into another product for self-sufficiency but also can use as a medicine. Those weeds give a variety of benefits to our health. Through these activities, I have learnt new knowledge and experiences which I can apply to my family, friends and community. I have committed that I will bring all of these knowledge and skills put into practice for my community. The lesson learnt that I gained today is how to utilize all your resources around you and make it into valuable, so we will the credible outcome. (Sokunthea, Cambodia)

Initially, we faced difficulties in fixing fire (using rocket stove), and we also disagreed on the various stages of our products. But at the end of the day, we agreed and produced our products. This working session also helped me to understand the importance of natural plants which have been related to the backyard in my country. People do not more valorize the importance of herbal medicines. This working session will help me to promote the valorization of medicinal plants in my country when I go back home. (Camerron))

With all the very important lesson learnt from this practical and field work, I hope that I can have enough material and handout at the of class, so I will keep read and share it with my family, neighbor and my community. (East Timor)

In today activities I have learnt so many experience which is very important for future use to protect our environment. The other thing that I understand from conducted activities how much we ignored our traditional scholars those who have some knowledge about how to use the wild plant and we need to have transform our feeding habit. Therefore, I am thinking that I have lots of responsibility to create awareness about the entertainment with wild plant and improving our feeding habit. (Ethiopia)

We also discussed about challenges of herbal medicine usage which we noted that some countries are facing challenges in the acceptance of herbal medicine usage as most of their medicinal products do not have proper scientific backing hence its rejection. During the group work, I learnt that every country has their own unique way of preparing a product and we need to compromise each other to have a good finish product. Also, I learnt how to use a local cooking stove which is economical for community sectors. (Ghana)

It was an interesting session, to learn from each other and appreciate creativity. It was inspiring to see that most common weeds across the world can be utilized for human consumption and can actually be turned into a source of income for farmers. (Kenya)

I appreciate all groups recipe. I never knew that what I considered as grass can actually be included in the food I eat. However, I'm not really fond of eating vegetables and other greens which I'm not familiar with. I did try smoothie from Team Awesome but the wood sorrel salad from Team DJOB, I didn't try. This is because even if I'm not familiar with pigweed, the smoothie I know that the smoothie has apple and pear which I used to eat, unlike the wood sorrel salad which was mixed with other plant that I don't know. My mom and aunts love veggies and maybe I can introduce Team DJOB's recipe to them. Team ASEE's tea, pancake and potatoes with herb are all good. I'm not sure though what herb did they put on the potatoes

As for the medicinal property of the wood sorrel, dandelion, pigweed and even mulberry, I believe it's very important to know these especially that it can really relieve pain. I'm really happy to know about wood sorrel which relieves pain of babies, according to Oscar and Bona. If it's useful and abundant in one's place, this can really be useful without spending more for medicine. The issue on quantity and dosage is valid, though. There are claims that herbal medicines have no overdose, I'm not sure about it. I'm just thinking that it can be true especially if it "very"

natural. And of course, taking it in moderation is important as everything excessive is not good.

At first, my view on taking "other" plants and use them to make something is shallow. I was just thinking that we're going to have fun making food or something useful, which I did. I like this kind of activities because I like cooking. But your last message struck me. All the plants we made may be found in our countries or maybe in our backyard back home. The thing is, can we really use them? With all the chemicals applied to soil, consciously or unconsciously, we are not sure whether these plants can be beneficial or can harm us. And I thought that "yeah, realizing all these, it's high time that we care for the environment". We should be more conscious of what we do in our daily life because the simplest things we do have an effect to another living thing. As commonly said by activist in the Philippines, "Kapag namulat ka sa katotohanan, kasalanan na ang pumikit". In direct translation, it means if your eyes become open to truth, it is a sin to close your eyes. It means that if we become aware of what is happening around us, we should not be blind and not care. Now that we know the reality of the world and how we have been destructing our God given nature, we must always bear it in mind, and seek and act accordingly in order to stop destroying and start preserve and restoring. The fight for the environment is a fight we should win. (Philippines)

By preparing this product as a group we obtained not only the knowledge of the procedure but also, we got the experience, fun, and enjoyed working as a group. Here we learn about not only the agricultural practices but also the teamwork, sharing experience and skills and also the flexibility and respect other ideas and beliefs. I can apply/ use these product procedures in our country and we could earn additional income for our country by using free sources like wild plants. Therefore, I am very grateful to you for Madam giving such valuable ideas for us to develop our community. (Sri Lanka)

Our group made ointment, salad and insoluble drug. And we also listened to another group presentation. For me, I was so excited with class today. It is my first time I had

experience to make products from wild plants. As my sharing in our class, I will share this knowledge with my friends, my colleagues and my students. Moreover, through this activity, I also learn how to work with group. And I also have chance to talk, work and understand more about my classmates. We are closer than before. Last but not least, now I'm so interested in agriculture. My family also have land, but they do not use it. So, I am thinking that I will plant some vegetables when I go back my country. Thank you very much for your interesting lecture. Honestly, I wish we have more lectures with you. (Vietnam)

Zone planning

We were tough the importance of zone planning. In the zone planning it is concerned with the level of human activity, efficiency of movement, and human effort on a permaculture. It is very important to analyze the movement and effective placement of components and relations to each other are considered. These zones can be categorized into personal, family and friends, associations, community, local businesses, mega corporations and undefined. We discussed our family farming edible yard. The zone discussions helped us to restructure and plan our family plan with greater efficiency. (Bangladesh)

Farm Design

As government officials, we can innovate low-cost strategies for agricultural marketing. These can be enhanced through policy advocacy. Eg. Agricultural weekly markets, leisure and market activities and crop product festivals. (Uganda)

I have learnt new things in today lecture is about Urban Farming. This is considered as the new method for the urban people who have varies issue and limitation of the land for cultivation. I have seen that in urban the community try to modify and used all of the resource to keep sustainability of farming and produce the needs for the markets and individual consume. I have notice as the example of utilization the roof to become their garden and it's was transforming the environment to be city green. Utilization of the playground for the family with the natural resource is very

important method to apply including the design of home garden with different model depend on the available land. (East Timor)

Make roadmap of decarbonized sustainable agriculture *s*

I have learnt an important discussion topic such as; reduce the emission of carbon from different view of education, community development and policy sector. In this discussion and presentation its help me to understand the causal and effect including the policy which need to address for solving the issue and I have learnt also how to make an overall roadmap for those issue. As I am not from the agriculture background…I am very proud and appreciated to join the class and learnt very important best practice that I never knew in my life (East Timor)

Team education showed a case in Fiji; they indicated various activities that can be carried in primary, secondary, and tertiary levels of education in order to create environmental awareness in Fiji. Some of these activities were arbor day, excursions to industries, natural parks, and beeches to make pupils and students understand the environment.

Team policymakers presented a case on the implementation of sustainable agriculture. They laid emphases on sustainable farming techniques such as organic farming and enforcing penalties on those who do not respect environmental laws.

Team community development. This team presented a case of carbon reduction in Dhaka, Bangladesh. Here, they presented the various actions that can be put in place to reduce carbon emissions in Dhaka. This comprised, organic farming, reduction of chlorofluorocarbons, creation of natural habitats and better waste management techniques.

This later followed by discussion among participants. Some issues raised during this period was pollution caused in some countries by foreign investors, carbon tax (carbon trade) environmental injustice, and how to make sure that these actions plans are really executed while respecting timeframes. (camerron)

For each of the had to come up with 10 years plan for the carbon emission. For our task we selected Dhaka the capital city of Bangladesh. Dhaka city has been going

through lots of carbon emission due to pollution from vehicles, industries and house hold. Dhaka is ranked 6th over populated cities around the world and 17th most polluted city in the world. Looking at this vulnerable situation of the city emission plan was mad for 10 years. The target is to reduce carbon emissions by 20% through well planned and coordinated community activities by 2030. The objectives of the plan are: 1) To develop domestic long-term strategy towards 80% renewable energy power generation and electrification. 2) To scale up the adaptation appropriate modern farming technologies. 3)To increase plant cover that facilitates the absorption and utilization of atmospheric carbon dioxide. 4)To empower the community with information on curbing carbon emissions. This plan would be challenging to change the mindset of the people. The main activates that would be involved are: 1) Adoption of organic farming, 2) Reduction of CFCs, 3) Creation of natural habitats, 4) Garbage management the budget for implementing the project would be US$ 1,130,000 for 20 years. The target stakeholders would be City Mayor, City Council, Ministry of Environment, Forest and Climate Change, Industrialist and Farmers Group. (Bangladesh)

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)

The activity to make a road map was a tough task. Personally, I find it difficult to decide on how it can be done, will it be sectoral, based on a country or just a local

policy. It's difficult also to decide when we really want to think seriously and think big. But I realized, even in science, we look at the ideal, then we adjust things by using "factors" to consider the deviations since ideal may not/cannot be attain. But still the ideal should be the target. I remember a saying that we should "reach for the moon, even if you fall, you can land among the stars". So, yeah, the policies we presented are strict, and would require effort but if we don't start, when can we start. And thinking about it, the starting is usually the hardest the most critical critics will throw words of accusations and other facts which may be discouraging, but at the end of the day, I hope we can stand for our environment. Even I don't know how I can start, but I believe I should and it drives me to think and act what I should do. And hopefully, when I get back to my country, I will be able to change and influence others to change their ways of treating the environment. As for the education group, I believe that knowledge is power. I believe with education comes knowledge and more practical things should be incorporated for appreciation. And practice does not mean doing only for one time. this has to be repeatedly done, and has to imbibed on everyday life as new normal. With this, the youth will be able to act for the environment. ... We already know about planting trees, we already know that we should segregate our waste, etc. But we lack practice and by doing so, we forget what we know. The thing is, it's just there on our brain and maybe youth of today just needs to be reminded be given a chance in order for them to practice about what they know about caring the environment. For the Bangladesh case, the heated discussion was on whether the responsibility on rampant pollution should be with the Government or with the foreign investor. I think it's always with the Government with share from the private sector. Yes, there are jobs which will be affected, maybe not now, but there are lives which are at stake if we let the investor polluting the country, and the Government has to stop it. Of course, there are agreements that come with them investing in the country and there are rules and regulations which the investors have to comply with. If these are not being met, the companies' attention must be called. Warnings may be given so that they can solve some problems in their emission BUT, if deadline on fixing the problem is not met, operation has to stop. The Government should be strict on this, because while they may favor the workers, some of their countrymen (if not all in the long run) will suffer. The 30,000+ garment

factories in Bangladesh may operate because people need them, but what is asked only to be a responsible operator, producing without harming the environment or compromising the health of people around them. (Philippines)

4.3.3 Curriculum implementation on appropriate farming technology and practice.

The study finding out suitable curriculum of international development cooperation training curriculum and determined what parameter emphasize international development cooperation training. Based on finding of awareness of students who were enrolled the program of appropriate farming technology and practice. Also, pretest and posttest, most of the students has been improved in all four sections. These questioned divided in knowledge, skills, attitude and participation 15 questions each and total 75 questions. The results show below:

Table 8 Student's awareness of climate change, sustainable development and sustainable agriculture according before and after enrolled the program.

Items	Before		After	
	Yes	No	Yes	No
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Climate change is just a natural fluctuation in earth's temperature.	9 (52.94)	8 (47.06)	17 (100.00)	0 (0)
Human activities have no significant impact on global temperature.	15 (88.24)	2 (11.76)	12 (70.59)	5 (29.41)

Items	Before		After	
	Yes	No	Yes	No
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Overuse of our natural resources is a serious threat for the health and welfare of generations.	16 (94.12)	1 (5.88)	17 (100.00)	0 (0)
I know what is carbon budget and green new deal.	13 (76.47)	4 (23.53)	17 (100.00)	0 (0)
Environmental balance is one basis for sustainable agricultural practices.	16 (94.12)	1 (5.88)	16 (94.12)	1 (5.88)
SDG framework does not distinguish between developed and developing Nations.	10 (58.82)	7 (41.18)	16 (94.12)	1 (5.88)
Reduce food miles can support carbon reduction.	5 (29.41)	12 (70.59)	13 (76.74)	4 (23.53)
Plastic waste took more than 400 years to decomposed.	11 (64.71)	6 (35.29)	16 (94.12)	1 (5.88)
Plastic food package became world problem.	17 (100.00)	0 (0.00)	16 (94.12)	1 (5.88)

Items	Before		After	
	Yes	No	Yes	No
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Forest absorbs carbon dioxide from the atmosphere; however, conserve forest is very important.	15 (88.24)	2 (11.76)	14 (82.35)	3 (17.65)
Monoculture is better than polyculture.	8 (47.06)	9 (52.94)	13 (76.47)	4 (23.53)
Wholistic approach needed for sustainable agriculture.	12 (70.59)	5 (29.41)	17 (100.00)	0 (0)
I know what is the meaning of permaculture design.	5 (29.41)	12 (70.59)	17 (100.00)	0 (0)
Farming is needed even in city.	15 (88.24)	2 (11.76)	17 (100.00)	0 (0)
In a cooperative, the members are the shareholders, not outside investors. And one member, one vote system.	13 (76.47)	4 (23.53)	11 (64.71)	6 (35.29)

Table 8 showed the student's awareness of climate change, sustainable development and sustainable agriculture according before and after enrolled the program, the data found

that the percentage of students answer of 15 questions were increase of right answer with 100 percent of 6 awareness questions (Climate change is just a natural fluctuation in earth's temperature, Overuse of our natural resources is a serious threat for the health and welfare of generations, I know what is carbon budget and green new deal, Wholistic approach needed for sustainable agriculture, I know what is the meaning of permaculture design, and Farming is needed even in city), it mean that there were more aware about the content of the program.

Table 9 Level of student's awareness of climate change, sustainable development and sustainable agriculture according to before enrolled and after enrolled the program.

Level of awareness	**Before**		**After**	
	Frequency (n=17)	**Percentage (%)**	**Frequency (n=17)**	**Percentage (%)**
Low	6	35.29	0	0
Moderate	11	64.71	0	0
High	17	100.00	17	100.00

Legend:

Scale	**Score**	**Description**
2.34-3.00	11-15	High
1.67-2.33	6-10	Moderate
1.00-1.66	1-5	Low

Table 9 showed the data of level of student's awareness of climate change, sustainable development, and sustainable

agriculture according to before enrolled and after enrolled the program, according to the answer awareness questions with 1-5 scores was low awareness, 6-10 scores were moderate awareness, and 11-15 scores were high awareness. This study found that students were a high level of awareness with 100 percentage through after enrolled in the program.

Table 10 A comparison of student's awareness of climate change, sustainable development and sustainable agriculture before and after enrolled the program.

Items	n	$\bar{x}$	S.D.	df	t	Sig.
Before	17	10.0588	2.164	16	- 6.818	.000*
After	17	13.4706	1.280			

*Statistically significant level at 0.05

Table 10 shown a comparison of student's awareness of climate change, sustainable development, and sustainable agriculture before and after enrolled the program. Regarding the student's awareness after enrolled the program, it was found to be higher than before with a statistical significance level at 0.05.

Table 11 Level of student's knowledge of climate change, sustainable development and sustainable agriculture according before and after enrolled the program.

Level of knowledge	Pre-test/ Before		Post-test/ After	
	Frequency (n=17)	Percentage (%)	Frequency (n=17)	Percentage (%)
Low	1	5.88	0	0
Moderate	12	70.59	1	5.88
High	4	23.53	16	94.12

Legend:

Scale	Score	Description
2.34-3.00	11-15	High

1.67-2.33	6-10	Moderate
1.00-1.66	1-5	Low

Table 11 shown the level of student's knowledge of climate change, sustainable development, and sustainable agriculture according to before and after enrolled the program, according to the answer pre-test and post-test with 1-5 scores was low, 6-10 scores were moderate, and 11-15 scores were high. This study found that students were a high level of awareness with 94.12 percentage through after enrolled in the program.

Table 12 A comparison of student's knowledge of climate change, sustainable development and sustainable agriculture before and after enrolled the program.

Items	**n**	$\bar{x}$	**S.D.**	**df**	**t**	**Sig.**
Pre-test/ before	17	8.24	1.751	16	- 4.747	0.000*
Post-test/ after	17	11.71	0.958			

*Statistically significant level at 0.05

Table 12 shown a comparison of student's knowledge of climate change, sustainable development, and sustainable agriculture before and after enrolled the program. Regarding the student's knowledge after enrolled the program. The evaluation of students' knowledge using 15 questions of pre-test and post-test for knowledge evaluation, it was found students' knowledge

was higher than before with a statistical significance level at 0.05.

Table 13 Level of student's skills of climate change, sustainable development and sustainable agriculture according before and after enrolled the program.

Level of knowledge	Before		After	
	Frequency (n=17)	Percentage (%)	Frequency (n=17)	Percentage (%)
Low	2	11.76	0	0
Moderate	4	23.53	0	0
High	11	64.71	17	100.00

Legend:

Scale	Score	Description
2.34-3.00	11-15	High
1.67-2.33	6-10	Moderate
1.00-1.66	1-5	Low

Table 13 shown the level of student's skills in climate change, sustainable development, and sustainable agriculture. According to the follow-up of students' skills using 15 questions of pre-test and post-test for skills evaluation, with 1-5 scores was low, 6-10 scores were moderate, and 11-15 scores were high. This study found that students were at a high level of their skills with a 100.00 percentage after enrolled and attaining the program.

Table 14 A comparison of student's skills of climate change, sustainable development and sustainable agriculture before and after enrolled the program.

Items	n	$\bar{x}$	S.D.	df	t	Sig.
Before	17	9.71	3.117	16	- 2.704	0.016*

After	17	14.70	0.469			

*Statistically significant level at 0.05

Table 14 shown a comparison of student's skills in climate change, sustainable development, and sustainable agriculture before and after enrolled the program. Regarding the student's skills after enrolled the program. The follow-up of students' skills using 15 questions of pre-test and post-test for skills evaluation, it was found students' skills after attaining the program was higher than before with a statistical significance level at 0.05.

Table 15 Students attitude of climate change, sustainable development and sustainable agriculture before and after enrolled the program.

Items	**Before**			**After**		
	Mean (n=17)	**S.D.**	**Description**	**Mean (n=17)**	**S.D.**	**Description**
I am alarmed about the reasons of climate change.	4.41	0.795	Agree	3.30	1.571	Moderate agree
If I come across information	4.58	0.507	Strongly agree	4.71	0.469	Strongly agree

Items	Before			After		
	Mean (n=17)	S.D.	Description	Mean (n=17)	S.D.	Description
about climate change, I will tend to look at it.						
I follow up climate change pollicis.	4.17	0.882	Agree	4.60	0.507	Strongly agree
I like to join climate crisis activities.	4.05	1.297	Agree	4.65	0.996	Strongly agree
I prefer to buy organic food.	4.64	0.492	Strongly agree	4.94	0.242	Strongly agree
Conserve biodiversity is import.	4.47	0.799		4.64	0.492	Strongly agree
I prefer to go local market.	4.58	0.618	Strongly agree	4.76	0.437	Strongly agree
No limitation for economic growth in the planet.	3.05	1.599	Moderate agree	4.94	0.242	Strongly agree
With economy growth, science and technology can solve all environmental problems.	2.94	1.596	Moderate agree	4.88	0.332	Strongly agree
I have responsibility on carbon emission in the planet.	4.41	1.000	Agree	4.35	0.242	Agree
Conserve	4.05	1.088	Agree	4.65	0.785	Strongly

Items	Before			After		
	Mean (n=17)	**S.D.**	**Description**	**Mean (n=17)**	**S.D.**	**Description**
ecosystem is more important than economy growth.						agree
I think natural damage can be tolerated for human welfare.	2.94	1.477	Moderate agree	4.35	0.996	Agree
I am worried about the consequences of food shortage on the planet.	3.82	1.421	Agree	4.90	0.321	Strongly agree
Increasing food self-sufficiency is very import.	4.52	0.799	Strongly agree	4.89	0.332	Strongly agree
Observing and dairy writing can increase farmer's skills	4.35	0.606	Agree	4.59	0.795	Strongly agree
Total	**4.07**	**0.465**	**Agree**	**4.65**	**0.342**	**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

Table 15 show the students attitude of climate change, sustainable development and sustainable agriculture before and after enrolled the program. The results found that overall, of students' attitude were strongly agree level of after enrolled the program with average mean of 4.65, and 12 items also were strongly agree level. Only, 2 items were agree level and 1 item was moderate agree level, after students attain a training were always participation of the climate change, sustainable development and sustainable agriculture with average mean of 4.50. In the considered individually, it was found that students were strongly agree as follow third order as follow: I prefer to buy organic food with mean of 4.94, No limitation for economic with mean of 4.94, and I am worried about the consequences of food shortage on the planet with 4.90, respectively.

Table 16 A comparison of student's attitude of climate change, sustainable development and sustainable agriculture before and after enrolled the program.

Items	**n**	$\bar{x}$	**S.D.**	**df**	**t**	**Sig.**
Before	17	4.07	0.465	16	-3.949	0.001*
After	17	4.65	0.342			

*Statistically significant level at 0.05

Table 16 shown a comparison of student's attitude of climate change, sustainable development and sustainable agriculture before and after enrolled the program. Regarding the student's attitude after enrolled the program. The follow-up of students' attitude using 15 questions of pre-test and post-test for attitude evaluation, it was found students' attitude after attaining the program was higher than before with a statistical significance level at 0.05.

Table 17 Students participation of climate change, sustainable development and sustainable agriculture

Items	Pre-test			Pos-test		
	Mean (n=17)	S.D.	Description	Mean (n=17)	S.D.	Description
I am ready to reduce my energy usage to tackle climate change.	4.17	0.727	Very often	4.12	0.781	Very often
I prefer walking than taking automobile's in order to mitigate climate change.	3.64	0.931	Very often	4.41	0.870	Very often
I prefer to use renewable energy sources then fossil fuel to resolve fine dust in the atmosphere.	3.76	1.200	Very often	4.29	0.771	Very often
I prefer vegetarian diet in order to mitigate climate change.	3.17	1.185	Sometimes	4.53	0.624	Always
I like to rase issue of climate change and sustainable development in working place.	3.88	0.781	Very often	4.47	0.717	Very often
I am not use chemical surfactant for water	2.82	1.550	Sometimes	4.59	0.618	Always

Items	Pre-test			Pos-test		
	Mean (n=17)	**S.D.**	**Description**	**Mean (n=17)**	**S.D.**	**Description**
conservation.						
Use water wisely for the most benefit.	4.52	0.717	Always	4.88	0.332	Always
I prefer Good Agricultural Practices (GAP) product.	3.76	1.064	Very often	4.94	0.242	Always
Grow own food with organic agriculture method.	4.41	1.032	Very often	4.41	0.618	Very often
Put priority to buy local food in local market.	3.94	0.712	Very often	4.53	0.624	Always
Practice waste segregation.	3.76	0.899	Very often	4.47	0.717	Very often
Purchase environmentally friendly products.	2.64	0.903	Sometimes	4.65	0.606	Always
I belong to one of cooperatives in my country.	2.64	1.903	Sometimes	3.94	1.028	Very often
I am active in an environmental organization.	3.11	1.536	Sometimes	4.47	0.717	Very often
I prefer to become a minimalist.	3.70	1.212	Very often	4.35	0.701	Very often
Over all	**3.72**	**0.632**	**Very often**	**4.50**	**0.421**	**Always**

Legend:

Scale	Score	Description
4.50-5.00	5	Always
3.50-4.49	4	Very often
2.50-3.49	3	Sometimes
1.50-2.49	2	Very seldom
1.00-1.49	1	Never

Table 17 show the students participation of climate change, sustainable development and sustainable agriculture, results found that overall, after students attain a training were always participation of the climate change, sustainable development and sustainable agriculture with average mean of 4.50. In the considered individually, it was found that students were always participation on prefer Good Agricultural Practices (GAP) product with average mean of 4.94. The level of participation of students was very often in before attaining the program participation of the climate change, sustainable development and sustainable agriculture with average mean of 3.72.

Table 18 A comparison of student's participation of climate change, sustainable development and sustainable agriculture before and after enrolled the program.

Items	**n**	$\bar{x}$	**S.D.**	**df**	**t**	**Sig.**
Before	17	3.72	0.632	16	-7.545	0.000*
After	17	4.47	0.421			

*Statistically significant level at 0.05

Table 18 shown a comparison of student's participation of climate change, sustainable development and sustainable

agriculture before and after enrolled the program. Regarding the student's participation after enrolled the program. The follow-up of students' participation using 15 questions of pre-test and post-test for participation evaluation, it was found students' participation after attaining the program was higher than before with a statistical significance level at 0.05.

4.3.4 Effect on Student Centered education.

Myint et al., (2020) mention that student-centered learning intends to create student self-directed learning by taking responsibility for their learning process. The heart of student-centered approach is skills and practices that allow lifelong learning and independent problem solving.

The curriculum follows students understanding of lecture. Group discussion and practice followed after all concepts. And students must submit the report of what they have learned and expectation from the class. These processes helped observe students understanding of lecture and educator could reflected on curriculum. These are student's final reflection from 48 hours of the classes. They shared what they've learn and plan after graduation.

I appreciate more working with others, it's something I actually want to master. I used to think that I don't need much help because I can do things on my own. But here, we are really doing things together, we start together and finish together. (Philippines)

Reflecting on the day that was, more than the learning from the Professor, it is also learning from the experience of my colleagues here is also of the equal importance. While the burden of the work seemed to heavy at first, I was surprised at how things became easier and lighter, as people joined hands, saw they're and the sweat of others on their foreheads (as the Canaan slogan implies). As if the excitement in the morning was not enough, equally fun and learning activities happened in the

afternoon. As we prepared needed materials and ingredients for our group projects, the purpose of each group was to finish and deliver what was expected. Each person had his or her own task to perform and responsibilities to take on. It became automatic in all of us to do whatever we had to do, and each of us complemented each other. It was more than a group activity. It became a family affair! While we were happy with the outcomes of our group, what I enjoyed and cherished the most was the whole process---coming together to make our chosen product and at the same time care for one another, even for the other groups who needed something that we had. People were just lifting each other up, and nobody was left behind even in terms of cleaning the mess, washing the utensils, and others. (Philippines)

The course will help me in many things when I go back to my country especially as concerns the production and use of liquid organic manure, how to measure my land before planting, how to consider geographic orientation before planting, how to do mulching, how to prepare Savon, shampoo, and make also how to make use of wild plants around my habitat. (Camerron)

The 2nd small part of our last class was in the field. At the end of the day, I was tired and reluctant to go to the field but once I breathed the fresh air I remembered again how nature release us. I am surprised. I will listen to nature more frequently that is what I want to do after this class. It does not matter how tired you are but work in the field stresses out people. (Azerbaijan)

To days lesson ignite me to think about what the activities I did previously and its impact to the environment. From now I want to optimize my career based on the principle of environment. during in group discussion have experienced that every individual has experience directly or indirectly when we give a chance and listen to them. The other issue what I have learned

is even though we are coming from different world, experience, and department we have stake to the environment. The main challenge commonly faced by developing country is transforming the knowledge of environmental protection into implementation phase. even if, there are objectively measurable indicators to take actions on the environmental pollution like environmental management system and cleaner production for factories. This is because of poverty, corruption, and others related factors. In addition to environmental issue, I have experienced how to change communities feeding habit. Ethiopia is the country having different Agro-ecological zone which is important for cultivating number plants but due to limited habit that is dependence on some specific plant specially crop and pulses we expose to risk of poverty time to time. So, this course gives me a chance to promote wild plant to be a part of our dish. Therefore, now I am thinking to change my feeding habits. Finally, I would like to thank for you that your sharing experience that what you know and how you are living what you know. I know it is so difficult, but you did it. (Ethiopia)

The class generally changed my view towards farming and I developed interest to implement the ideas in my home country and embrace organic agriculture. (Kenya)

This session gave me new perspectives. It provided me new outlook on how to try, promote, and advocate for sustainable agriculture one crop, one technique, and one day at a time. (Philippines)

Some policies have been crafted concerning harvest and post-harvest but what is important is to participate in the conservation of sustainable agriculture and the promotion of permaculture and agroforestry as well. I experienced to learn the ways through which farming can be done in the cities. In addition to that I learned how the seedling (seeds) maize and

beans are planted. Allow me to highlight my sincere gratitude towards the time knowledge and experience that we gained from you in different aspects for example the use of wild plants in generating medicines, food and other products like soaps etc. Through this class I have learned the ways of harvesting Irish potatoes and the ways through which Agriculture should be well emphasized. Mostly in some countries like mine farming is taken as a neglected sector which is reserved for illiterate or other people who do not have other option. But After learning the ways that farming of different products can be made in order to be productive, I believe in mindset transformation that I can pray my part so that I can show a positive model to my society. (Rwanda)

Who is responsible for greater damage on the environment? How much and who should compensate for environmental degradation and consequences of climatic change? Should less advanced countries forego industrialization to conserve the environment? All these questions remain unanswered. (Uganda)

I have studied from you not only the knowledge but also teaching method. I can feel your patient and enthusiasm during our class. From that, I know I should improve myself to be better lecturer. (Vietnam)

First of all, it is very new topic to me, as all the time we hear about its reduction and less waste of other hazardous gas but how to measure its reduction level is not talked much…Nowadays unfortunately, more or less everybody should be an environmentalist without concerning about his background or the job. … "we do not have another home" except this planet. If we consider a little, maybe our problems will not be solved but at least the situation could get better. (Azerbaijan)

The lecture and activities yesterday were very importance for me, especially the topic talk about carbon emission and the sharing ideas from each group presented. It made me know more about the value of environment and how to apply those knowledges to country such as awareness to the students every level knows how importance of environment and how to take care. The technique of sustainable agriculture farming also good, now I can introduce what I have learned to others who interested in farming. (Laos)

I think the questions asked earlier from the presentations are important and are valid. Though I think, the groups overlooked some important details which may also be understandable due to time constraints, like the "how much will be produced" and 'will the produce be sufficient for the users". These questions alone say a lot about how we could have planned for our farms. (Philippines)

4.3.5 Interrelationship with effect of curriculum with host training center

CLGC's belongs to Canaan Farmers School (CFS). CFS aims to produce model communities of poverty eradication based on mindset transformation and to raise leaders who would practice and live the changed mindset. This evolved into a social movement, encompassing every aspect of life, especially through practical vocational training. It was also adapted as the role model for New Village Movement education.

During summer program all the participants must followed Canaan's four domains: mindset training, lifestyle training, practical training and field trips and theoretical training. CGLC has three core values: work, service and scarified and three vision: From barren land to fertile soil, From dependence to self-sufficiency and from polluted planet to green earth. With this principle's lifestyle in CGLC are strictly ingrained. Therefore, the curriculum of Appropriate agriculture and

practice were stick together with CGLC's principle. There are no other explains needed for it.

Figure 9 Students have their own duty while stay in CGLC. This is one of the practices for self-sufficiency.

CHAPTER 5
CONCLUSION, DISCUSSION AND RECOMMENDATION

This study seeks to sustainable agriculture curriculum for international cooperate training program as practically accepted under climate change era. This study was evaluated and

developed with CGLC and the participants of Yonsei-Canaan Summer Program participants.

For the curriculum development researcher collected two types of data. First data was collected right after the class from 2016 to 2019. Second data gathered from Yonsei- Canaan summer program alumni who answered the questionnaire. Curriculum developed after analyzed collected data. The implementation of developed curriculum exam with enrolled with Yonsei-Canaan Summer Program in 2020 and adjusted with student's pretest and reflection.

The Population of this research are 86 students with 33 different nationalities. Sample of this research is 17 students with 15 different nationalities. Most of the population are government officer or related government's work. However, the data is too small because of COVID 19 pandemics.

5.1 Conclusions

CGLC evaluate lectures every year and most of the students give high score in five evaluate list. Among five evaluate list students give very high score with the answer of "relevant to the program objectives". And the rest of four five high score like 1) lecture meet the needs of my community, 2) lecture can be applied to my community, 3) lecture can contribute to economic development in my community, and last 4) if I apply knowledge and skill from the lecture, it can be possible to sustain economic growth.

Alumni students, suggest more filed work and practice not only rural but urban. Due to students are belongs to government or related work, they used to live in the urban area.

And at the beginning of the lecture, students think of sustainable agriculture as partially but when they revise their thought and analyze their budget and self-sufficiency, start to think of sustainable agriculture in systemically and holistically. Based on student's reflection, above activities are affected. Lee

and Chang (1993) found their research that indicated the environmental education strategy through personalization of environment was an effective strategy to change the awareness, attitude and behavior toward the environment compared with a traditional teaching strategy.

Implemented Curriculum improve student's environmental ability such as awareness, knowledge, skill, attitude and participation are increased. And student kept say how to implement this curriculum in their country. Students centered education

Students centered curriculum also affected to increase student's environmental ability. CGLC, the training center's philosophy also affected because every work in the center must be in a residence. Through this activity's students have chance to learn how to live independently

5.2 Discussion

5.2.1. Appropriate international development cooperation training curriculum

The Republic of Korea has achieved remarkable success in combining rapid economic growth with significant poverty reduction (The world bank). Many of the people who come to Korea to study, asked about rapid development. However, the reduction in agricultural workforce among advanced countries. Nonetheless, Korea had experienced changes in its industrial structure at a speed that had been two to five times quicker than those of advanced countries. And the self-sufficiency rate of grains as a whole is merely 23.1% as of 2013.

Being COVID-19 pandemic globalization move into localization especially there are lot of climate crisis evidence as well. Increase self-sufficient capacity needed. Therefore, the main focus of this curriculum is increase self-sufficient through sustainable agricultural method. Furthermore, UN report say Small-Scale Organic Farming only way to food the world.

There were big caps between people' greed and reality. When people came to Korea to study, they would like to learn fast development but can't see the behind of fast development. Furthermore, climate crisis phenomena are seen more often.

Based on climate crisis UN, EU and US alarmed and suggest sustainable agriculture as well as newdeal like "fork to table". And the international cooperative development curriculum must contain this situation. And let students to criticize climate crisis and their own live to build up sustainable agriculture society. From the UN education for sustainable development sourcebook suggest that have become part of the global sustainability dialogue.

Suitable international development cooperation training curriculum need to consist those researchers' questions and alumni student's reflection and solution of filed problem. The curriculum followed place-based learning, so that the main lecture consists with common information, filed practice focus on local environment and group workshop focus build up in each domain with good communication. Students class reflection shows how curriculum affects.

5.2.2. How we can urges limiting global warming to 1.5°C above pre-industrial levels and related global greenhouse gas emission that International Panel of Climate Change (IPCC) suggested? And curriculum development affects student's literacy of global task on Climate change and sustainable development?

The student's awareness of climate change, sustainable development and sustainable agriculture according before and after enrolled the program, the data found that the percentage of students answer of 15 questions were increase of right answer with 100 percent of 6 awareness questions (Climate change is just a natural fluctuation in earth's temperature, Overuse of our natural resources is a serious threat for the health and welfare of generations, I know what is carbon budget and green new deal,

Wholistic approach needed for sustainable agriculture, I know what is the meaning of permaculture design, and Farming is needed even in city), it mean that there were more aware about the content of the program. Robert (2017) addressed in "what is Climate change education." That Climate change should be understood as a complex social as well as scientific issue characterized by uncertain and context-specific knowledge.

In the developed curriculum use educational methodologies such as 1) Golden circle method to assess student's awareness, 2) Budget analysis with self-sufficiency and dependency to know the interrelationship, 3) Make sustainable cloth production to think systemically, 4) Make roadmap to cut the CO2 emission for the participation. And one of the students reflected as below:

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.

5.2.3. Is training curriculum can approach to objectives of Environmental Education? Through student centered curriculum design support increase student's capacity?

The result of the pre and posttest shows that all of the environmental education component improved from before the program to after the program. The result of pre and posttest shows that student's awareness, knowledge, skill, attitude and participation, all of five environmental ability improved. Julie

and Martha (2000) explain that environmental literacy depends on a personal commitment and motivation to help ensure environmental quality and quality of life. This commitment and motivation often begin with an awareness of one's immediate surroundings. Environmental educators can help foster learners' innate curiosity and enthusiasm, providing them with continuing opportunities to explore their environment and engaging them in direct discovery of the world around them. As learners develop and apply analysis and action skills, as they have the opportunity to make their own decisions and think more critically about their choices and as they hear stories of success, they are learning that what they do individually and in groups can make a difference.

5.2.4. Through international development cooperation training program make students to design sustainable agriculture development under climate change era?

When students 1) understand interrelationship between producer and consumer, 2) recognize climate crisis situation and 3) caused of the environmental problem, students participation increased. As IPCC report addressed that climate change influenced by human activities. Based on student's reflection, through international development training program make student to design sustainable agriculture under climate change era.

Agricultural activity as well as agricultural policy cannot be realized individually. It needs to integrate the other fields in order to obtain sustainability. We worked on the project as a group for making sustainable cloth production by considering seven important principles of permaculture. ... Though it is very difficult to satisfy seven principles in one project but even to be taken into consideration 3-5 principles by every producer we will not face with these challenges today as a world. Unconscious consumerism is the biggest problem of each country as unconscious production. We should learn as a

consumer to become more careful about each product we buy. I want to be part of change. … I immediately thought that when I go back to my country, I will definitely make a conference or workshop making awareness about existence of this approach. Since I am working for Ministry of Agriculture the employees are not aware of this concept.

Is training curriculum affects host training center's philosophy?

Yulius (2020) explain the philosophy has always been the foundation in various fields of life, including in the world of education. Thus, education is nothing but philosophical speculation of human life. It is in this interest that education is born as a process of teaching or transforming the values of living models on the one hand and increasing the values of living models on the other through the design of an educational curriculum.

CGLC as specialized institute for global leadership training of Canaan Farmers School in Korea. CGLC objectives are eradicate poverty and attain sustainable development through change the mindset of rural leaders, who, in tur, would spearhead the change of mindsets in their communities. CGLC always Thank of "I" and enlarged into family, community, nation and world. During Yonsei-Canaan summer program CGLC open Cooperative practices. The basic concept of 2 different subject has same core. Besides CGLC curriculum is not only in the class but also in the regulations. Whoever joined the class, there are no exception of cleansing, morning exercise and work. And the regulations is rigorously applied. Once students joined this class, they are disciplined. Environmental education thinks about planet but start to participate from one person who aware of environmental problems. Consequently, if training host training center has same philosophy, the curriculum creates synergy.

5.3 Recommendations

The following recommendations are presented based on the results and conclusion

The international cooperative training program need holistic approach to design sustainable development. And adjusted by student's reflection.

Based on the result of the research, this curriculum can be adapted in other training center, university for transition of life not only personal practice, but also participate social system change.

Under the climate crisis era, the contends of curriculum needed improve such as 1) carbon neutral agriculture, 2) processing and biodegradable package materials and 3) proper storage system.

Follow up Yonsei-Canaan alumni's practice in their nation and accumulate practical data for others. And exchange idea and share difficulty to keep partnership for achieve SDGs.

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APPENDICES

Appendix A: Letter to Yonsei-Canaan Graduates from 2016 to 2019

Dear Yonsei-Canaan Graduates.

Greeting from Korea. I wish you are fine as you received my email. Furthermore, your family, work and countries well.

This is Heejung Kim who had lecture on your summer session of “Appropriate Farming Technology and Practices” in Canaan Global Leadership Center.

Last 2014, The International Panel on Climate Change (IPCC) published that Human influence on the climate system is clear, and recent anthropogenic emission of greenhouse gases are the highest in history. And October, 2018, IPCC adopted special report urges the world that limiting global warming to 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and to eradicate poverty (IPCC, 2019).

For this reason, I try hard to give you a lecture on sustainable agricultural as considered as planet environment. In order to do that I emphasize climate change and permaculture

design during my lecture. However, most of you are belong to government, and your government may focus on development which count on money making in short time. So that I am afraid that how you can implement on your field from my lecture. And I wonder how can I improve my lecture for real situation.

If you give me a feedback in your field, I can find out how to improve. And to exteriorize of this work, I am going to write my Ph.D. dissertation with this curriculum development. Sametime your junior will be had improved lectures. Furthermore, I wish to fellow your work in your country after I finished with research.

Would you help me to do that?

Once again, this survey will be used for my Ph.D. dissertation writing titled “Curriculum Development for Sustainable Development in International Development Cooperation Training Program”. Please accept my sincere thanks to taking the time to provide such a valued information. I am looking forward to hear from you soon.

With love

Heejung Kim

Appendix B: Questionnaire of Yonsei-Canaan Graduates from 2016 to 2019

Student's information

Part 1. General Information

1. Name/Country:
2. Age/Sex:
3. Graduate year:
4. Occupation/Position:
5. Address and contact number

Table 1. Curriculum of "Appropriate Farming Technology and Practice "briefly.

Chapter	Context
1	Introduction to Appropriate Farming Technology and Practice Climate change and sustainable agriculture.
2	Permaculture Design (lecture in class room and field work) ➢ Ethics and principles ➢ Appropriate technology ➢ Agroforestry

	➢ Companion plant ➢ Post-harvest ➢ Zoning (community) ➢ Marketing
3	How we can to group project?
4	Design project in group
5	Present group project

Part II. Typical information

1. Have you ever implemented what you learned from "Appropriate Farming Technology and Practices" class in your summer session in Canaan Global Leadership Center?
   1-1. If yes, can you please explain what was it?
   1-2. If not, have you tried? What kind of obstacle you faced on?
   1-3. If not, not even tried? Can you please explain why?
2. Are any agricultural skills you need badly, but you didn't learn? Can you explain what is that?

3. Do you have any suggestion to add more curriculum context in “Appropriate Farming Technology and Practice” to solve your problems and obstacles?

*If you added pictures to support your answer, it would be helpful to understand. Thanks.

Appendix C: Respond from Yonsei-Canaan Graduates

Part 1. General Information of students

	Name/Country	Age/ Gender	Graduate year	Occupation/Position
1.	Ianja Raolisoa / Madagascar	29 / Female	2016	Responsible Monitoring and evaluation
2	Akuila Sovanivalu/ Fiji	39/Male	2016	Human Rights Officer- United Nation Human Rights Office
3	M.D.R. Prasad/ Sri lanka	44/Male	2016	Deputy Director (Planning)
4	Pascal Zacharia Ndnuguru/ Tanzania	47/ Male	2017	Community Development Officer
5	Yazilatun Nadhiyah/Indonesia	28/Female	2017	Civil Servant/Analyst Public Complaint
6	Rodavil Jacama/Philippines	33/Female	2017	Local Government employee/ Administrative Officer 3
7	Seydina Aboubakry Cisse. Senegal	42/Male	2017	Educator/Ministry of Education
8	Abdoulaye/Cameroon	Male	2018	Support Staff
9	Agha Mohammad Rohmal / Afghanistan	33 / Male	2018	Chancellor for Admin and Financial Affairs

10	Nemesis Myers/Nicaragua	31/ Female	2018	Currently not working for the Government but as a professor for youth developmental projects and also professor of project management.
11	Rabindra Prasad Yadav/ Nepal	35/male	2018	Government Job/ Section Officer
12	Ayana Jamnia G. Maranda/Philippines	24/Female	2019	Development Work
13	Elizabeth Sarfo/Ghana	33/Female	2019	Cooperative Officer
14	Mbabazi Fiona/Rwanda	29/Female	2019	Social and Environment safeguards specialist

Part II. Typical information

1. **Have you ever implemented what you learned from "Appropriate Farming Technology and Practices" class in your summer session in Canaan Global Leadership Center? If yes, can you please explain what was it?**

Ianja Raolisoa / Madagascar (2016)

- No. I couldn't try because I moved to another department, so there wasn't any chance to implement it.

Akuila/ Fiji (2016)

- Yes. I've used this for basic family and community food security where we can enjoy fresh products from the farm and backyard garden.

M.D.R. Prasad/Sri Lanka (2016)

- I have not practiced all the learning methods that I learned from Canaan. However, I only practiced making a permaculture design and slightly practiced some vegetable farming. I made a permaculture design for my garden. I used the technics that I learned from the lecture in Canaan and also referred to some information through google. I tried to implement the lesson learnings during the period of COVID-19 vacation this year (March to May). Then, I have started some vegetable farming and However, it was not succeeded as I expected due to the lack of supervision after restating the office work. In general, I do not involve in agriculture for my office work. Usually, I involve in all steps of the project Cycle (project management) for fulfilling my office task. However, I got plenty of knowledge on agriculture during your lecture, unfortunately, I have not had much time to implement the learning points.

Pascal Zacharia Ndnuguru/ Tanzania (2017)

- Yes. I shared a skill learned in Canaan about application of appropriate technology in corn production value chain whereby farmers have been capacitated on postharvest technology and corn marketing at national and cross border markets.

Yazilatun Nadhiyah/Indonesia (2017)

- Not yet. I tried. I am living in rented house in capital city so it's kind of hard to do farming, no land available. Also, I work until late at office and have a lot of business trip so time management to taking care of plant is very hard. I do farming for hobbies for now, I make compos from my leftover food and make mini garden with easy plant that not required a lot of treatment.

Rodavil Jacama, Philippines (2017)

- I tried, but only in our backyard. Not for very long also because of work and new born baby. Was not able to manage farming.

Seydina Aboubakry Cisse/ Senegal (2017)

- Not after my Canaan training but I had a project for some community students to involve in income generating activities in gardening to grow different types of vegetables. After Canaan I

am more on helping community women to design their project and find strategies to boost their businesses.

Abdoulaye/Cameroon (2018):

- Yes. I am working with farmers, on how to make bio fertilizer 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 on food. I have initiated Neem seed oil project: by producing neem seed oil and cake, people will plan more three and protect them because, it became their sources of income (the idea, it is to match income growth and environment protection). Also, neem cake can be used as anti-nematode and animal food.

Agha Mohammad Rohmal /Afghanistan (2018):

- Not yet. Actually, the men power in the field of management/leadership is more needed in the situation/circumstances of Afghanistan, so that I was hired for such a busy position in the field of management. But still I'm engaged with formers for forming in the campus of the university I work.

Nemesis Myers/Nicaragua (2018)

- Yes. I have planted a variety of seeds in a 25*25 Mt land my family owns.

Rabindra Prasad Yadav/ Nepal (2018)

- Yes. I have made snail garden in my office quarter garden and now growing some vegetables like brinjal and chillies.

Ayana Jamnia G. Maranda/Philippines (2019)

- Yes, the implementation is mainly focused on the area of re-echoing that was done in a learning exchange and sharing of best practices. As part of the development work force and coming back to the Philippines with my learning in South Korea, the earnest approach in sharing knowledge is to re-echo through workshop and lecture series to be followed by grant/seed fund approaches that the community can apply and implement their proposed project wherein the lecture on appropriate farming technology and practices are encapsulated.

Elizabeth/Ghana (2019)

- Not yet. I have been transferred to the office with management responsibilities. So practically, I've not been able to interact with the farmer groups. But in due time, I plan to have time to organize meetings with farmer groups and share my experience with them.

Fiona/ Rwanda (2019)

- I tried companion planting in the backyard of my home (Kitchen garden). I wanted to grow many crops in one area while trying to avoid the use of pesticides and insecticides.

2. Are any agricultural skills you need badly, but you didn't learn? Can you explain what is that?

Ianja Raolisoa / Madagascar (2016)

- I think, I could learn more about contract agricultural farming skills. As in a developing country, it one of the way to develop with some investors and we need to learn about it to understand the systems.

Akuila/ Fiji (2016)

- I feel that Agribusiness and hybrid business model such as cooperative and social enterprise should be considered taught to allow participants to have a more business approach to the technical farming skills that they learn from Canaan Leadership center.

M.D.R. Prasad/Sri Lanka (2016)

- In general, I do not involve in agriculture for my office work. Usually, I involve in all steps of the project Cycle (project management) for fulfilling my office task. However, I got plenty of knowledge on agriculture during your lecture, unfortunately, I have not had much time to implement the learning points.

Pascal Zacharia Ndnuguru/ Tanzania (2017)

- In Tanzania farmers face difficulties how to practice fair trade business because of cumbersome International market regulations. Also digital crop marketing still not yet applied, therefore, I badly need to have access to these two basic training packages to boost rural farmers in their areas of operations.

Yazilatun Nadhiyah/Indonesia (2017)

- Yes, I think we also need to learn how to plant in rural area, like hydroponic. Or any skill that can help people with limited land, they can still do farming.

Rodavil Jacama, Philippines (2017)

- To be honest, we did not have much time to apply what we learn during lecture in our stay in Canaan… We were only able to prepare the land, but not able to monitor and harvest. Also, I

live in the urban area where there is not much land to do farming.

Seydina Aboubakry Cisse/ Senegal (2017)

- Well, I am not of an agricultural background but I measure its importance to eradicate poverty that's why I combine it in my activities to empower communities. I would love to learn more on natural fertilizers free of any chemicals.

Abdoulaye/Cameroon (2018):

- I would like to learn more about irrigation or how to keep longer moisture in the soil. I found there are organic hydrogel that can absorbed 300 times water and can keep moisture for long time. In this part of the country, water management for farmers is a challenge.

Agha Mohammad Rohmal/Afghanistan (2018):

- For now, it is enough for me. I will let you know if there is any other information I need.

Nemesis Myers/Nicaragua (2018)

- More information was needed on how to make and use natural fertilizers.

Rabindra Prasad Yadav/ Nepal (2018)

- I was also interested to make organic manure and pesticides to prevent from pests which is less harmful to human health and also soil.

Ayana Jamnia G. Maranda/Philippines (2019)

- Although I have no deeper engagement of agriculture, I wanted to learn more about germinating seeds and what seeds or type of plants/harvest that are adept to grow in certain conditions. As a development worker, we often involved ourselves in supporting livelihood activities for the community. Having enough land but limited access and knowledge to appropriate farming technology and to start with the basics, I wished to have learned more on that so when I will be drafting programs and project proposal; a deeper understanding will be involved and applied to it.

Elizabeth/Ghana (2019)

- For now, what I had is enough. Will let you know if there is any other information I need.

Fiona/ Rwanda (2019)

- Soil health and soil testing.

3. Do you have any suggestion to add more curriculum context in "Appropriate Farming Technology and Practice" to solve your problems and obstacles?

Ianja Raolisoa/ Madagascar (2016)

- Permaculture use more intellectual resources than physical so we need to develop more training about because it can help to face the climate change which becomes very important nowadays.

Akuila/ Fiji (2016)

- In the curriculum it would be best to include designing and managing appropriate farming technology and practice with the desire that this is a TOT that allows participants to further teach community and training centre based training.

M.D.R. Prasad/Sri Lanka (2016)

- This is to request for adding some lectures regarding the "COMMERCIAL AGRICULTURE FARMING such as wheat, maize, tea, coffee, sugarcane, cashew, rubber, banana, cotton…etc.

Pascal Zacharia Ndnuguru/ Tanzania (2017)

- For about 20 years ago Tanzania we used Crotalaria ochroleuca plants as potential fertilizers to rejuvinate the land but with time the application of artificial fertilizers have dragged down the soil fertility. Therefore, if the use of Crotalaria ochroleuca plants shall be emphasized more organic crops will be harvested and win the markets.

Yazilatun Nadhiyah/Indonesia (2017)

- Yes, hydroponic and rural farming.

Rodavil Jacama, Philippines (2017)

- It would also be nice to learn urban farming. When there is no land to farm how appropriate farming technology and practice can be use in the urban areas.

Seydina Aboubakry Cisse/ Senegal (2017)

- I would appreciate to see next graduates to stay longer at Canaan to learn more on making Fertilizers and also instruct them on fair trade and circular economy.

Abdoulaye/Cameroon (2018):

- I suggest that: how to implement their idea without government by being volunteer in their community. Also, how to keep bio fertilizer for long time, in hot environment it is difficult.

Agha Mohammad Rohmal/Afghanistan (2018):

- I think in case of possibilities we should focus more on implementing power of such curriculum in different countries for getting output rather than internal changes, otherwise it is good for me.

Nemesis Myers/Nicaragua (2018)

- Maybe if you add in the types of land appropriate for the type of seeds also add in how long does it take for you to harvest once you've planted etc.

Rabindra Prasad Yadav/ Nepal (2018)

- I think we should also learn and practice about manure preparation and natural pesticides preparation at Canaan course.

Ayana Jamnia G. Maranda/Philippines (2019)

- Considering the diversity of the students in the class, I would suggest the following: 1) Students that belong to one country may be grouped accordingly to prepare of needs assessment or a

select area/community focused to improve on appropriate farming focused practices, 2) The focus area or community will be the output based approach in the end of the class in tailor fitting the project required; in this way there is a greater possibility of application based/output from the class upon returning to their respective countries/areas of responsibility.

Elizabeth/Ghana (2019)

- I think we should have more practical's on urban agriculture and permaculture to enhance and improve our understanding on it. Thank you.

Fiona/ Rwanda (2019)

- I suggest a lesson on horticulture farming. Specifically, on a small area using cost effective technologies.

<u>Part III</u>. Student's activities in their home country.
Akuila Sovanivaly/ Fiji (2016)

Before	After- planting of sweet potatoes and cassava
	
	
	

Community Farming

Recently I spearheaded an initiative where food was mobilized from farmers to those that were in lockdown area during the COVID-19 situation.

Collection of farm food from the community

Exchange at the boarder at the lockdown area

Distribution of food in the lockdown area

Yazilatun Nadhiyah/ Indonesia (2017)

The first time I just doesn’t know how to managed my food tras h. I couldn’t apply your suggestion to make worm because I stay in rented house and sharing some public facility with other frien ds. I begin to just collect my leftover food in bucket and start to mixing it with soil.

My first plant was sansevieria, they say it’s good for clean up the air and easy to grow.

Later I found myself like to plant in coffee cup.

Abdoulaye Barkindo Sali/ Cameroon (2018)

Tithonia leaves (Tithonia Diversifolia)

Appendix D: Pre-test for Appropriate Farming Technology and Practice

Name		Age	
Nationality		Gender	

Awareness of climate change, sustainable development and sustainable agriculture item

	Items	Yes	No
1	Climate change is just a natural fluctuation in earth's temperature.		
2	Human activities have no significant impact on global temperature.		
3	Overuse of our natural resources is a serious threat for the health and welfare of generations.		
4	I know what is carbon budget and green new deal.		
5	Environmental balance is one basis for sustainable agricultural Practices.		
6	SDG framework does not distinguish between developed and developing Nations.		
7	Reduce food miles can support carbon reduction.		

8	Plastic waste took more than 400 years to decomposed.		
9	Plastic food package became world problem		
10	Forest absorbs carbon dioxide from the atmosphere; however, conserve forest is very important.		
11	Monoculture is better than polyculture		
12	Wholistic approach needed for sustainable agriculture		
13	I know what is the meaning of permaculture design		
14	Farming is needed even in city		
15	In a cooperative, the members are the shareholders, not outside investors. And one member, one vote system.		

Knowledge of climate change, sustainable development and sustainable agriculture

Items		Yes	No
1	An IPCC special report on the impacts of global warming of 2.0c above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the treat of climate change, sustainable development and efforts to eradicate poverty.		
2	EU countries now support 2050 carbon neutrality goal.		
3	SDG no.2 is end hunger. It means achieve food security and improved nutrition by 2050.		
4	Sustainable development ties together capacity of natural systems with the social, political, and economic challenges faced by humanity.		
5	Agriculture and climate change are deeply intertwined.		
6	UN report says small scale organic farming only way to feed the world.		
7	An advantage of sustainable agricultural practices is reduction in the use of chemical fertilizers.		
8	Farmers in sustainable agriculture lives more in harmony with nature.		
9	GMO help prevent food shortage.		

10	Agroforestry has varied benefits including increase biodiversity and reduced erosion.		
11	Companion planting helps crop cultivate.		
12	Concept of appropriate technology is small, local, and self-reliant.		
13	Number of Rooftop garden increase in the world.		
14	Plastic package can replace by biodegrade package		
15	Local food reduces food mileage		

Attitude of climate change, sustainable development and sustainable agriculture

	Items	**Strongly disagree**	**disagree**	**Moderate agree**	**Agree**	**Strongly agree**
1	I am alarmed about the reasons of climate change.					
2	If I come across information about climate change, I will tend to look at it.					
3	I follow up climate change pollicis.					
4	I like to join climate crisis activities.					
5	I prefer to buy organic food.					
6	Conserve biodiversity is import.					

7	I prefer to go local market.					
8	No limitation for economic growth in the planet.					
9	With economy growth, science and technology can solve all environmental problems.					
10	I have responsibility on carbon emission in the planet.					
11	Conserve ecosystem is more important than economy growth.					
12	I think natural damage can be tolerated for human welfare.					
13	I am worried about the consequences of food shortage on the planet.					
14	Increasing food self-sufficiency is very import.					
15	Observing and dairy writing can increase farmer's skills					

Skills of climate change, sustainable development and sustainable agriculture

Items		Yes	No
1	I can calculate carbon foot print.		
2	I know how to conserve energy.		
3	I can explain sustainable development goals.		
4	I can make organic farm.		
5	I know how to make organic fertilizer.		
6	I know how to segregate waste.		
7.	I know about water management.		
8	I can find problem in the farm with observation.		
9	I know how to use wild-plants.		
10	I know how to preserve food for long storage.		
11	I know how to use SNS marketing.		
12	I know how to set up a co-op.		
13	I know how to rase environmental issues in group.		
14	I prefer to do tuning when community have conflict.		
15	I like to make network.		

Participation of climate change, sustainable development and sustainable agriculture

	Items	Never	Very seldom	Some times	Very often	always
1	I am ready to reduce my energy usage to tackle climate change.					
2	I prefer walking than taking automobile's in order to mitigate climate change.					
3	I prefer to use renewable energy sources then fossil fuel to resolve fine dust in the atmosphere.					
4	I prefer vegetarian diet in order to mitigate climate change.					
5	I like to rase issue of climate change and sustainable development in working place.					
6	I am not use chemical surfactant for water conservation.					
7	Use water wisely for the most benefit.					
8	I prefer Good Agricultural Practices (GAP) product.					
9	Grow own food with organic agriculture method.					

10	Put priority to buy local food in local market.					
11	Practice waste segregation.					
12	Purchase environmentally friendly products.					
13	I belong to one of cooperatives in my country.					
14	I am active in an environmental organization.					
15	I prefer to become a minimalist.					

Appendix E: Post-test for Appropriate Farming Technology and Practice

Name		Age	
Nationality		Gender	

Awareness of climate change, sustainable development and sustainable agriculture item

	Items	Yes	No
1	Climate change affects our common lifetime.		
2	Carbon budget is a simplified way to measure the additional emissions that can enter the atmosphere to stay below 1.5C, or any other temperature limit.		
3	Sustainable consuming is important as much as sustainable producing to achieve sustainable agriculture		
4	Planting trees are one of the solutions to climate change.		
5	Practitioners of sustainable agriculture seek to integrate three main objectives into their work: a healthy environment, economic profitability, and social and economic equity.		
6	When we purchase stuff, cheapest is the best selection.		
7	If you make farm, just follow what farmer's do.		

8	Wild plants are useless if it's grown inside farm		
9	Compost is very difficult to make so that only specialist can make it.		
10	More diversity causes more problem in the farm.		
11	The problem is the Solution		
12	Zone planning can contribute to effectiveness and efficiency in our everyday life.		
13	Save seeds are important as food security		
14	Companion planting makes easier for farm management		
15	UN Report Says Small-Scale Organic Farming Only Way to Feed the World		

Knowledge of climate change, sustainable development and sustainable agriculture

	Items	Yes	No
1	Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.		
2	An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change,		

	sustainable development, and efforts to eradicate poverty		
3	In 2015, the UN set out 8 goals that are a blueprint to achieving a better and more sustainable future for us all, addressing the challenges our world and the people in it face on a daily basis.		
4	We have to cut off this circulation structures such as mass production, mass consumption, and mass disposal.		
5	Permaculture is a type of agricultural method.		
6	Observation is important principal in permaculture design		
7	Biodiversity plays an important role in ecosystem functions that provide supporting, provisioning, regulating, and cultural services.		
8	Sustainable agriculture integrates three main goals, environmental health, economic profitability, and social and economic equity.		
9	Permaculture design consider 3 ethics care of the Earth, care of people, and care for money.		
10	Land observation helps farm planning		
11	One of the Permaculture principle is “Integrate Rather Than Segregate”		
12	Zoning is a Permaculture design technique that positions the elements (like herbs, trees, chicken house) in our design in areas according to their need or our use.		
13	Define food forest is an area where you plant multiple level of plants that are edible or useful		

	for your land management		
14	One big tree has various benefits.		
15	Local food reduces food mileage		

Attitude of climate change, sustainable development and sustainable agriculture

	Items	**Strongly disagree**	**disagree**	**agree**	**Strongly agree**
1	I will listen without interpret				
2	If I come across information about climate change, I will tend to look at it.				
3	If I buy stuff, I will consider process of stuff production.				
4	I will analyze myself before I criticize others				
5	I will consider sustainable agriculture.				
6	I will practice what I learned.				
7	I will look for local wisdom to learn how they live with nature.				
8	I am thankful for forest.				
9	I love to conserve biodiversity.				
10	I want to conserve clean water.				
11	I will learn how to manage				

	carbon budget.				
12	I will adopt limitation of our planet.				
13	I will learn how to harmonize to make healthy environment.				
14	Increasing food self-sufficiency is very import.				
15	Observing and dairy writing improve myself.				

Skills of climate change, sustainable development and sustainable agriculture

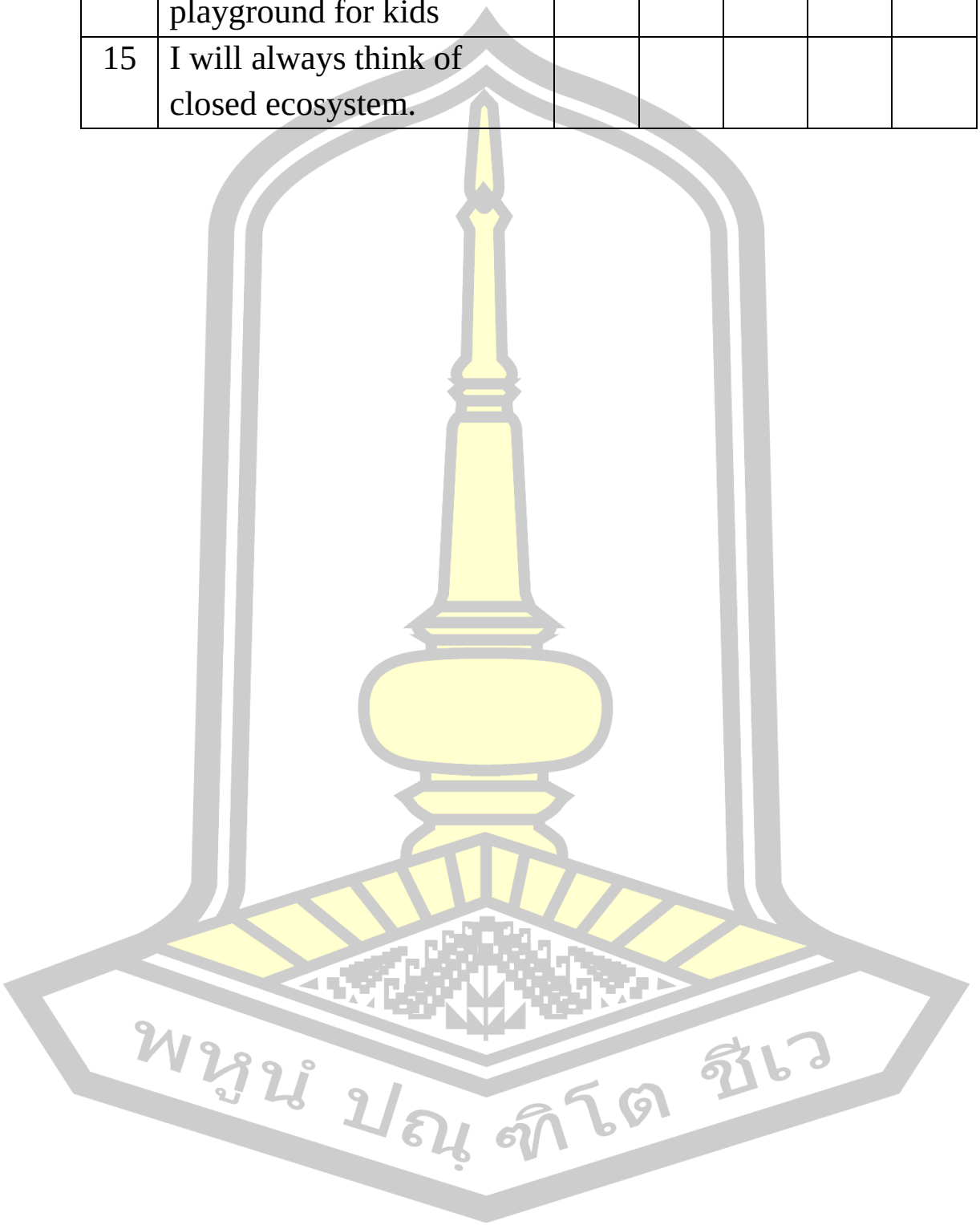
Items		Yes	No
1	I can search the new of climate change		
2	I can analyze self-sufficiency and dependency		
3	I can explain sustainable development goals.		
4	I can observe farm land.		
5	I can plan for farming.		
6	I can make living materials from wild plants.		
7.	I can search the information that I needed.		
8	I can find solution from problem.		
9	I know how to do seed planting		
10	I can make organic fertilizer		
11	I can write and speak about what I learned.		
12	I can read label on food product		
13	I can do zone planning to manage farm efficiently		
14	I can plan for farming.		
15	I can make food forest		

Participation of climate change, sustainable development and sustainable agriculture

	Items	**Never**	**Very seldo**	**Some times**	**Very often**	**alway s**

			m			
1	I will update the information on climate change.					
2	I am going to practice for sustainable agriculture as producer or consumer.					
3	I will buy local product					
4	I will be avoided chemical surfactant for water conservation.					
5	I am going to practice fare share.					
6	I am going to think of how to take care of the earth.					
7	I am going to practice to reduce waste.					
8	I am going to share my knowledge of sustainable development					
9	I will go to forest more often to treasure them.					
10	I will plant a tree or support tree planter.					
11	I will eat more vegetable rather than meat					
12	I will participate sustainable agricultural activities.					
13	I try to use bicycle rather than car.					

14	I will think of natural playground for kids					
15	I will always think of closed ecosystem.					



Appendix F: Evaluate sheet of learning method on class for students

	Items	Strongly disagree	Disagree	Sometimes	Agree	Strongly Agree
1	Please check if that methodology helps you to understand the lecture					
	➢ Golden circle method					
	➢ Budget analysis with self-sufficiency and depend					
	➢ Make sustainable cloth production					
	➢ Make farm planning					
	➢ Research on wild plant product					
	➢ Make roadmap to cut the CO2 emission					
2	Please check if below practice helps you to understand the subject					
	➢ Harvest potato					
	➢ Make a soap,					
	➢ Make a shampoo					
	➢ Use eco-friendly detergent,					
	➢ Use eco-friendly tooth powder					

	➢ To learn footsteps as a measurement tool					
	➢ Observe the land					
	➢ Make liquid compost					
	➢ Farm activities (clean the area, make bed, plant a crop and mulching)					
	➢ Seeding management					
	➢ Make rocket stove					
	➢ Produce product from wild plants					

Appendix G: Lesson Plan and Syllabus

Chapter	Context
1	Introduction to Appropriate Farming Technology and Practice Climate crisis and sustainable agriculture (Permaculture Design).
2	Permaculture Design (lecture in classroom and field work) ➢ Ethics and principles ➢ Seed (native seed) ➢ Appropriate technology ➢ Agroforestry design (Soil Nutrition, Crop rotation, Organic fertilizer) ➢ Companion plant (Natural insect management, Organic repellent) ➢ Post-harvest (Storage, processing) ➢ Zoning (Maximize energy efficiency and build up sustainable lifestyle: ecovillage network and transition town) ➢ Marketing (on and off market, local market)
3	Case study: What is the sustainable agriculture under climate crisis? (Thailand sufficiency agriculture)
4	Design sustainable agriculture in group

	(Community based, policy making, education, Cooperative)
5	Present group project

Syllabus 1

Subject:

- What is Appropriate Farming Technology and Practice?

Objectives:

- Understanding course direction.
- Awareness of Climate crisis
- Finding sustainable agriculture

Preparation:

- Pre-test paper, PPT

Time:

- 4hours

Materials:

- Wallpaper and writing materials.

Steps:

1. Orientation: Course introduction.
2. Do Pretest to know student's status.
3. What is sustainable agriculture: Make a group by four students each. 1st speaker will be speaking 3 min. then next person will be summarizing from speaker in 1 min. third person will pick up 3~5 core ward from summery. Each person speaks, summery, and core word will be taken 5 min.
4. Collect all key word in big board in each column like who, why, how, what
5. Write answer to questions. 1.What make unsustainable agriculture, 2 how to make sustainable agriculture use key word.
6. Watch short video "man" and world news of climate crisis.
7. Explain overview of climate change.
8. Let students present their answer of unsustainable agriculture and sustainable agriculture.
9. Let students to analyze one's budget with 5 different section: Food, clothes, housing, health, and transportation and analyzes dependency vs independency in each section. Then, collect the data in group and make average.

10. Explain relationship sustainable agriculture and oneself.

Lecture script:

Good morning, I am Hee Jun Kim and I will Be supplementing this course on Appropriate Farming Technology and Practices. Nice to meet you all.

I am a farmer in Jangsu, Jeollabuk-do, Korea. I studied in Thailand and completed a doctorate course on Environmental Education. I began teaching in 2014 at the Canaan Global Leadership Center, I have also given lectures at the Yonsei-Canaan for the summer course in 2016. I will be supplementing this curriculum. I will get your input and include them during this course. We are meeting for the next three weeks for eight-hour days, totalling 48 credits. The situation of climate change is declining as the needs differ by country and occupation. This course will cover climate change adaptation and sustainable agriculture in an era of climate change crisis. We will complete workshops and field practices based on specific theories. Participation is important, it is 40% of your total score; 30% for attendance and 30% for assignments.

Please let me know if you have any questions.
I hope you enjoy my class.

Before we begin class, this pre-test will let me know how much knowledge and awareness you have now so I can better manage this class.

If you allow me to use this data, I will use it for my research, Thanks.

What do you think is sustainable agriculture? If we put the goal of sustainable agriculture, in other words we are under unsustainable agriculture now. What do you think? Have you heard this word? “Problem is the solution.” If we know the exact problem, we may find out the solutions. From now we are going to split into 4 groups and will be talking about unsustainable agriculture and sustainable agriculture. Here is are the rules. One person spends 3 minutes speaking and the others will give a one-minute summary and use keywords from the summary. Be concise with your opinion and understand from the speaker’s point of view.
The key is not to make a change if your summary differs from another person’s summary. Communication is the most important.

(Group work)

Thanks for your work.
Please write your key word in the diagram. This diagram comes from Simon Sinek’s Golden Circle Approach to reorganize. I added Who. Now please make new sentences with who, why, how and what made unsustainable agriculture and who, why, how and what can make sustainable agriculture used by what you used here. We are going to meet here after a 10minutes break.

Before reading your sentence, I would like to share 3 short videos about our planet under the climate crisis. The 1st is 3 minutes animation called “Man”, and the others are international news. After the lockdown to prevent COVID 19 spread, it seems our planet recover fine air condition and clean water like India and Venice canal, Italy. On the other hand Siberia experiencing higher than normal temperature like 17°C average. This raises worry of food shortage and famine by destroyed farmland by Locusts. Meanwhile, the Huge CO_2 absorber in the Amazon

rainforest destroys rapidly to enlarged farmland for crop and livestock by illegal lumberman. But that news was overshadowed by COVID 19 related news.

Intergovernmental Panel on Climate Change (IPCC) Press "Climate Change 2014 Synthesis Report" in 2014. The is report is the most comprehensive assessment of climate change undertaken thus far by the IPCC: Climate Change 2013: Physical Science Basis; Climate Change 2014: Mitigation of Climate Change[i]. It states, "Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.[ii]"
in 2018, IPCC published a special report. This report emphasizes limiting average temperature up to 1.5˚C from the pre-industrial level. It is a more tightened agreement then the Paris Climate Agreement. Also, the level of greenhouse gases must be reduced by 45% until 2030 from the present. To do this, a great transformation of life is needed. We are going to discuss sustainable agriculture in this situation, climate change, climate crisis and climate urgency era. I am going to send you the document that I mentioned above. I will also send you the climate change synthetic report and special report by email. Please study well. That will be a good reference when you do final group work

ok.
It's time to listen to the group work on sentence making.

(present by group with short explaination.)

What do you think of all the sentences that you present and listened to? The core of "who" for unsustainable and sustainable agriculture are mostly "farmers". Do you really think that only

farmers can be a solution? Is there anything I can do for sustainable agriculture who is not a farmer?

To answer this question, I would like to suggest you analyze yourself. You are coming from all different countries, occupation and have different money values. So this unit of analysis is percentage by 5 different sections, Food, clothes, housing, health, and transportation. After you finish that please show decency vs independency. It means most of you are consumers.

Thanks
Please write your data on this board.
Except group4 food and housing most of your dependency is higher than not dependency, it means most of you are consumers.

Answer these questions. What are your criteria for purchasing food? Is your priority on purchasing an environmentally friendly product? What about clothes? Do you check whether it's made by environmentally friendly materials? What about your housing and housing materials? Production and consumption must balance. If consumers are not looking for environmentally friendly product, who would produce sustainable agricultural products. Let's go back to the point of the core person of sustainable and unsustainable agriculture. Do you still think that the farmer is the only one who is responsible for sustainable agriculture?

What if the consumer doesn't care about product processing?
What if only good-looking products can sell out?
What if the government support synthetic fertilizer and pesticide to farmers?
Nevertheless, do you still think only famer is the core of making sustainable agriculture.

We are responsible for creating unsustainable agriculture. If you don't recognize this problem, we can't solve it. From produce, consumption, and disposal are all related. Our role in this process is critical.

Sustainable development is on overarching paradigm of the United Nations. Sustainability is a paradigm for thinking about the future in which environmental, social and economic considerations are balanced in the pursuit of an improved quality of life.[iii] However, how did we develop? We focused on the economy only. Natural environment distracted and raised social injustice. Agriculture is not different. Therefore, the UN said in 2014, "Small farmers and agroecology can feed the world."

I mentioned before the IPCC reported natural disasters are too close to us. Even in South Korea, we had a big typhoon in fall last year. And a long summer drought in 2018. That is all unpredictable weather conditions. Unfortunately, these phenomena are occurring in many different countries, like what we watched a while ago. Climate is the most important factor in the agricultural field, I emphasize to you to understand this, because we must understand these phenomena to plan sustainable agriculture, poverty eradication, and for overall wellbeing. Our society must go forward to decarbonization. Although perpetrators and victims of climate change are still different. We have to survive and adapt to these climate situations. In this sense, if you study the green deal from the European Union and the action plan for the food system. "Farm to Fork strategy" may help you to plan sustainable agriculture.

Syllabus 2

Subject:

- Filed practice and make sustainable living materials

Objectives:

- Know the importance of observation of farmland for training
- Know how to use natural resources for livelihood.

Preparation:

- PPT, Agricultural working tools, Shampoo and soap making kit

Time:

- 4hours

Materials:

- Harvesting box, working clothes, Glove, Boots, Shovel, Making kit for Soap, Shampoo

Steps:

1. Explain how to harvest potato
2. Explain how to store potato
3. Explain problem of synthetic surfactant and products.
4. Explain materials and method of shampoo and soap
5. Let students to make it.
6. Clean the area and close the class.
7. Announce assignment.

Assailment:

- Class records for feedback
- Reviews of products

Lecture script:

Historically, civilization was settled by farming. Agricultural mass production start with the Green Revolution by the 1960s, seed improvement, synthetic fertilizer and pesticide use. However, water, soil, and air pollution are factors. Along with civilization, people leaving the agricultural area to the city and the agricultural machines are replaced by man power and plastic materials increased. These are factors that increase greenhouse gases.

In 2018, a survey by a Korea publication released statistic of their Agriculture, Forestry, and Fishery survey. Their result shows that the agricultural household is 5.2% in total population and the again population of 65 years and older occupy 44.7% among agricultural household. The farmers newspaper reported for 2016-2018, the gran self-sufficiency rate in Korea averaged

2016 22.3% and keeps decreasing. Based on this data, foods, the basic needs for living in Korea and the farming rate is low in Korea. Especially during the COVID 19 crisis, agricultural countries started to closed. Among them aging population 65old above are occupied 44.7%.[iv] The Farmers newspaper reported the grain self-sufficiency rate average from 2016 to 2018 is only 22.53% and keep decrease in Korea[v]. During COVID 19, agricultural countries start to close food exportation to keep national food security. What if there is nowhere to import food from? What if climate change cause poor harvest? We can't predict what we will have. So, food self – sufficiency is very important. What about your country? What do you think of my opinion? With these questions I would like to introduce 2 people. First is great Thunberg from Sweden, climate change action youth activities and Jon Jandai, from Thailand

(Field practice)

Today we are going to harvest potatoes. The life-cycle of a potato takes around 90~100days. In Korea they usually harvest before the rainy season. However, the summer harvesting takes only a month, but during the covid 19 crises it was delayed two weeks. Meanwhile when the rainy season began it was difficult to harvest the seed in the less than a month. With that, we will late spring and fall plant crops. This potato was planted by Canaan staff. But I am not sure of the quality of the potato. However, we can see what will happen on last harvest, they may sprout or nor. After harvesting the seeds, we will sort the plant by size and store in a cool and shade area.=
Harvest is the first practice in our class. It is difficult to see whole life cycle of crop in a month. Besides our class postponed 2 weeks to start due to COVID 19. In that sense our class will harvest spring crop and plant fall crops to understand life cycle of crops. This potato planted by Canaan staffs in spring. Life cycle of potato took around 90~100days. In Korea usually

harvest before rainy season. Unfortunately, rainy season started already. So, I am not sure of quality of potato. We may see rotten one and sprout one. After harvest we have to sort by size, and store in cool and shade place and covered to prohibit the sunlight.

(soap making practice)
Have you heard about “body burden”? Body burden is total accumulation of toxic in the body. (Ronald, 2012)[vi] it disturbs metabolism or cause disease. One of these toxic chemicals are synthetic surfactant which is used in daily care like soap, shampoo, detergent and toothpaste. I already made detergent and powder toothpaste for you and we are going to make soap and shampoo. If you can make yourself, you can also reduce plastic waste like containers which is non-biodegradable garbage.

Main material of shampoo is a sorrel. This is one of indicators plant where can find rich in nitrogenous organic matter soil. In spring, young leaves can eat as vegetable and root can use as medicinal herbs. This plant is releasing harmful substances such as heavy metals in our body. Also, it used as natural antihemorrhagic and good for sterilization. We use this plant in shampoo because of Emodin. Emodin expands blood vessels, and promote blood circulation to supply nutrition to scalp. And reduce inflammation by heat in scalp

You can use sorrel in both fresh and dry. With 800ml, add 23 handful sorrel. Boil thoroughly. And leave 20 minutes to infuse, then filter the water. Add 8g of polyqurter and mixed thoroughly under double boiler. Then put 200ml of natural surfactant mixed about 5minites. Add natural 40 drops of natural fragrance and put it in the bottle.

To make soap will be used Melt and Pour soap base. First of all, we are going to cut the soap base in a little piece and put in the double boiler for melt. When it melts thoroughly, add functional powder and mix. Add natural fragrance and put in the frame about 2 hours to harden. You can cut and use soap as you like. For today I prepared Aronia (Black chokeberry) as functional powder. I wish you to learn “do as you learn”. I wish you to remember that you are the solution of sustainable agriculture under climate crisis era.

Thanks for your active participation. See you tomorrow.

Syllabus 3

Subject:

- What is Permaculture design?

Objectives:

- To understand concept of permaculture design.
- To know permaculture ethics and principle.
- To practice permaculture design.
- To learn sorting the product.

Preparation(reference):

- PPT

Time:

- 8housrs

Materials:

- Big paper and writing materials. Observation sheet. Working clothes. Gloves. Harvesting box, light clothes for cover.

Steps:

1. Explain overview and ethics of permaculture design.
2. Explain group workshop: let students to design sustainable clothes production use permaculture concept.
3. Students will be present their group work. With students work, will check their understanding.
4. Introduce permaculture 12 principles.
5. Practice how to sorting potato and store.
6. Observe farm area and fill the observation form.
7. Let students to pick one wild plant in the field and research it deeply.

Lecture Script

Is anybody know about permaculture design? Can you explain briefly what you know?
Thanks.

Permaculture design is combined word of permanent and agriculture or culture. in other word, permanent agriculture and permanent culture. Permanent agriculture means sustainable food production system that improves soil quality, adds nutrients and naturally protects plants from pest and disease. Permanent culture means the harmonious integration of landscape and people providing food, energy, shelter, and other needs in a reproducible way.

In end of the year 1970s, Bill Mollison and Davide Holmgren create the concept of Permaculture design. The book of introduction to Permaculture design (Bill Mollison) said that permaculture is the philosophy that work with nature. Not only work for longtime without thinking, but concerned and observe.

Agriculture is not a monoculture system but considerate functions of interaction with wild animals and plants. In other word, permaculture design is not a method of technology but use technology like organic agriculture, sustainable agriculture, energy efficiency building or Ecovillage network to design properly. Because even if someone made natural farm but the society is not sustainable, then it's hard to sustain. So that permaculture design makes permaculture flower that can use various technic for sustainable society.

Permaculture design have 3 ethics, 12 principles in 7 domains to build up. We are going to discuss of it. Three ethics is care for the earth, care for the people and fair share. It is big word to me. So I would like to introduce these ethics as much as I understood.

(show the picture of Mongolia Gold Mine)

In 2008, Mongolia is 10th in the world of natural resources owned country. They have various natural resources like oil, coal, gold, silver, copper, iron and rare metals. And Mongolia government give mine right to foreign investors with tax free for first 5 years. The foreign investors develop mine for 24hours a day, but when they leave without any recover after 5years. The surround of mine development area contaminates by toxic substance they used. No one can't live there include wild animals and plants. Besides, in the small mine site without certification, regulations, human right and environment ignorance.

Trafficking of woman and kids also rising as social problem in mine development.
Do you have gold? Do you know where your gold came from? Can you find anything about care of earth, people and fair share in my stories?

What about clothes? Is anyone knowing process of clothes production? This is Aral Sea. The picture shows with small water in sea. From 1960s to 2000s, Uzbekistan government make cotton farm around the Aral Sea to use water. As continues cotton farming the Aral Sea water level decreased up to 80% and changes into desertification. The feature of cotton needs a lot of water and nutrients. The cotton farmers use a lot of synthetic fertilizer and herbicide. It contaminates soil and water. But they didn't care environmental regulations but produce products.

In 2013, Dakar Bangladesh, world largest garment factory collapsed and 1136 people died. The building was not safe due to reduce budget. But still I can buy one white cotton T-shirt in 4,000 won in Korea. I am wonder of price. How much of the fees will go to farmer, labor, factory management, farm management, market management and transportation? Is it fair?

Now let's think about manage the clothes. What detergent are you use? Have you checked ingredient of detergent? Do you know some detergents contaminate water? Have to heard about microplastic? Our clothes and detergent contaminate water and soil. Even microplastics goes with water and eaten by aquatic animals. Finally, it comes to our dish. Everything is connected. Take care of earth, people and fair share is basic element of living.

I would like to introduce 2 short videos about resilience of Aral Sea and make solutions when we have problems.

(watch 2 short videos)

5 years after the world's largest garment factory collapse, is safety in Bangladesh any better?

Apr 6, 2018 3:30 PM EST by Larisa Epatko

It's considered the worst garment industry accident of all time: An eight-story building housing several garment factories and a shopping center called Rana Plaza collapsed five years ago in Bangladesh, killing more than 1,000 workers and injuring more than 2,500.

Officials discovered the top four floors were constructed without building permits. The owner of the building, Sohel Rana, was convicted on corruption charges and sentenced to three years in prison. Murder charges are still pending against him.

Since the collapse, several initiatives have focused on improving factory safety. But researchers, retail alliances and human rights groups said more work needs to be done. Here's what we know.

The issue

Bangladesh is the second largest clothing manufacturer in the world, second only to China. The garment industry employs millions of people in Bangladesh, across about 7,000 facilities, said Paul Barrett, deputy director of New York University's Stern Center for Business and Human Rights, which has been following Bangladesh's garment industry since the factory collapse. "The remembrance of what happened in April 2013 is very powerful and still symbolizes a lot to the people of Bangladesh."

The garment industry in Bangladesh was fraught with problems when the building collapse happened. Fires often broke out at factories, and workers complained about not getting paid, said James Moriarty, former U.S. ambassador to Bangladesh from 2008-2011. “You got to a point where the problems had to be addressed absent a Rana Plaza. But Rana Plaza definitely was the catalyst to make it happen when it did.”

New alliances
In the weeks following the disaster, two coalitions representing major retailers joined forces and committed to making factories that supply them safer.

One was the Alliance for Bangladesh Worker Safety, composed of mostly U.S. brands, such as Gap Inc., Walmart and Target. The other was the Accord on Fire and Building Safety in Bangladesh, signed by 220 mainly European companies and trade unions.

The groups set out to inspect all factories that supplied their members’ products, spotting deficiencies, evacuating those with serious structural concerns, and ending their business with the ones that did not comply with needed improvements.

The Accord was a “game-changer” for how it combined transparency, giving workers a voice and enforcing safety requirements, said Aruna Kashyap, senior counsel for the women’s rights division of Human Rights Watch. It made “brands put money behind lip service.”

Brands, including those linked to the garment factories at Rana Plaza — Italian retailer Benetton, and Britain’s Bonmarche and Primark — joined the coalition because “they understood

this was a credible way of dealing with the supply chain issue," said Joris Oldenziel, the Accord's deputy director for implementation. The companies paid membership fees up to $500,000 per year, depending on the value of apparel they produced from Bangladesh, to fund inspections, remediation and training programs, Oldenziel said. The companies also provided loans to the factories for upgrades or offered to extend their contracts to entice factory owners to make safety changes.

Rana Plaza was a "wakeup call," he said, that "made it clear the government was not monitoring and enforcing the safety of these factories."

What they found
Since the collapse, inspections at 1,600 garment factories under the Accord revealed more than 130,000 safety problems, including electrical and structural integrity issues and a lack of safe fire exits, Oldenziel said. So far, 85 percent of those issues have been resolved. Inspectors ordered the temporary evacuation of 50 factories because of serious structural concerns, he added.

As for the U.S. brands, about half of the 666 factories that are part of the Alliance have completed fixes in the five years since Rana Plaza, and the rest have completed about 80 percent of their fixes, said Moriarty, the Alliance's executive director.

Barrett's center found in total that about 80 percent to 90 percent of the 2,300 factories between the two groups addressed their deficiencies, from installing sprinkler systems to building stronger buildings.

Another 109 factories that did not cooperate had their

contracts terminated, which also meant they could not work with any of the brands who were in the Accord, Oldenziel said. After 18 months, if the factories made required improvements, they became eligible to re-qualify for contracts.

Both organizations have started programs to train workers, security guards and safety committees to conduct on-site monitoring. “Once you take a building that’s safe, and you put people in it, people make mistakes,” Moriarty said. “Workers need to be able to identify dangers within the factory” and know what to do in an emergency, such as a fire.

The groups also have set up 24-hour helplines for workers to report inappropriate practices. Moriarty said the Alliance’s helpline has gotten an average of 6,000 calls per month. “The workers trust it. Everybody knows the number — they put it on the back of their ID cards,” he added.

Though the focus is on factory safety, the helplines also help address other worker complaints, such as quality of food or bathrooms, and violence in the workplace, Oldenziel said.

Issues that remain

In the last five years, safety has improved at the larger factories that have direct relationships with Western retailers and are under the supervision of two initiatives, Barrett said. But workers at the smaller factories that have domestic contracts and those that are subcontracted – in other words, get the overflow work from other factories – are still in peril, he said.

Those factories are under the responsibility of the Bangladeshi government, which has not done as thorough a job of inspecting or pushing for remediation, Barrett said. “No one has been paying attention to them.”

In the wake of Rana Plaza, the Bangladeshi government merged its fire safety and building assessment efforts, but it still has hundreds of factories to inspect.

Barrett's center proposes a shared-responsibility task force — including industry, government and other stakeholders — to enforce safety measures at the factories that are flying under the radar. It would be similar to efforts in Detroit, where local businesses, governments and philanthropies joined forces and raised millions of dollars to improve the city, Barrett said.

The cost of that center would be about $1.2 billion – based on the estimated $250,000 it would cost to bring each remaining factory up to the alliances' safety standards, Barrett said. The participation of many companies, the Bangladesh government and other international organizations like the World Bank would mean that no one entity would bear the cost burden alone, he said.

Oldenziel and Moriarty, however, said retailers do not have an incentive to improve factories that do not supply them, and they wouldn't have leverage with those factories without contracts anyway.

"The factories have the fear of losing contracts if they don't respond to the push for safety. If you take that relationship away from the factories, I'm not sure what leverage they would have to drive progress in the factories," Moriarty said. "Free money is a dangerous thing in Bangladesh. It tends to disappear. So I'm not sure that the concept of giving small factories money is necessarily going to make them a lot safer. It's something that would need to be worked out and watched closely."

What's next

The Alliance and the Accord were both designed as five-year initiatives. They end in May. However, both organizations plan to continue monitoring and enforcing safety standards after their expiration dates, and brands will have a chance to sign on again.

"We're going to need to set up an organization that somehow cooperates with the government but is genuinely independent and credible in its operations," Moriarty said.

The Accord hopes to transition its functions to the Bangladesh government once it proves itself capable of doing everything the Accord did: managing inspections, enforcing safety improvements, providing transparency around factory progress, and offering a complaint mechanism for workers, Oldenziel said. Every six months, the Accord reviews the government's capacity to take on the duties, and so far has found that it is not ready.

Socially conscious buyers should make their voices heard to have the companies where they buy their clothes continue to apply pressure in Bangladesh to improve conditions, Barrett said.

Garment workers earn the equivalent of about $64 per month — "that's not enough to live on, even in Bangladesh" – and they are exposed to many risks, Barrett continued. "It took a disaster as horrendous as Rana Plaza to shake the whole global fashion industry and make the industry realize that for whatever motivation – whether it was for public relations, or a true humanitarian motivation, or a combination of the two – that something dramatic had to happen."

Kashyap of Human Rights Watch said in addition to safety

enforcement, the Bangladesh government should set up a national insurance plan for injuries on the job, “so all workers across different sectors can at the very least be compensated for loss of life and disabilities, and receive trauma and other care in case of fire and building safety disasters.”

The government also needs to amend its labor laws to bring it in line with international labor rights standards, she noted, and promote greater respect for workers’ freedom of association, such as allowing them to join unions. “It truly is one of the most powerful vehicles for worker empowerment,” she said.

Source: PBS NewsHour

“solution is in the problem.”

If all of 7.8billion people in the planet live with above 3 permaculture ethics, what will happen? I imagine that day. It may not come but still practice as much as I can. And try to motivate people surround if you join it then can change. Same with climate crisis. As IPCC report addressed human activities caused climate changes. That means human can solve the problems. The scientists analyze carbon budget to limit 1.5°C before industrial revolution. By that standard we have less than 10 years left if we live same as now. Therefore, some of countries declare carbon neutrality and make action plan like ‘Green Deal’ or ‘Green New Deal’. The point is understanding of earth limitation and make decarbonize society.

Consequently, we have to introspection and analysis of our life style. Same meaning of sustainable agriculture can’t make only organic farmers but all of us in various way. Just like a flower. These 7 domains help to consider permaculture ethics.

Any questions?

From now, we are going to design of “sustainable cloth production.” Please make a group again and try to make sustainable cloth production system.

Thanks a lot, of your work. I know this isn’t easy work but you made good result. I wish these plans can make it in real world when you go back to your work. Let’s clap to everybody. You do good job.

Permaculture emphasizes patterns of landscape, function, and species assemblies. It determines where these elements should be placed so they can provide maximum benefit to the local environment. Permaculture maximizes useful connections between components and synergy of the final design. The focus of permaculture, therefore, is not on individual elements, but rather on the relationships among them. Properly done, the whole becomes greater than the sum of its parts.[vii] Let’s look at the 12 principles.

1. Observe and interact. Observation is the most important factor in permaculture design. Observation makes learning natural interactions. You will learn from observe your field, surround area, wild plants and animals, history of the land moving of wind, sunlight even wind. Of course, it is very import how to interact with all those factors each other. You can make farm planning by life cycle of crops, arrange crops by shade loving, sun loving, water tolerance, dry tolerance. Also consider with wild plants and animals to protect or manage nutrients. If you see the wild plants some of them shows soil conditions. We call that indicator plant. Some of them grows in acidic soil and in alkalic soil. You can even check when you grow your crops. The crops show nutrient deficiency and excess. So that you can

manage your crops by observation. This will be related zone design, but we are going to discuss more deeper later. Generally, permaculture landscape show with U form. It means in the southern part open for the full sunlight and close northern part to block the cold wind. Like this picture. Also, we can use slop landscape for the crop arrangement like water tolerance and dry tolerance. It can collect to water to use.

2. Catch and store Energy: There are sunny days and rainy days. The drought country needs to store water when rain comes. When you build a house, you need to consider how to capture sunlight for the house and how to manage energy to use. Even food storage, we do dry during cool sunny day. We can also use rocket stove, as a cooking material to reduce woods to use.

3. Obtain a yield. No matter what you willing, you need to gain what your basic needs. This is same meaning of sustainable development concept that I understood. The main factor of sustainable development is socially acceptable, Ecologically sound and economically viable. Isn't it? That factors must be balanced. that is, if you earn nothing it can't be sustainable.

4. Apply self-regulation and accept the feedback. Left side of this picture is the beginning of farming. We follow organic agriculture, but we use tractor for tilling, and use plastic mulching. I have high yield at that time. However, I met earthworm one day. It cut in half by my hoe. And I saw the other earthworm to run away. Our couple talked about this and what happen with all earthworm when we use big tractor? How they can run away? That's so fast and big. Meanwhile, my husband gets busy and can't work in the farm. I was 100% depend on him to tilling, make bed and

mulching. But can't make time and I lost right time for seeding. I have to find out how to manage by myself. And I learn who followed natural farming. I am not perfectly following that logic but not tilling, I apply liquid fertilizer. And I start to make my farm by myself. And work together with my baby cause the are nothing harm. I harvest as much as I need and share with my family. Not for sale. Only one cash crop, Ginger for maintaining farm. My farm became more diverse. More insects come and regulate themselves. My goal of farming is self-sufficient of my food, plant indigenous seed, make more diverse. On 2018, we had long summer drought about 40days. I observe my land which one can tolerance drought. The bed with full of wild plant can grow better. In that reason, record is best way to learn and preparing future difficulties. Of course, the principle No. 1 observation and interaction is deeply related.

5. Use and value renewable resources and services. For me, when I read this I immediately think of this picture. Can you guess what is this picture? Yes. Seed. Native seed. The meaning of native seed is live from generation to generation in particular place with particular climate and environment. When we talk about native seed, we are not talking only one kinds of seed but various. Each place has their own native seed.

   Recently, where they buy the seed generally? Most in Korea, farmers buy in seed market. Some of grain seed provided by government seed propagation plan. Government received seed application before supply. For the vegetation seed are mostly used F1.

   Suring seed propagation, seed diversity reduced. They became week in diseases. Irish potato famine has same

caused. What about Generically Modified Organism (GMO) Seed? GMO seed spread by plan same as herbicide. GMO seeds are not dying with herbicide. But herbicide remained in products, soil and waters. It caused problem in health of human as well as wildlife. In fact, we(Korean) eat lot of GMO food without knowing. Because our policy is not required labelling GMO even there are lot of request. And Korean biggest starch sugar company use GMO corn as their row materials. On the other hand, when Africa had poverty issue in 2002, Zimbabwe, Mozambique, and Zambia reject US GMO corn assistant. The president of Zambia said that can't eat the poison cause of starving. Furthermore, he warried contamination of seed.

"Use and value renewable resources and services" I remind one of permaculture ethic care for the earth. Native seed can use every year to plant. Seed is life. Although the production might be lower that propagation seed, native seed can inherited generation to generation.

6. Produce no waste. Our plant is round shape. It's not open place but closed. Whatever we need, from extract till disposal would be in the planet. But look at the waste issue. Plenty of waste are accumulate without disposal. Materials like plastics sustain 5 times more then human. New island made up by plastic waste in Pacific Ocean. Some of wild animals eats plastic as food. Recently, many studies shows that human also eats plastics by food web. Instead of dispose plastic brake down into microplastic. It eaten by plankton and again eaten by higher predator. At last it some of sea animals come to the table as a food. Not only in ocean but also in the agricultural area. Many plastic materials used for farming.

However, I would like to introduce one Thai village. This village is not perfectly disposing all the waste but they try their best to reduced. This village is in Kkuchum municipality, Yasothon province, North East of Thailand. The village was so clean even alleys. All house has their own segregate waste bin and all the village members are the waste cooperative members. On 2016 when I visited at first, they open waste bank twice a month. At the beginning, the village members donate their recycle thing to the bank until they collect fundamental management budget. After that waste bank start to buy recycled materials from village members. After they run waste bank the village members reduced even recycle materials to use. Village members start to make compost from the agricultural residue and sell to the market. They even sell earthworm bucket for organic farmers. Waste became market products. The officer of Kkutchum municipality said that the total waste of a day reduced from 7tons to 4tons and the waste bin was reduced from 600bins to 200 bins. Farmers in the village, they even use banana leaf or bamboo stick as a pot when they sell herb in the market. Their no waste movement is not only showing but life in daily.

7. Design from patterns to details. Please check these pictures. What do you think? In permaculture design, the first principle is observation. Right? In the nature, all the shape and patterns also have a reason. The reason is the best for interact with natural factors. Like use sunlight, air exchange, and water management. In that reasons, when you design your garden, you can apply natural patterns.

8. Integrate rather than segregate. As I mentioned earlier that Irish potato famine is typical example of monoculture.

Farming is more depend on weather. But we do predict and plan based on previous data and prepare for the risk. Even thought, sometimes, risk comes badly. Farmers live for farming. It means, farmers need enough product to provide what they need. Monoculture started for the easy management based on chemical farming. But the research shows that the chemicals farming contaminate soil, water even human health. In that reason organic farming recommend. Also, polycultures are better then monoculture because, farmers can manage harvest time, use companion plants for pest control and so on. If you apply food forest in your garden you can even reduce time for work in the farm.

9. Use small and slow solutions. This picture shows wisdom of Korean ancestors. This is the way how to collect to rainwater. The rainwater will be cleaned when it passes the rice strow. Simple but multi-proposed. Next picture shows mulching. Now adays in Korea, plastic mulching is popular and easy. But produce plastic waste. If you do a monoculture, you may have no chose but if you follow multicultural you can use residue as a mulching material. Organic mulching materials have more benefit than plastic because it will be a compose after a while. Simple but useful solutions that you can get.

10. Use and value diversity. Diversity is repeating ward in permaculture design. Diversity is very important. Even in natural ecosystem. More diversity is healthier like rainforest. Unfortunately, human in the planet didn't put valued in it. But we can start from garden. This picture call kitchen garden in the Philippines. They planed farming based on what you need in the kitchen. Also, they always make compose area at the same area. All the

residues from kitchen will be returned compose. Some of your senior use balcony to do gardening also make earthworm house to dispose food waste in the city. I challenge you wherever you stay you can make garden. That is important.

I would like to introduce one smart farmer in Thailand. He introduces himself as a smart farmer. He is Mr. Suchon Sukkasem. He follows Philosophy of Self-sufficiency economy. He has 1 acre. He has coconut, lime, papaya, mango tress. He also rase chicken, duck, fish and shrimp. He uses various alternative technology like water pump, biogas, biodiesel. The area managed not like general farm because the he lives in lowland so that they have lot of waters so that the land mixed with pond and farm like this picture. He graduated only elementary school but he uses his farm very efficiently. One of graduate school visited his farm and respect his experience, they give him an honorary Mater degree. Now his farm used as a education center not only Thai students but international students come to learn. All the system is connected. For example, the animal nursery has slop, when he cleans the area with water, the water goes pipe which connected to biogas tank. And the biogas connected kitchen for cook. The irrigation connected to bicycle pump. When he needs to watering just ride a bike. So that in his farm, he even makes hall for education, dining room for the guest, and small guest room for the visitors. His place became more diversity. His influence affect to this village members. He suggested his village members to sell their product when he has visitors. Visitor wants to buy something and village members can sell their products. His request to the village members is only one. Be sure of good quality of products. I learn a lot from him. He showed me how to manage

diversity farm and fruitful results comes from that.

11. Use edges and value the marginal. The Marginal has many possibilities. For example, between city and country side, the area solves each desire. Someone has land but no power, someone has power but no land. They could share what they have. This is share garden project In Totness, England. Highest diversity is in the forest entrance where is marginal area. Please check your surround. Where is your marginal? Please put your value in it. You will get more fruit at there.

12. Creative use and respond to change. This generation changed rapidly. We learn experience from history and adopt new generation. Something could be a waste but could be resources to someone. We call that upcycling.

    I would like to introduce 2 examples for this topic. First example is Towervill in Philippines. There is social enterprise “igting” sawing center. They make student’s uniform, eco-bag. However, remnant of clothes produced. Mostly it throws away but Igting product pouch with remnant of clothes. They even make experience program for the visitors. Not only that. The wall in the towervill decorated with dumped ceramic.

    2nd example is in Vang Vieng, Laos. The house builds combination of traditional Laos house structure with Korean’s mud-house. All the materials provided by local but learning 2 countries housing structure. It makes change to exchange culture. This picture is organic farm in same province. This farm also run guesthouse. At the beginning, foreign friends of owner start to build mud house as a volunteer. And later more volunteers come and stay at the farm for experience. Someone called this type of tour is voluntour(volunteer + tour). The foreigners

experience to live in Laos with local people and do something what they could do. Some people who stay more then 2weeks, they make special class in local school to share their talents. Now the organic farm has enough mud house for the quest, and can have discount if the guest does volunteer work in the village. This farm became place for culture and learn local culture. Owner of organic farm said, he travels whole world by learning from visitors. Very flexible person.

Well, we discussed 12 principles all. I give you only simple related examples of this. But you can find more in internet or in the books. I wish you to think why these principals made. Think deeper and wider to make sustainable agricultural society.

(Field practice)

This is the potato you harvested yesterday. The price of potato will in increased if you sale later then harvest season. But if you don't have storage room or not sure of quality of storage, have to sale right after the harvest. Segregation is the first step. In Korea, there are products size. If you just sale to Agricultural Product Center (APC) you should select in particular size. If you sale in market or direct sale, you may separate size by cooking, boiling, extra small size. Before that you should check one more time whether potato have green color or not. Green color caused by exposed sunlight. It has toxicity. Also sprouted potato and scratched one.

Thanks for your work. This is observation sheet. From now, all of you will go to the field by oneself. Please be silent and observe oneself. Feel the wind direction, sun moving, surround of field. Check wild plants and wild animals' trace. Filled this sheet and submit with today's diary.

Thanks for today. See you next week.

Syllabus 4

Subject:

- Farm planning

Objectives:

- To understand life cycle of crop. Define what is Sustainable agriculture
- To know how to planning farming

Preparation:

- Pre-test paper, PPT,

Time:

- 8housrs

Materials:

- Wallpaper and writing materials. Working clothes.

Steps:

1. Review previous lecture and student's land observation
2. Explain how to plan farming and preparation.

3. Explain Group work: farm planning in 4 different groups. Community farm, School farm, Family farm, and office farm.
4. Present students group work
5. Field practice: clean the farm area, make green plants liquid fertilizer, Nitric fertilizer

Lecture script:

Good morning everyone.

Thanks a lot, of your reports. I read all your respond. I can read your stress, hashes, proudness, and awkward too. The propose of observation sheet and research wild plants for the farm design. The data will be useful when you arrange crops in the farm.

Let's review last week, what should we considered? Based on land location, we should check sun and wind moving. What else? Yes, surround environment. Water source, what kinds of trees, wild plant, wild animals exist. Before you select the crops, you must know about it. For example, there are lot of wild pig in here, and corn and sweet potato are your wanted crops, how and which area you can arrange? Corn and sweet potato are wild pig's favorite food. You should not plant them where wild pig can approach. They will harvest just before you do. Another example is crops need morning sunshine. In that reason, you should not plant big tree in the east. Do you remember U shape? Based on crops feature, you can arrange in the farm. Of course, if there are slop, you may plant dry tolerance crops in the higher and water tolerance crop in the lower to plant. Have you heard about "Indicator plant"? With wild plant observation you will

about know soil. Like pH level, nutrients status. Based on soil pH, different wild plants grow.

For now, we are going to learn what we need for farming.

1. Land is the first things to consider. And propose of farming. For earn money or for self-sufficiency? Or both? Based on your objectives you have to decide your goal and calculate input and outputs of farming. You have to consider life cycle of crops, harvest season, market possibility, storage and so on. Besides, our classes put priority is small scale organic farming for self-sufficiency. In Thai philosophy of self-sufficiency, they have contents for the agriculture "New theory". In that theory, it suggested manage land by people. Whoever, try to manage their land with 10:30:30:30. 10% for house, 30% for rice, 30% for water, and 30% for animals' fruits and verges. In Thailand also tropical country with rainy season and dry season. Generally, they do make a pond for water, but some practices make differently. In the rice filed they dig 1.5m to 2m deep for water. The water has multipurpose. With organic way, they grow rice with duck. Ducks control weeds and have eggs. Besides they also raise fishes. With 1 acre, people can have house with rice field, fruit trees, vegetables, animals and fertilizer.
2. Select the crop. For me, I focus on food self-sufficiency, but I still need money for farm maintain. So that I select some cash crop for selling. For full time farmers may have to monitoring market situations and price. When you choose crops, please check the data not only other people's word. Once you choose something, you are the one who has responsible for that. That means you are the one who choose what you willing to plant. You can't blame on others later. You can even blame on other; no

one help you to recover.

3. Apply fertilizer in the land. Generally, herbivorous animals manure used for compost like caw and chicken. Of course, for right now, in Korea used lots of commercial fertilizers can used. IMO which made from near forest. Mostly compose applied before planting and additionally based on crop's circumstance. However, fertilizer needed in the middle of farming based on crops nutrient situation. So hold enough fertilizer.
4. Prepare Irrigation system. Although we depending rain water, have to prepare for emergency. In Korea, I experience summer drought around 40days in 2018. Irrigation should be settled. Based on my observation in Tropical countries make pond, rain water harvest system, or swale to use water. Besides I learned during 40days drought that crops grow better with weed. Weeds made shade so reduce evaporation, and share water under the roof. therefore, water should be prepared.
5. Choose seeding type and prepare a seeding. I know 2 types of seeding, direct seeding and make nursery. Both seeding has good and bad. For direct seedling's advantages are 1) save time, 2) roots develop strongly, but loose seed easily by wild animals. In Korea, there are ward of plant three beans. One for worm, one for bird and the other for human. However, if you make nursery, advantages are 1) save seed, 2) easy to control the weed.
6. Prepare post-harvest. I think this is most important part. Before harvest, you have to assume quantity of your harvest. Decide whether you sale right after harvest, or put in the storage. If you decided to sale, the price will be different by joint market or local market. For the joint

market you do not need to think of loss because they will get all your product but in low price. But in the market, you have to how to deal with customers. In Korea, for the small-scale organic farmer do direct marketing with online. So the truth is the most important. Have to be sure with your products quality. All the information of your products in online and customers share it. In Korea, government support cold warehouse for support farmer's storage system. In harvest season, over products in market and the price decreased. If farmers can store their products, they could control the period of selling and maintain the price with less losses.

Is there any questions? I would like to share one short video about school farming. The school make regular curriculum for farming and cooking for students. And they learn importance of food and make healthy food by themselves. I wish you can learn from it.

Let's practice farm planning in group. In each group will choose different society like community, school, family and office. Please make farm planning based on it. I will give you a chart that you must considered.

	owned	budget	time	support
Land preparation				
Seed				
Livestock				
Fertilizer				
Pesticide				
Corp selection				
Water				

management				
Mulching				
Tools Harvest Market storage				
processing				

Thanks for your work. When you manage the farm, there are lots of thing to considered. Make planning itself, you may understand farmers. Everyone learn by failure but the failure must be a lesson not just happening. As you are work for the people, I wish you the know all these processes and can support them with their actual needs.

We learn that we live in climate crisis era. And people leave rural area continuously. It is not easy to make sustainable agriculture with decarbonize way of farming. Nevertheless, food production environment is important. But you can make your own. It must go together even it takes time. This is the propose of farm planning workshop.

Field practice
Clean the land. Cut the weed in the area.
Make Green plants liquid fertilizer and nitric liquid comfrey fertilizer.

Fresh green plants liquid compost (use it at least 7~10days after and dilute 500times with water after 7~10days mix 50times 100ml Materials volume with water to use, after 3month, 500 times mix with water Materials

Required materials	Container	100ml
	Vinyl for cover	
	String for tie	
	Cutter	
	Wood and stone	
	Fresh green plants	40kg
	Water	
	Leaf mold	1 shovel
	Sesame dregs	2kg
Selected materials	Rice bran	1kg
	Black treacle	100g
	Sun dried salt	50g

Methods

① Prepare all materials.
② Cut the all-fresh plants into 10cm.
③ Put it in container and pour water till materials to be soaked.
④ Use stone and wood to prohibit floating materials.
⑤ Cover with vinyl and tied for anaerobic fermentation

Comfrey liquid compost

Materials: Container, comfrey leaves, water

①Cut Comfrey leaves in to 10cm.
②Put it in container
③Pour water till materials to be soaked.
④Use stone and wood to prohibit floating materials.

Calcium liquid compost (use it at least 1 week after and dilute 500times with water)

Materials: Dried eggshell, vinegar

Method:

①Put together eggshell and vinegar by 1:10 ratio
②Stir it (for 3days)

Syllabus 5

Subject:

- Crop cultivation and distribution (zone design)

Objectives:

- To make farm efficiently.
- To make sustainable agricultural system.
- To learn farming by doing.

Preparation:

- PPT, practical materials.

Time:

- 8housrs

Materials:

- Farming tools, materials for Dandelion flower jelly (it can change by situation).

Steps:

1. Brief today's lecture
2. Explain life cycle of some crops in Korea
3. Explain Zoning in permaculture.
4. Group workshop to make zoning

5. Explain how to make one's body part measurement
6. Explain how to make calcium liquid fertilizer
7. Explain how to make pot seedling.
8. Explain and let student's make mud rocket stove

Lecture script:

Good morning.
We have heavy work in the field. Although you have young body, your mussels need time to adopt labor. Please take good care of yourself. We are going to have classroom lecture in the morning and field practice in the afternoon. Today, we are going to learn zoning.

In the field work, first, you will learn how to make measurement with your body part. second, make calcium liquid fertilizer with egg and vinegar, make nursery in the pot. Also make rocket stove with mud for cook. Sad to say that July in Korea is not a planting season. So that we are going to plant few crops. So that before we discuss zoning, I will introduce crops life cycle based on my experience.

This is ginger. My main cash crop. The seed of ginger in Korea store in the underground tunnel. So that I buy native seed in originate place of ginger in Korea where do ginger as ginger agribusiness. On April I bought from there and store in a month for sprouting. Generally, ginger plants in April but I live in 500m in sea lever like high latitude area. Cooler than other area so I plant a bit later like first week of May and harvest early October. Because ginger is week of cold. The problem of buying seed is can't guarantee of seed price and quality. For example, on 2018 ginger had bad harvest, so that the seed price in 2019 were very high. So, the product's price also high. In this year

2020, the seed price is still high but the quality of seed was very bad. So, I am not sure of ginger production this year. However, I do not increase ginger price for my customers. Most of them use it as a medicine. So, I try maintain the price. I usually use all farm materials get from near my farm. Mulching materials, fertilizers (native microorganism in the forest), and so on. I used to get organic certification before but not now due to high cost of authentication. Instead of certification, I do post on my SNS and blog method and methodology of my farming. I write my story without exaggeratingly.

This is red peppers. In Korea, red pepper powder is main seasoning of our food. So that mostly all the family need red pepper powder. Generally, pepper farming start from January. But the weather in Korea is very cold. so that the nursery need heat for maintain temperature. I use seed by gathering myself. I do plant in pot but a bit later than other like in March to avoid to use electric. I harvest one or two times lesser than others. In the early stage of growing like before flowering, aphids come. I used organic pesticide and other organic handmade insecticide. Among them, baby bath water (with little amount of soap) with sugar was the best effected. Sugar condense must be slightly sticky. And apply early in the morning. Aphides come for sweet but trap by soap water. When sun comes it dried up. For now, I am don’t even spray that because ladies bug comes when it comes. After flowering tobacco moth comes. When rainy season comes, anthrax come. After ripe, start to harvest and dry for the pepper powder. Dry also important. It’s easy to grow mildew inside pepper. For now, many of farmer used drier. But the color and spicy are better in sun dry. For tropical countries can grow chili more than a year but not in here. Cause pepper die when the temperature goes down like lower than 5°C. One of Thai organic farmer said, grow chili with banana grows better.

Peanut. I'm not planting right now. Because, our land is open to wild animals and they loves it. So I stop planting it. For the peanut farming has one thing to care. Peanut start to fruit after flower drops. So, you have to put more soil when it flowered.

Perilla and sesame seed. It plants on June after harvest onion. In Korea, we use perilla and sesame a lot. Oils, sesame for seasoning, perilla leaf as a vegetable. Perilla has lot of omega 3. These 2 plants are not difficult to grow.

Onion. Onion's seeding start from August. And transplant on November. It harvests on end of May or early June. In Tropical country that I know is plant onion after rice harvest during dry season. And took 4 months. The variety is different also size. Onion is heathy and useful vegetable. Good for person with high blood pressure.

Garlic plant when transplanting onion, end of October. It sprouts when the winter goes like on February. Generally, we apply first additional fertilizer together with onion. Garlic harvest almost one month later than onion. For garlic use seed same we eat also get seed from garlic flower. but it took 2 years for the same size like we eat. Garlic grows under the soil, so the seed may affect fungal disease. For this reason, it needs to change seed into new generation from the flower.

Zones are areas where elements are placed according to distance from the center of energy, frequency of use, amount of care and upkeep needed, and scale of production. When we do a zone analysis, we consider each element in relation to function, structure, nutrient, energy, water and access needs. [viii]

Most of you are working in agricultural supporter so that I am going to explain based on Thailand case. Generally, do zone analysis from 0 to 5. 0 is housing, where you stay.

Zone 0 is simply where you spend and stay long time. Like house. Type of housing are very different. In Korea, especially in city, mostly of them stay in apartment or multi-unit house. But in rural area, can use more space like detached house. Materials for the house also very variety. I recommend the materials from the natural resources. Like earthbag house, mud house, wood house. The scale will be depending on people, but the recommendation like Thai is 10% from your total land. There are people become minimalist. In 2011, after Fukushima nuclear power plant accident, minimalism come up to the surface. The materials gone within a minute. So, think about your life, what would be your priority. Do you remember jon jandai, Thai. He can make his house in 3month in 2hours a day work. The house should be cozy but also energy efficiency is important. There are lot of information for the insulations, to control the temperature inside house for comfortableness. If you have to choose of building, you may use other resources to manage building temperature. Like green curtain, white rooftop makes cool down. Wind location and shade of wind also efficient, make ventilation helps too.

When you buy living, materials check energy efficiency and longevity. Like rocket stove. I've seen lot of place where use stove for cook. This is mud stove that I made and used in Thailand. Based on reference, the quantity of woods can save 5/6 compare to normal stove. This picture shows shower booth in outside. In top rolled hose observe heat at sunny day, can provide worm water. There is unplugged refrigerator exist. We are going to see in short movie for materials and method. The above examples we called appropriate technology. It must be built locally with available materials. Also, can managed by local people.

Zone 1, where you go every day by walk and near from zone 0. Just like your kitchen garden, small portray, nursery, compost. You can make keyhole garden, which is combined place with composting and planting together. For farming, some vegetables need to care every day. Like lettuce cucumber, tomato and etc. You must place it in zone 1. You can also put daily market in here. It must be near from your home. Office worker and student may but their workplace and school will be put it in here.

Zone 2, may the place where you often go like every other day. In Thailand, they open farmers market in many other places. The farmers sell their product every other day in different place like front of municipal ground, local market, and front of hospitals. This is one of local governments support organic farmers. Farmers can meet different customers and the customers can get healthy food in nearby. This local government support wasn't easy at first. But they made it with long and a lot of conversation each other.

Zone 2 may say bicycle approachable.
Zone 3, this place may go to weekly. You may go there by transportation. Crops like potato, corn can be plant in this area. It need care seldom. And where should be in here? Like book store, library, movie theater and so on.

Zone 4,5 just like near forest or the place where you go every other week or month in a week, sometimes once in a while. You may not put energy here. (Add little more in here from the reference)

Zone design is important matter too. for example, in Korea many of rural area faced on local extinction. It's hard to hear babies crying. And when the baby grows like elementary student, parents want to move to the city for study. Schools are closing. If school close, it means, there will be no young couple

to move in that village. School is stick together with. So that make zoning is covered not only crop arrangement, but also manage their relationship management too. so please, based on our lecture analyze yourself by zoning and make zoning together in group.

(filed practice)

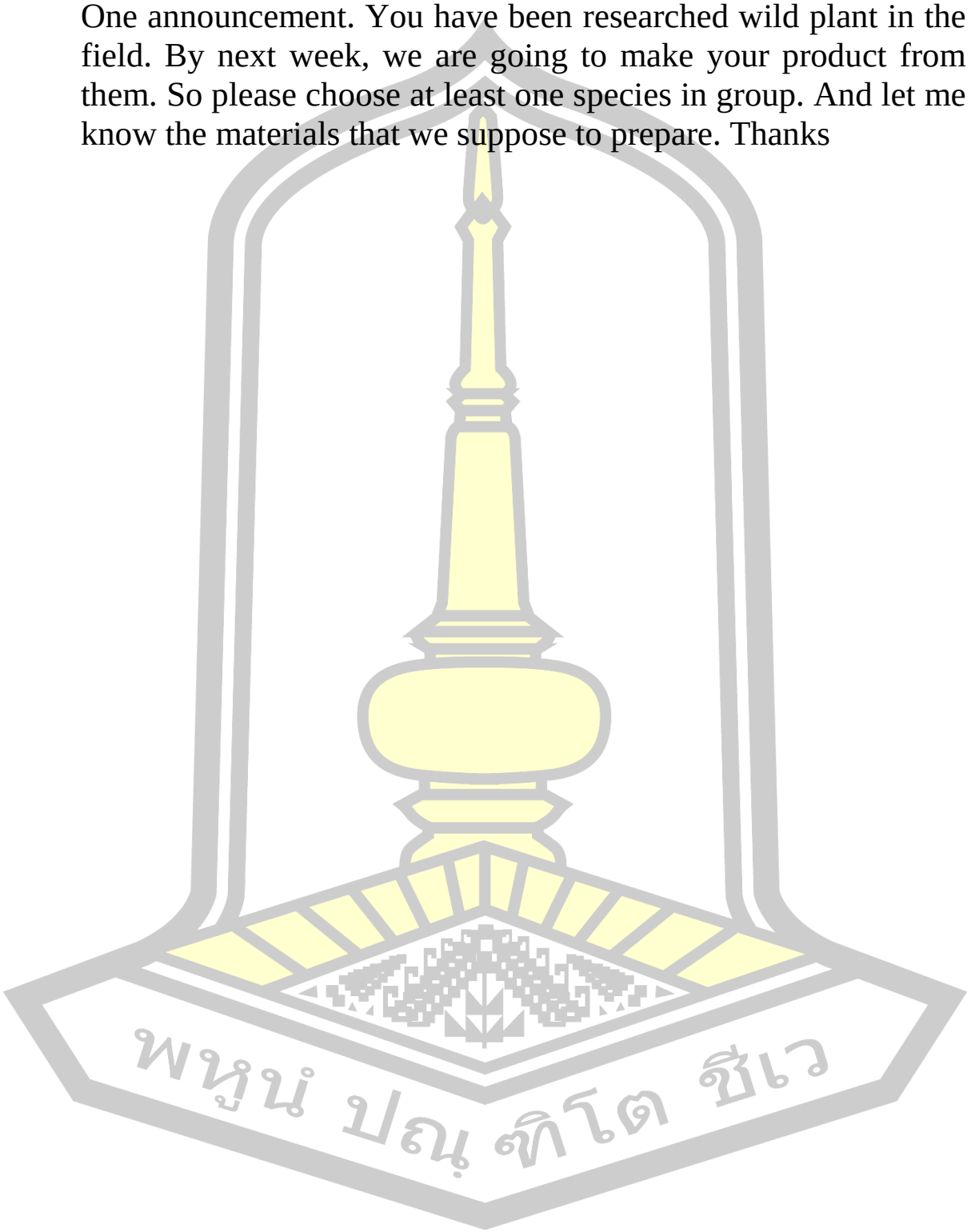
Hemideh Faridi(2018) mentioned in his research that eggshell has a huge amount of calcium which can be used very effectively in various applications. As a fertilizer, it enriched the pH and calcium content of the soil.[1]

We are going to plant red bean, corn and spinach. Red bean and Corn seed are native seed but spinach seed is F1 from seed market. Put culture medium in the tray and put one seed in one hole in tray. It helps if you put this tray in the water then the medium will absorb water more efficiently. If not, watering enough.

We are going to make simple mud rocket stove. Get soil in near from you and put some rice strow and water. Put together and mix properly. And prepare a bucket and bigger than10cm in diameter of pipe. Put pipe in the middle of bucket and put mix mud between bucket and pipe. Squeezed mud. After filled all mud in it, remove pipe. Turn the bucket upside down and take mud out. The mud shape may change depending on water consist. So please make properly. After that, you have to make same size of entrance and exit. And dry under the shad. A than put tray in the entrance. The important thing in here is complete combustion. Condition of complete combustion is same size of entrance and exit. Also, space for the air. This is the reason to make tray in the entrance. Hope to make it good.

[1] Hemideh Faridi, Akbar Arabhosseini, 2018, Application of eggshell wastes as valuable and utilizable products: A review, Research in Agricultural Engineering.

One announcement. You have been researched wild plant in the field. By next week, we are going to make your product from them. So please choose at least one species in group. And let me know the materials that we suppose to prepare. Thanks



Syllabus 6

Subject:

- learning how to use wild plants and import of environment

Objectives:

- To learn farming by doing
- To know the efficient wild plant
- To understand import of good environment

Preparation:

- Pre-test paper, PPT, cooking practice

Time:

- 8housrs

Materials:

- Agricultural tools, cooking materials

Steps:

1. Explain efficient of mulching and how to do it
2. Explain how to arrange crops in the field and transplanting.
3. Let students to prepare their own field project. (make product from wild plant)
4. Let students to present their products. And share their comments and expression of group work.

Lecture script:

Good morning.
It's no rainy day. I've heard that you been finished filed work in your free time. I am so proud of you and thanks for your voluntary work. Mulching support crop growing. It helps maintain soil moisture and temperature. Also mulching with organic residue helps soil fertility.

Let's review for a while. Let's check the direction of sun. right. Morning sunlight is important for crop growing. So that do not black east side. We are going to transplant native corn and red been in the field. This native corn has very small size but have more fruits. Corn is taller than red bean? Short crop should be in east north direction. This is just simple example. In fact, it is early to transplant, but we are trying to plant it.

From now, it's your time for team project. Please harvest your own wild plant and make group product. After that please prepare presentation of your product. Please enjoy your preparation and will see you in the class room.

How do you think of your work? It's amazing. You have done great much more than I expected. Thanks for all your work. But it's shame we can't use mud stove. It's not dried well and the branches. We can see that happened in rainy season. It's better to prepare before rain. We learn that.

The final project is very variety and learn a lot about wild plant. It is beauty of collective intelligence. I wish you to share like this even you are back in home. Whenever you face something you can share your problem and help each other. Once again, I am pleased your group work as well as your research, sharing

and made it. What if we share it with other Canaan staff in dinner?

Before we closed our class, I would like to ask you one thing. When you harvest wild plant, were you worried about pollution? Like safety of food or contamination of water and soil? No never. Why? Because no harmful materials exist in Canaan. What if this place is not safe? What if Canaan didn't care of pollution? Were you happy to harvest wild plant like today? Yes. You can't. this is the reason why we have to think wildly and have to make together. Not only oneself. One of my favorite former presidents mention this "Organized power of awakening citizen." I wish that you to be one of awaken citizen in climate change era. And make sustainable agriculture. Please don't forget to think who, why, how, what we can do for sustainable agriculture. I wish today's group work help you to think about it. Thanks

Syllabus 7

Subject:

- Design Sustainable agriculture (decarbonize agriculture)

Objectives:

- To prepare oneself for the planning decarbonized agricultural society.
- To know the practical decarbonized agricultural society planning.

Preparation:

- PPT, Post-test

Time:

- 8housrs

Materials:

- PPT, working clothes.

Steps:

1. Explain definition, function and type of food forestry.
2. Introduce case study of Advanced permaculture design on transition towns
3. Let students to planning decarbonize agricultural.
4. Let students to present what they made and exchange question and comment)
5. Design sustainable agriculture in one's field and sharing

Lecture script:
Good morning everyone. This is our last class.

I would like to start with food forest. What is the definition of food forest same as forest gardening? In Wikipedia, forest garden is a low-maintenance, sustainable, plant-based food production and agroforestry system based on woodland ecosystems, incorporating fruit and nut trees, shrubs, herbs, vines and perennial vegetables which have yields directly useful to humans. Making use of companion planting, these can be intermixed to grow in a succession of layers to build a woodland habitat.

As we learned at the first time, human produce a lot of carbon dioxide. Tree observed carbon dioxide and produce oxygen. Korea Forest Service researches relationship between species of tree and CO_2 obsecration in ages. With this data highest CO_2 observation tree is 30 years old Acorn. This data reported by Yonhap daily new paper. One big tree provide oxygen for 4 people in a day, 7,000 dust particles are reduced to 1L of air, and reduce 10-15% of heating cost. Generally, one person used 118 trees in whole life. In case, all the people must plant as much as they used. Tree mange water too. healthy 30years old tree have more than 200,000 leaves and evaporate 42 liters of water to the air and land.

We also learned about revitalizing local ecological livestock project by linking ecofriendly livestock goods production and animal welfare. Present livestock practices factorial methods to apply meet in cheap price. In that situation, livestock's get week easily and depend on antibiotics. It causes many food problems like Africa swine fever, pesticide on egg, and so on. in that reason, sustainable agriculture needs to concern of human life. Agricultural system shouldn't only follow people's greed but

self-sufficiency. If not, it causes unfairness. Therefore, take care of each other.

Tree also do importance of river bank buffer zone to prevent erosion, water quality, aquatic habitat and terrestrial habitat.

Food forest is the area where multiple level of plants that are edible or useful are planted for land management. Currently this trend is common in city area where the land access to farming is very low. Natural disaster like flood, landslide, drought comes when we ignore tree's function and do over logging, Tree also observe noise in city.

In permaculture design suggest forest garden. It suggests let natural environment support each other. Ideal forest garden is not input

- **Tall trees** – It should be made up of large fruit (apple, plu m) or nut trees (walnut, chestnut) and nitrogen fixation tre es (kalopanax, alder tree, black locust, lacquer tree). It nee ds space between them to allow light and airflow.
- **Low trees** – Plant smaller fruit or nut trees like peach, Jap anese apricot, hazel, pear, mulberry, Asiatic cornelian cher ry and nitrogen fixation trees like walter's dogwood, willo w, ash tree. **Shrubs** – Like blueberries, gooseberries, raspb erries, rose.
- **Herbs** – With perennial plant Such as mint, sage, rosemar y, thyme, dill, alpine leek, oregano and comfrey.
- **Ground cove**r – Like strawberries or nasturtiums as easy g rowing.
- **Vines** –Like passionfruit, pumpkins, melon and cucumbers .

- **Roots** – Shallow roots like garlic, onions, and potato. It wo uld be put distance from other trees not to disturb the roots of the plants.
- Caution: When you choose the plant, it would be suitable f or your land climate.

Guilds are more or less just a step beyond well-established companion planting arrangements, moving from useful pairings onto functionally, ideally self-sustaining polyculture systems. In guilds, many plants are serving one another route to a stable co-existence in which the garden is mulched, the soil fertilized, the pests controlled, the pollinators attracted, the nutrients accumulated and the cultivators feed. We now know better than to monocrop. We've established great charts for plant compatibility. The final step is to simply add some design knowledge and extend simple pairs and trios into mixed garden eco-systems.[ix] For example, walnut tree guild is bo tree, berry, Chinese pea tree, Siberian chrysanthemum, balloon flower, clover, honeysuckle. Apple tree guild is wild chives, red spider lily, comfrey, hop.

This picture was taken from Sri Lanka where I had homestay. She was ordinary government officer and get food resource from her garden.
In Africa there are a lot of desert, right? Lot of place were lock of water. There are Green Wall International campaign to solve water problem in Africa. If there have forest, it will become a habitat for the wild animals and the soil will be better conditions. Then, plants can grow better than before. In that sense, tree is not only one tree but also multipurpose. To make forest garden is very important to provide food, medicine and good soil fertility and tent to be habitat.

Next picture shows different type of forest garden. Based on the land, you can make your own forest garden.

This is picture is hügelkultur. In Wikipedia define that the ward come from Germen and means mound culture or hill culture. It is horticultural technique where a mound contracted from decaying wood debris and other compostable biomass plant materials is later planted as a raised bed.[x] Megan (2016) found in her study in China hügelkultur had high water holding capacity and enhance soil development.

This Keyhole gardens. This garden I learn from Uganda woman by youtube. In the middle of garden has compost like food waste. It became fertilizer in the middle of garden and will be spread by slope. This is useful in dry area and lack of fertilizer.

When you design your garden, your world view and objective shows at there. For me, I would like to design my farm as safety. When I start farming, I have 1 year old baby. I spend most of time at the farm. My son used to play at the farm and eat anything at there. So that I consider of safety at first. No harmful machine, no harmful fertilizer et all.

I separate my farm for my cash crop, and self-sufficiency crops. I try to make it easy to harvest and transport where I plant in cash crop but where I plant for eat, I used to rase it with weed. Because I eat and used weed in my filed.

This is different type of garden. Small land holder, rooftop garden, vertical garden, for while chair user's garden. So different way of farming. Farming is not only purpose of farming but also landscape.

Well, what do you think of forest garden? Do you still remember 7domains to consider? 3 ethics and 12 principles. Now we are talked about forest garden. Forest garden is complexed of permaculture principles. This type of garden has

many functions. You can get food, medicine, living things materials as well as provide other species habitats. Which one would like to choose for sustainable agriculture? Monoculture farming? Or permaculture farming? The choice is yours.

Well, for now I would like to give you last group work.
We are going to make 3 groups 1; community development, 2; policy makers and 3; education.
All of you have to make 10 years road map for sustainable agriculture to reduce carbon emission. The target percentage I am going to give you but, you can adjust. There is no other choice but decarbonize till year 2030. You can choose one of your member's country.

Thanks for your effort. I wish this work can help you when you go back to your country. Because decarbonization is everyone's work in this planet. So please keep work for it.

The last part of our class is check in the field. Please check your filed whenever you have time while you are here in Canaan. Thanks for your attention and good participation.

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permaculture design

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