

**Education on Agriculture and Natural
Environment:
Comparative Study across Asia and ASEAN**



Asia & ASEAN Center for Educational Research
Faculty of Education, Chiba University

Education on Agriculture and Natural Environment:
Comparative Study across Asia and ASEAN

Edited by

Asia & ASEAN Center for Educational Research, Faculty of Education, Chiba University

Koji Tsuji, Professor

Sanyo Media Co., Ltd.
Chiba, Japan
2020

Copyright ©2020 by

Asia & ASEAN Center for Educational Research, Faculty of Education, Chiba University

All rights reserved.

ISBN: 978-4-909857-05-7

Edited by

Asia & ASEAN Center for Educational Research, Faculty of Education, Chiba University

Koji Tsuji, Professor

Printed in Japan by

Sanyo Media Co., Ltd

CONTENTS

Foreword	5
<i>Jun Nomora</i>	
<i>Director of Asia & ASEAN Center for Educational Research, Faculty of Education, Chiba University</i>	
< Japan >	
1. Education on Agriculture and Natural Environment in Japan	7
<i>Koji Tsuji¹, Yoshikazu Tatamoto², Kentaro Tashiro¹</i>	
<i>1. Chiba University</i>	
<i>2. Senior High School at Sakado, University of Tsukuba (UTSS)</i>	
< Vietnam >	
2. Sustainable Development Goals: the view of Education on Agriculture and Natural Environment in Vietnam	11
<i>Bui Thi Thanh Huong¹, Lu Thi Mai Oanh¹, Nguyen Thi Bich Thuy¹, Nguyen Ngoc Anh¹, Pham Manh Ha¹, Koji Tsuji²</i>	
<i>1. VNU-University of Education, Vietnam National University, Hanoi</i>	
<i>2. Chiba University</i>	
< Thailand >	
3. From School Garden to a Plate: A Thai Model of Agricultural Education for Sustainability	23
<i>Somsak Techakosit¹, Pongprapan Pongsophon²</i>	
<i>1. Kasetsart University Laboratory School</i>	
<i>2. Kasetsart University</i>	
< Indonesia >	
4. Education for Sustainable Development in Indonesia: A Special Case in Science Education	29
<i>Fitri Khoerunnisa¹, Mita Nurhayati¹</i>	
<i>1. Indonesia University of Education (UPI)</i>	

Foreword

In 2012, we started our collaboration on science education as the Twin College Envoys (TWINCLE) program. This student exchange program on science education has been developed over eight years based on collaborations between Chiba University and universities in ASEAN countries. In this TWINCLE program, we have focused not only on student exchange but also on research collaboration among the university members. As the outcomes of the collaboration research, several articles have already been published in some international journals. With these fruitful achievements, the “Asia and ASEAN Educational Research Center” was established in the Faculty of Education, Chiba University, in 2018. Since 2019, a member of this Center, Professor Tsuji, launched a new collaborative research, titled “Contribution to SDGs from the view of education on agriculture and natural environment among Asian countries,” which is supported by JSPS KAKENHI Grant Number JP19K03111. This book is an outcome at the launching step of this collaboration research. Collaborators in Japan, Vietnam, Thailand and Indonesia reported SDGs related topics in each country from the view of education on agriculture and natural environment. This book is useful to know the outline and practice of education on agriculture and the natural environment in each country.

野村純

Jun Nomura

Director of Asia & ASEAN Center for Educational Research,
Faculty of Education, Chiba University, Japan

Education on Agriculture and Natural Environment in Japan

Koji Tsuji¹, Yoshikazu Tatemoto², Kentaro Tashiro¹

1. Faculty of Education, Chiba University, Chiba, Japan

2. Senior High School at Sakado, University of Tsukuba (UTSS), Sakado, Japan

Abstract: Basic law and guideline on education of Japan are “Basic Act on Education” and “Government Course Guidelines”. Importance of education on life, nature, environment and sustainable society is described in these law and guideline. Multifunctional roles of agriculture which is an important concept for sustainable society is described in the basic law on agriculture of Japan “Food, Agriculture and Rural Areas Basic Act”. Based on these law and guideline, education on agriculture and natural environment for contributing to sustainable society has been enforced and accelerated. As an example on the education focusing agriculture and natural environment with global aspect, activities by Senior High School at Sakado, University of Tsukuba (UTSS) are introduced.

Key Words: Agriculture, Education, Environment, Japan, Nature

Corresponding Author: Koji Tsuji (tsujikoji684@chiba-u.jp)

1. History and present situation of education on agriculture and natural environment at schools in Japan

1-1. Law and policy by government related to education on agriculture and natural environment at schools in Japan

Education in Japan has been based on “Basic Act on Education” which was enacted in 1947. The “Basic Act on Education” consists of following four chapters (1) Aims and Principles of Education (2) Fundamentals Concerning the Provision of Education (3) Educational Administration (4) Enactment of Laws and Regulations. The Chapter 1 was revised in 2006 and added a section “Fostering the values of respecting life, caring about nature, and desiring to contribute to the preservation of the environment”. This revision means that Government of Japan is recognizing importance of education on life, nature and environment.

“Government Course Guidelines” is also important in the education system in Japan. The “Government Course Guidelines” is established for each grade of school and subject. Teachers plan their lesson content and schedule based on the “Government Course Guidelines”. The “Government Course Guidelines” has been revised every about 10 years. In the latest version which was revised in 2017, for example subject on Technology and Home economics for Junior high school, “To develop attitude for contributing to sustainable society” is ranked as a pillar. This means that Government of Japan is recognizing importance of sustainable society.

Government of Japan is also recognizing importance of education on food and nutrition. Under the “Basic Act on Shokuiku (Food and Nutrition Education)” which was enacted in 2005, agriculture is being focused.

1-2. Ethnic values and ethics which might have influenced to the education on agriculture and natural environment at schools in Japan

Historically, people in Japan have lived with nature. Japan is located in the temperate zone with relatively calm climate, plenty of water, fertilized soil etc. People could collect their food from various sources, e.g. field, forest, river and sea. Accordingly, people has been familiar with agriculture and nature. Based on such background, people has recognized the multifunctional roles of agriculture, i.e., role of agriculture is not only to provide food but also to preserve land from flood, to be source of water etc. Government of Japan has recognized importance of multifunctional roles of agriculture. In the basic law on agriculture “Food, Agriculture and Rural Areas Basic Act” which was enacted in 1999, importance of the multifunctional roles of agriculture are also described as “Multiple functions of agricultural production activities in rural areas, other than the function of supplying food and other agricultural products, such as the conservation of national land, recharging of water resources, conservation of the natural environment, formation of favorable landscapes, and the passing down of culture (hereinafter referred to as "Multiple Functions") must be performed appropriately and sufficiently into the future, given their role in achieving stability in the lives of citizens and the national economy.”

Though people in Japan has recognized the importance of agriculture a nature historically, as most of the industrialized countries experienced, pollution became a serious problem in Japan on the way to industrial society. Through this experience, Government of Japan recognized importance of environment. Government of Japan established “Environment Agency” in 1971 and it was developed to “Ministry of the Environment” in 2001.

People and government of Japan are aiming sustainable society with recognizing importance of agriculture and nature and industry.

1-3. Relation with SDGs and the education on agriculture and natural environment at schools in Japan

As the activities in global society, Government of Japan has been participated in “Decade of Education for Sustainable Development (ESD)”. Especially, Ministry of Education, Culture, Sports, Science and Technology (MEXT) supported activities for contributing to ESD. After the “Decade of Education for Sustainable Development (ESD)”, ESD is located in SDGs and Government of Japan still supporting the activities related to ESD and SDGs.

2. Example of education on agriculture and natural environment at schools in Japan

2-1. School outline

As an example, we will examine the case of Senior High School at Sakado, University of Tsukuba (UTSS). UTSS is a university laboratory high school, which was originally established in 1946. In 1994, UTSS was further recognized as an "integrated course school." In this course, students can choose subjects that they want to learn. As the Ministry of Education's prototype for promoting education reform, it was established as Japan's first high school with an integrated science program. The educational goal of UTSS is to provide students with a comprehensive, general and specialized education so that they become lifelong learners who are able to adapt and continue making contributions to an ever-changing society. This goal is in line with the goals of education for ESD.

UTSS offers a variety of elective courses, which are based on the school’s academic goals, and a systematic course of study. Examples of programs include Biological Resources and Environmental Science, Engineering Systems and Information Science, Life and Human Sciences, and International studies. UTSS is committed to international education and has been certified as a UNESCO ASP net school

since 2011.

2-2. Education on Agriculture and Natural Environment in Classroom and at School Farm

The school's farm is 22,230 square meters (Fig. 1), wherein a wide range of activities is available, and where both agricultural and environmental studies are carried out.

UTSS offers 12 subjects in Biological Resources and Environmental Science. In these elective subjects, students can learn about useful animals and plants, and acquire the knowledge and skills for correctly controlling and using them. Students can also learn the importance of biodiversity in theory and practice in school.

A sample lesson in Environmental Science is when students are challenged to manage their own field, with an area of about 10 square meters. They make their own cultivation plan, and grow vegetables of their choice in an environmentally-friendly way. In addition, they investigate the flora and fauna surrounding the field where they are growing their vegetables.

2-3. School forest project

A project entitled "Making a Forest at School" was initiated by the school in 2000, in cooperation with the Silviculture and Nature Conservation Laboratory at the University of Tsukuba. The project was started with acorns of two *Quercus* species (*Quercus serrata* and *Quercus acutissima*), which local farmers have long used on secondary forests, and have enabled them to do composting, charcoal-making, and mushroom cultivation. Many spring ephemeral birds and insects can also be observed in this secondary forest. Thus, this secondary forest supplies people the materials they need for daily life, while providing many living things, especially endangered species, a place to live in. At this secondary forest, called "SATOYAMA" in Japan, students can learn about conservation-oriented agriculture and biodiversity conservation.

2-4. International Environmental Education Collaboration with Indonesian High School

In 2011, UTSS signed an international partnership agreement with a high school in Indonesia mainly to develop an international education program on environmental education. One of the yearly activities of the program is a collaborative project on forest conservation and sustainable use, jointly conducted by Japanese and Indonesian high school students in rural areas around the national park of Indonesia. In this project, high school students are divided into three teams to tackle forest-related issues (environmental education, ecotourism, community development). For example, the environmental education group visits a local elementary school to engage teachers and discuss with elementary students practical lessons on the environment. Through these international collaborative projects, high school students can acquire skills in international collaboration necessary for the realization of the SDGs.

2-5. International High school's ESD symposium @Tokyo

Since 2012, UTSS has been holding its annual international high school ESD symposium, which has been participated in not only by Japanese high school students, but also foreign high school students from Indonesia, Thailand, Philippines, and Australia, among others. Every year, participants from various high schools report and share their research and/or activities on ESD and SDGs. By experiencing such international symposia, high school students get a chance to develop the mindset of international cooperation for realizing SDGs (Fig. 2).



Fig. 1. School farm and school forest



Fig 2. International High school's
ESD symposium @ Tokyo

3. References

Yoshikazu, T. (2011) Environmental Education at Sakado Senior High School, University of Tsukuba. *Journal of Developments in Sustainable Agriculture*, 6 (1), 136-139.

Sustainable Development Goals: the view of Education on Agriculture and Natural Environment in Vietnam

**Bui Thi Thanh Huong¹, Lu Thi Mai Oanh¹, Nguyen Thi Bich Thuy¹, Nguyen Ngoc Anh¹,
Pham Manh Ha¹, Koji Tsuji²**

1. VNU-University of Education, Vietnam National University, Hanoi, Vietnam

2. Faculty of Education, Chiba University, Chiba, Japan

Abstract: By literature review and survey, the status of sustainable development goals (SDGs) and education for sustainable development in the ASIAN and Vietnam were shown by policy system, ethnic value and new K12 program in Vietnam integrated knowledge of SDGs. Example of education on agriculture and natural environment at schools in Vietnam also was given by our research. The survey was implemented in 6 schools (2 rural schools and 4 urban schools) in different districts in Hanoi in secondary school, high school and higher education in Hanoi. By observing activities, discussing with principle, teachers, students and collecting data and materials, the status of awareness of SDGs and expectation of teachers and students were presented through data survey.

Key Words: Education for Sustainable Development (ESD), Education on Agriculture, Education on Natural Environment, Sustainable Development Goals (SDGs), Vietnam

Corresponding Author: Bui Thi Thanh Huong (bui Thanhhuong.vn@vnu.edu.vn)

1. Introduction

The term "sustainable development" appeared from the 70s of the twentieth century in the movement to protect the environment and report of the World Commission on Economic Development (WCED) in 1987 with the title "Our Future" defines "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The program consists of 17 sustainable development goals (SDGs), including a number of important goals such as poverty reduction, planet protection, and common prosperity for all. 17 sustainable development goals and 169 targets designed to cover the three pillars of sustainable development - economic, social and environmental; constitute a comprehensive policy framework, applicable to both developed and developing countries¹⁾.

Vietnam and other countries around the world have built and committed to implement 17 goals for sustainable development since 2013. Since then, the Government and ministries such as the Ministry of Education and Training (MOET), the Ministry of Resources and Environment, (MONRE), Ministry of Industry and Trade, Ministry of Culture, Sports and Tourism, Ministry of Finance have made strong steps to fulfill their commitments. MOET has permitted integrating the content of education for sustainable development (ESD) into geography and biology in high schools and universities.

The article discussed about ESD, especially SDGs from the view of Education on agriculture and natural

environment in Vietnam in the context of SDGs in the Association of Southeast Asian Nations (ASEAN). The research group has surveyed at 2 secondary schools, 3 high schools and 1 university in Hanoi, capital of Vietnam for SDGs research from the view of one in Vietnam.

2. Literature review

2-1. SDGs in the Southeast Asia

Researching reports of UN in 2017²⁾, 2018³⁾ and 2019⁴⁾ shown that, four years after signing the 2030 Agenda for Sustainable Development, countries have taken action to integrate the Goals and targets into their national development plans and to align policies and institutions behind them. According to sustainable development accessible from agricultural education and natural environment, the Sustainable Development Goals Report 2019 shows that, there are still nearly 800 million people who are undernourished, poor⁴⁾. They have no income or in low income and need the support of society. Almost 80 percent of the world's extreme poor live in rural areas where most are dependent on agriculture. Meanwhile Agriculture is the single largest employer in the world⁴⁾.

The FAO report⁵⁾ also showed that production and consumption need to be sustainable, which is also the 12th goal of SDGs on "responsible production and consumption". Awareness of sustainable production and consumption needs to be paid attention in human education, especially agricultural education and protecting the natural environment. FAO emphasized that aquaculture was the fastest growing food industry. While a third of agricultural land was degraded, up to 75% of crop genetic diversity had been lost and 22% of livestock varieties were at risk of extinction⁴⁾.

10 ASEAN member countries (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam) have been making efforts to achieve sustainable development. This is reflected in the strong growth in income and consumption in recent years that has reduced poverty, improved education, health and achieved many other achievements despite the uneven development between ASEAN countries. For example, the growth of income and the absolute poverty reduction policy in 2030 have been strongly implemented in most ASEAN countries⁶⁾. Maintaining this performance will also result in significant improvements in educational and medical outcomes. Despite some ASEAN countries still faced challenges to achieve SDGs, improved economic well-being (rising income inequality at a time), and change in production trends have been impacting on environmental sustainability.

The ultimate goal of the proposal is to assist ASEAN countries to achieve inclusive, sustainable, dynamic and appropriate development by incorporating actions in the 2030 Agenda for Sustainable Development. To achieve the goal of sustainable development, the Program will support the planning and implementation of multi-benefit model projects, as well as develop the capacity of next-generation cities and share experiences and the knowledge generated by the ASEAN Member States Program (AMS) to promote Replication towards a clean and green ASEAN. Some of the key activities include (i) identifying SDG priority actions and providing them with financial support to demonstrate the selected actions; (ii) promoting a voluntary National Assessment (VNR) by linking monitoring and evaluation of local actions with the mechanisms of VNR; (iii) facilitate knowledge exchange between cities through national and regional workshops to replicate good practices; and (iv) provide opportunities for secondary cities to learn from successful cases and implement pilot projects⁷⁾.

Pursuing sustainable development entails sizeable spending needs. For developing ASEAN countries, concessional financing from development partners will be required. ASEAN developing countries made significant progress towards meeting the Millennium Development Goals (MDGs). The IMF, with its

mandate to promote economic growth and stability, is well positioned to support ASEAN countries as they pursue their SDGs. ASEAN, maintaining past good performance would help achieve significant declines in poverty and improvements in health and education outcomes. Many ASEAN countries perform well in terms of education outcomes. Nevertheless, with a 78 percent enrollment rate in lower secondary school and a ratio of 18 pupils to teacher for the median ASEAN country, the region trails advanced Asia⁸). At current trends, enrollment would rise moderately and the pupil-to-teacher ratio would decline, with the lower-middle-income ASEAN catching up with the overall ASEAN median by 2030. ASEAN countries have committed to incorporating SDGs and designing policies to pursue sustainable development in their national development plans. ASEAN countries' existing medium-term national and sectorial development plans generally do not yet explicitly and fully integrate the SDGs, though many have now mapped policies and actions in their plans to the SDGs.

2-2. SDGs in Vietnam

After 1980, economy of Vietnam had made significant progress, the Vietnamese Government paid attention to reasonable extraction and use of natural resources. The national development strategy to 2020, which was formally stated in the "Political report" of the 8th National Congress (1996) of the Communist Party of Vietnam, also emphasized the point of sustainable development, strengthening effective environmental management, resulted in all fields, ensuring the good implementation of the "Environmental Law"⁹).

In 2008, MOET has integrated ESD into subjects: Vietnamese, Ethics, Nature and Society, Science, History, Geography, Arts, and extra- circular activities. Regarding the objectives, content and solutions of environmental education for pupils in primary schools (Thai 1993¹⁰, Duc et al. 2003¹¹) environmental education through extracurricular activities (Hang 2002)¹² and environmental protection education (Khoa 2009)¹³. Some basic approaches to environmental education (Nhuan and Khang 1999)¹⁴, raising community ecological awareness for sustainable development goals (Nghì et al. 2005)¹⁵, environmental management for sustainable development (Sinh 2008)¹⁶ emphasized awareness and concern for environmental, economic and social justice issues.

In Vietnam, there have also been a number of studies and learning materials that integrate education with a sustainable development environment, such as: Telling stories about the natural environment around me (Tuc 1997)¹⁷, educating preschool children to cope with climate change through games, poetry, storytelling and riddles (Thu 2014)¹⁸, instructing teachers on raising awareness of environment and climate change (Cuong and Phuong 2013)¹⁹, identifying organizational forms and methods of environmental education through Geography at Vietnam for junior high school (Hanh and Hang 1997)²⁰, environmental education through geography (Hanh and Chuong 1998)²¹, environmental education through teaching ecology in grade 11 high school (Sy 2002)²²; The works focus on specific methods and teaching methods for each subject and lesson with environmental education contents. Research "Education and sustainable development" by Tri and Duc (2005)²³ said that education can help increase productivity in agriculture, improve the status of women, reduce the rate of population growth, promoting environmental protection, and generally increasing the quality of life.

The Government of Vietnam and the United Nations have developed a common strategy to integrate SDG with the socio-economic development strategy (2011-2020) and socio-economic plan (2016-2020) in order to realize the realization. The plan focuses on four main areas: investing in people (goals 1, 2, 3, 4, 5, 6), ensure adaptability to climate and environment (goals 2, 5, 7, 9, 11, 12, 13, 14, 15), prosperity and cooperation (goals: 6, 8, 10, 12, 17), promote justice and comprehensive governance (including goals 5, 10, 16) (Sustainable Development Office - Ministry of Planning and Investment, 2016). Regarding the goals,

content and sustainable education solutions based on agricultural and natural approaches in Vietnam, it is mainly presented by environmental protection education materials in subjects in preschool and K-12. In addition communication on national television and local channel also contributed to improving knowledge of SDGs from view of agriculture and natural environment for Vietnamese people.

2-2-1. About law and policy by government related to education on agriculture and natural environment

Government has integrated educational contents on agriculture and protection of the natural environment in policies and regulations. First of all, in the Decision 1363/ QD-TTg issued on October 17, 2001, the Prime Minister officially approved the regulation "Putting environmental protection contents into the national education system"²⁴⁾. Next, the Prime Minister issued Decision No. 158 / QD-TTg dated December 2, 2008 to approve the National Target Program to respond to climate change²⁵⁾, MOET approved the action plan on climate change and the regulation "Putting climate change content into education programs". The regulation emphasized that the process of education for sustainable development needs to be integrated into school curricula.

MOET and MONRE have signed collaborative program in environmental protection in the period 2019-2025. According to the document, 2 Departments will build and complete contents of education of environmental protection for preschool, K12 and higher education adapting to the new context of national educational innovation through books, digital books, e-learning, communication program about environmental protection education, nature and biodiversity reservation, municipal solid wastes sorting and processing, reduce plastic products in schools in Vietnam for all ages in various forms and ways of learning, through education in schools and teachers, non-school, formal, non-formal and informal education.

2-2-2. Ethnic values and ethics which might have influenced to the education on agriculture and natural environment at schools in Vietnam

Vietnam is an agricultural country since its inception with farming is dependent on nature. The tropical-monsoon conditions of Vietnam are often erratic, rainy, drought, and flooding makes unstable agriculture which leads to crop failure. The natural features of Vietnam have greatly influenced the formation of the value system of the Vietnamese nation, creating strong community ties, love and solidarity with each other, laying the foundations of hard work. Over time, national values and ethics have somewhat influenced education in agriculture and the natural environment at schools in Vietnam.

The spirit of hard work and saving is also considered an important moral value in the value system of the Vietnamese nation. The moral value system has greatly affected labor activities, agricultural education and environmental protection in schools. In fact, to create material wealth, any ethnic group must work, and they can be proud of the achievements, but the Vietnamese people are a special case. Because Vietnam is a country with a long-standing agricultural civilization and agricultural labor is the type of hard labor, requiring a lot of time and effort.

Experience of adapting to natural environment transferred through generations by doing such as: drought adaptation, flood mitigation, crop calendar, cultivation techniques and many other skill life adaptations to natural environmental. These ethnic experience is national value supporting to SDGs from the view of agriculture and natural environment for sustainable Vietnam and developing life for people.

2-3. Environmental and agricultural education in the new K12 program in Vietnam

The contents of environmental education were integrated into subjects of the new K12 program²⁶⁾ as follow:

In primary level, content about environmental and agricultural education was integrated in natural and

social science subjects are organized for 35 lessons per year (in grades 1 and 2), 70 lessons per year (grade 3, 4, 5).

In secondary school, the contents of natural environment and agriculture were integrated into biology, geography and nature science subjects. It was accounted for 25% the content of these subjects in the new K12 program for secondary level. This will help students to form a love for their homeland, the spirit of protecting the homeland, specifically protecting their living environment.

In high school, the contents were mainly integrated into geography, biology, technology, citizenship education and history following teaching scenarios of each teacher, not common regulation. The integrated knowledge is available or not available into high school level. Students gain much this knowledge by themselves through extra- curriculum education or volunteer in the farm.

Extra- curriculum education (is called experiential activity in primary school and secondary school, vocational experience activity in high school) were designed with the number of 105 lessons/ each grade (3 hours/week/ each grade). Topics in educational activities are directed to the content about people, society, nature and career (Table 1). SDGs content from the view of agriculture and natural environment will be integrated in the topic dedicating society and adapting to environment (Table 1).

Table 1. Distribution topics in extra- curriculum education for K12 in Vietnam.

Content	Primary school	Secondary school	High school
Activities focus on managing oneself	60%	40%	30%
Activities focus on dedicating society	20%	25%	25%
Activities focus on adapting to environment	10%	15%	15%
Activities focus on vocational orientation	10%	20%	30%

Source: MOET, the new K12 program 2018⁶⁾

3. Example of education on agriculture and natural environment at schools in Vietnam

3-1. Objectives

To propose a model lesson plan with teaching materials and training program regarding education on agriculture and natural environment which is applicable to Vietnam, the authors of this article research status of SDGs education in some schools and ethnic values which might have influenced to the education on agriculture and natural environment at schools in Vietnam.

3.2. Research Methods

The research was implemented with the below research methods:

Literature review: by collecting data, materials, reports about SDGs in Vietnam, ASEAN and the world, the picture of SDGs in Vietnam and the Southeast Asia was shown up. Based on experience of maintaining SDGs in the world, many valuable lessons were collected and applied in the context of Vietnam.

Fieldtrip method: With 5 working days, the research group to visit 6 schools (2 rural schools and 4 urban schools) in different districts in Hanoi (Fig. 1). The number of students in 6 schools are above 4000 students and around 450 teachers. In each school, the group observed activities, organization, discuss with principle, teachers and students, collected data and materials (Fig. 2).

Survey method: It was implemented with 2 types of questionnaires (for teachers and for students). The questionnaire was designed for 3 main groups of variables that are individual characteristics of students (independent variables); level of awareness about sustainable development goals; perspective on effective activities to achieve sustainability goals (dependent variable). All information obtained from interview by questionnaire was presented by the below results through quantitative results collected.

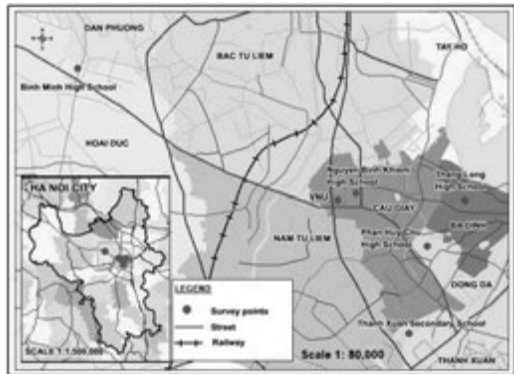


Fig.1. School farm and school forest



Fig.2. Survey in 6 schools in Hanoi, Vietnam

Table 2. Data feature of case study.

Content		Frequency (people)		Frequency (%)	
		Students	Teachers	Students	Teachers
Gender	Male	158	9	42.7	16.4
	Female	212	46	57.3	83.6
School	Secondary school	163	22	44.1	40.0
Level	High school	179	25	48.3	45.5
	University	28	8	7.6	14.5
Case Study	University of Education, VNU, Hanoi	28	8	7.6	14.5
	Thanh Xuan Secondary School	52	11	14.1	20.0
	Thang Long Secondary School	111	11	30.0	20.0
	Phan Huy Chu high school	55	12	14.9	21.8
	Binh Minh high school	57	13	15.4	23.7
	Nguyen Binh Khiem high school	67	0	18.1	0.0
Total		370	55	100.0	100.0

Table 3. Awareness of SDGs of teachers and students in the case study (%).

	Know SDGs		Not know SDGs	
	Students	Teachers	Students	Teachers
Secondary school	8.0	81.8	92.0	18.2
High school	22.3	59.6	77.7	40.4
University	17.9	100.0	82.1	0.0
Male	15.8	88.9	84.2	11.1
Female	15.6	71.7	84.4	28.3

3-3. Results

3-3-1. Status of awareness of Vietnamese students and teachers about SDGs

Awareness of students and teachers about SDGs in the 6 schools surveyed was shown in the Table 3. Ratio students, who have not known SDGs are still high, account for 92% (secondary school) 77% (high school), 82% (university). Also, the ratio are lower for teachers in secondary (18.2%) and in high school (40.4%). Lecturers in University of Education surveyed have known SDGs. The ratio knowing/not knowing SDGs are balance between male and female.

3-3-2. The most interested SDG of students and teachers

About the most interested SDG was asked, the differences of selection between teachers and students are quite clear (Fig 3). With 17 SDGs were asked, almost teachers and students have selected Goal 3 (good health and well-being) with 52.7% (teachers) and 20.3% (students). SDGs from the view of education on agriculture and natural environment were also selected through the goals (1, 2, 3, 4, 6, 11, 13, 14, 15) by many students and teachers, in that, the Goal 1 (no poverty), Goal 4 (quality education) and Goal 13 (climate actions) were interested in so much.

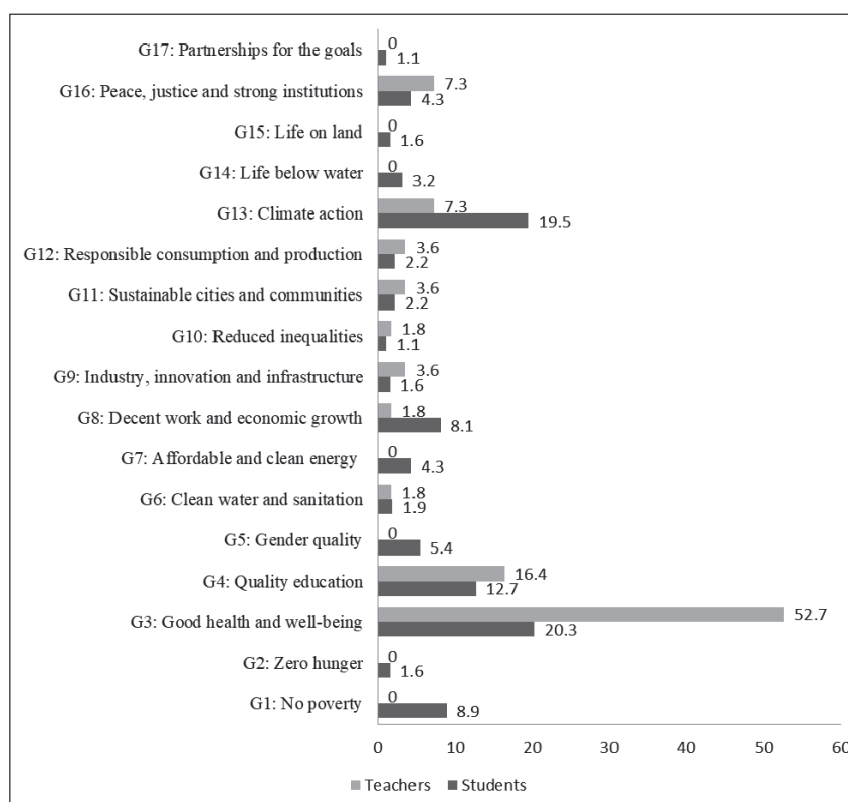


Fig. 3. The most interested SDG (%).

3-3-3. Some opinions of teachers and students about activities to achieve sustainable goals from agricultural and natural environment

The research team surveyed respondents' opinions from the perspective of agriculture and the natural environment showing the diversity in assessing the effectiveness of sustainability goals to be achieved. The opinions of students are different from one's teachers. The results were shown in the below box 1 and box 2.

With the above results, it is necessary to have solutions to raise awareness of SDGs for stakeholders, especially teachers and students. Vietnam has taken important steps such as integration into the educational program, in order to support teachers and students to realize their full role in achieving the SDGs. Newspapers, radio and television are also an important information channel used to propagate and disseminate laws and policies on sustainable development.

Box 1: Students' opinions on activities to achieve sustainable goals from agricultural and natural environment access

- Create a healthy living environment, minimize environmental pollution and provide a clean food source.
- State policies, raising awareness of community.
- Propagating activities on forest and environment protection, planting and tending trees, applying science and technology to agriculture. Mobilize people to take action for the environment to reduce waste from agricultural and industrial activities
- Afforestation by improving the living environment.
- Pay attention to annual tree planting activities
- Improving water sources, rice seeds, effectively using natural resources
- Use organic fertilizer
- Encouraging agricultural development with the production of clean agricultural products, limiting genetically modified agricultural products; Control the use of plant protection drugs; Need to develop agricultural fields
- Improve the water environment; Application of green technology in agriculture
- Do not use pesticides, smoke and actively participate in garbage collection activities;

Box 2: Teachers' opinions on activities to achieve sustainable goals from agricultural and natural environment

- Use products of natural origin.
- Balance between production and environment. It is necessary to have an effective waste treatment system
- Production and consumption must be responsible.
- Educating and organizing experience activities for students and students.
- Replace chemical fertilizers with organic, inorganic and urban manure
- Need green space, minimize the impact on the natural environment, especially air quality, limit the use of plastic packaging
- Planting many trees, using resources economically
- Planting trees and nurturing greenery, using environmentally friendly and easily biodegradable

materials.

- Having laws and strict enforcement to ensure sustainability target criteria
- Protect the beautiful green environment, plant a lot of trees. Improve the quality of teaching from passion-driven lectures
- Use items that are environmentally friendly, do not pollute the environment. Raising animals and clean food. Preserve beautiful natural green environment.
- Adjustment of agricultural cultivation process is needed. Limiting the use of chemical waste indiscriminately actively planting trees into air conditioners in daily life minimizes dust and pollution causing increased environmental pollution;

4. Discussion

Firstly, In Vietnam, sustainable development-oriented education is a top concern of political organizations, the Government, MOET, other ministries, local governments expressed in the system of guiding views, legal policies and action programs. Research towards the approach of sustainable education development from the perspective of agriculture and nature in Vietnam has been interested by many researchers with many educational trends such as environmental sustainability; the role of sustainable development education, research on women in improving the status of women, reducing population growth, promoting environmental protection and increasing the quality of life.

Secondly, in the general education curriculum in Vietnam, the contents of environmental education are often integrated into some compulsory subjects. In addition, students have extra- circular activities to protect the environment, increase responsibility for nature, respect labor activities including farmers ... through the school education activities. In the school education program in Vietnam that has been officially applied since 2018, the nature-oriented experience is one of the main contents to help students have an understanding of the environment, how to protect and save resources during living.

Thirdly, in the new national education - 2018 program, there is a new educational content, which is local education. Local education activities help equip students with the knowledge of where to live, fostering students love the homeland, a sense of applying the knowledge learned to solve local problems. In the content, each local will have different learning contents depending on the conditions and practical circumstances for each one.

Fourthly, the general education program in Vietnam has integrated knowledge about the natural environment and agriculture but has not yet helped learners identify SDGs that Vietnam is committed to. The results also show differences in educational attainment when teachers' awareness of sustainability goals is higher than that of students. Although students are equipped with knowledge of the natural environment and knowledge of environmental protection, the educational content for students about the goals of sustainable development have not been formally focused on activities. Experiments aim to create a sense of civic responsibility for SDGs. The difference in geographic area makes the awareness of Vietnamese students on SDGs is changed strongly, the correlation between SDG's full awareness and students' environmental protection behaviors is not seen yet. While they will play an important role in helping Vietnam achieve its sustainable development goals by 2030. Therefore, students need to raise awareness about SDGs as well as raise awareness of levels of leadership and management of the state.

4. Conclusion

Awareness of teachers in schools and students of SDGs is low, the number of people asked have never known about SDGs is very high in Hanoi, Vietnam. Government and communication have not focus on enhancing about SDGs for Vietnamese people, especially in schools. Although Vietnam had good ethnic experience of adaption to natural environment, some policies for sustainable development in education but the policies have not enough strong and updated for requirements for 17 SDGs of the United Nations.

In the context of Vietnam, it is necessary to build a suitable program for integrating into K12 and high education curriculums for enhancing awareness of SDGs, especially SDGs from the view education on agriculture and natural environment.

5. References

- 1) <https://www.un.org/development/desa/publications/the-sustainable-development-goals-report-2018.html>
- 2) <https://www.un.org/development/desa/publications/sdg-report-2017.html>
- 3) <https://www.un.org/development/desa/publications/the-sustainable-development-goals-report-2018.html>
- 4) <https://www.un.org/sustainabledevelopment/progress-report/>
- 5) www.fao.org/3/a-i4997e.pdf
- 6) Olsen, S.H., Teoh, S., & Miyazawa, I. (2015) ASEAN community and the Sustainable Development Goals: Positioning sustainability at the heart of regional integration. *Greening Integration in Asia*, 59.
- 7) Pitakdumrongkit, K. (2018). *Sustainable Development : Can ASEAN Lead the Process?*. (RSIS Commentaries, No. 168). RSIS Commentaries. Singapore: Nanyang Technological University.
- 8) <https://bitly.com.vn/Mb5S9>
- 9) Vietnam National Assembly, 1993, 2005, 2014, *Environmental Protection Law*, National Political Publishing House.
- 10) Thai, P.D. (1993) *Some foreign experiences on environmental education, General summation and Hanoi translation*.
- 11) Duc, N.H., Huong, V.T., Huong, N.T.V., Than, N.T. (2003) *Environmental education in elementary schools*, Education Publishing House, Hanoi.
- 12) Hang, H.T.T., (2002) *Some methods of environmental education for elementary students through out-of-class-hour educational activities*. PhD thesis in Pedagogy - Psychology, Hanoi National University of Education I
- 13) Khoa, L.V. (Editor) (2009) *Environment and environmental protection education*, Vietnam Education Publishing House.
- 14) Nhuan, N.D., Khang, N.V, (1999) *Some basic approaches on environmental education*, Vietnam Publishing House.
- 15) Nghi, P.T., Dung, V., Luu, N.V. (2005) *Awareness raising of community ecology for sustainable development goals*, Social Sciences Publishing House.
- 16) Sinh, N.N. (2008) *Environmental management for sustainable development*, Hanoi National University Publishing House.
- 17) Tuc, L.T. (1997) *Telling stories about the natural environment around me*. Education publishing House.
- 18) Thu, N.T.H. (2014) *Preschool education on climate change through games, poetry, storytelling, and riddles*. Education publishing House.

- 19) Ho Chi Minh City Pedagogical University (2013) Teacher guide on environmental awareness and climate change, translator Chu Van Cuong and Nguyen Thi Viet Phuong.
- 20) Hanh, N.P., Hang, N.T.T. (1997) environmental education through Geography at high school, Education Publishing House, Hanoi.
- 21) Hanh, N.P., Chuong, N.T.K. (1998) Environmental education through geography in high school. Educational Publishing House.
- 22) Sy, D.T. (2002) Environmental education through teaching ecology grade 11 in high school. PhD thesis in Educational Psychology, Hanoi Pedagogical University
- 23) Tri, N.H., Duc, P.V. "Education and Sustainable Development", In Proceedings of Science Conference, Hanoi, December 2005, Ministry of Education and Training, Hanoi University of Education, pp 50-53.
- 24) Decision No. 1363 / QD-TTg of October 17, 2001 of the Prime Minister approving the Project "Bringing environmental protection contents into the national education system".
- 25) Decision No. 158/2008/QD-TTg of December 2, 2008, approving the national target program on response to climate change.
- 26) MOET, the new K12 program 2018: <https://moet.gov.vn/tintuc/Pages/tin-hoat-dong-cua-bo.aspx?ItemID=5755>

From School Garden to a Plate: A Thai Model of Agricultural Education for Sustainability

Somsak Techakosit ¹, Pongprapan Pongsophon²

1. Kasetsart University Laboratory School, Faculty of Education, Kasetsart University, Bangkok, Thailand

2. Division of Science Education, Faculty of Education, Kasetsart University, Bangkok, Thailand

Abstract: This paper aims to study the implementation and examine the impact of a school garden program initiated by HRH Princess Sirindhorn of Thailand entitled the Agriculture for Lunch Project. The program incorporated the Late King Bhumibol's a New Theory of Agriculture that embraced sufficiency economy and sustainable development in agriculture revolving around self-reliance of food source and agricultural practice in harmony with the nature in a household to a community based on knowledge, ethics, virtue, and morality. The researcher visited a border school in the eastern part of Thailand to conduct in-depth interviews with a principal, a soldier teacher, and some student leaders as well as participant observation. The findings indicated that the program was implemented both in and out of class. The students collaboratively grew food plants and raised livestock and poultry from a very beginning, nurture, and harvest them using organic farming practice and integrated polyculture farming system. They also got involved in school's cooperative activities such as selling agricultural product to the school at low cost for free lunch for all students in school and to community. Even the school was underprivileged and remote, it had food security and had a good partnership model on sustainable development in agriculture between school and community.

Key Words: School garden, Sufficiency economy, Sustainable development

Corresponding Author: Somsak Techakosit (techakosit@gmail.com)

1. History and present situation of agricultural education in Thailand

Thailand is a country of agriculture because of suitable weather conditions for growing a variety of crops. The majority of the population are farmers and their main income is from farming (Thai Organic Trade Association, 2011; Isvilanonda and Bunyasiri, 2009). Thailand has been a major exporter of many agricultural products and goods to the world for decades (OECD, 2013). To increase production capacity and secure labor force, Thailand's agriculture has been transformed to a large-scale producer using advanced technology with the ambition to become the biggest agricultural exporter in Asia (OECD, 2013; Thailand International Development Cooperation Agency, 2010). The knowledge of this modern agriculture was disseminated to farmers by the Ministry of Agriculture and Cooperatives and by private sectors. The introduction of modern technology for a large-scale agricultural production, however, results in the replacement of polyculture by monoculture for tremendous commercial benefits. With the monoculture, the land for growing single crops is expanded. The utilization of chemical fertilizers and weed killers increases.

Consequently, it causes the loss of biodiversity, the reduction of soil fertility and climate change. Socially and economically, the utilization of the chemicals brings debt and poor health conditions among farmers. This is a not sustainable practice of agriculture in Thailand. (Shozo and Tounshirou, 2006; Kraipinit, Chantuk and Siriwong, 2017; Isvilanonda and Bunyasiri. 2009).

Sufficiency economy is a philosophy of living given by His Late Majesty the King Bhumibol to all Thais in 1997. It centers on sustainability for dealing with the challenges and threats as the results of drastic changes in the global economy. Sufficiency economy put emphasis on balance and a middle way of living and being practical at household, community and national levels. Sufficiency here means moderation, reasonability, and morality. His Late Majesty the King Bhumibol recognized the impact of globalization on local economy and society and thus he proposed an idea that later became known as the New Theory of Agriculture, which emphasizes integrated farming practices and the need to gradually transform the communities, by first laying down a firm foundation for sufficiency economy. According to the New Theory, the aim is to enable farmers to support themselves focusing on optimizing rice production, their main staple food, and then, water to grow other crops, The farmers should have a pond in the land to make sure that they have enough water for farming and household needs. The government or private sectors provide support and funding to the farmers in building a pond (Wibulswasdi, Piboolsravut and Pootrakool, 2012).

The New Theory is a part of His Late Majesty the King Bhumibol given for all Thais in agricultural sector. It provides principles and practical guidelines for sustainable agricultural management focusing on land and water use and polyculture. According to this theory, doing agriculture for household consumption throughout a year is prioritized and if there is some extra crop yield, the farmer can process and sell it to earn extra income. As elaborated in a speech delivered by HRH Princess Maha Chakri Sirindhorn of Thailand during her visit to the Museum of Agriculture and Culture, Kasetsart University, Bangkok on November 18, 2004, "Sustainable agriculture is the core of the New Theory given by HM the King Bhumibol. It is a way to restore the exploited and deteriorated natural resource and environment and revive ecological balance. The New Theory can resolve the problem and issue which is a consequence of international trade policy. Sustainable agriculture can raise farmers' quality of life. They can produce and rely on their high quality and sufficient food. They can also earn some income for their family. The New theory can promote environmental awareness among the farmers in restoring natural resource by properly managing natural resources and environment in their capability. This, collectively and constantly builds solid foundation in their community and bring prosperity and security to our nation as a whole".

2. An example of agricultural education programs in schools in Thailand

From School Garden to a Plate Project was initiated by HRH Princess Sirindhorn in 1980 with the aim to give secure food sources for students in remote areas by growing crops in their schools. The students need to access nutritious food for physical and cognitive development so they could grow up well to be adults who will develop their community in the future. At the initial stage, she piloted the project in three border schools and then expand to all border schools in the following years.

This article will take this project to be a case study of an agricultural education program that incorporate a New Theory of Agriculture. We visited one border school named Ban Na Yao Border School in Sachengsao province in the eastern part of Thailand. This school provided K-6 education. Most students migrated from the north-eastern part of Thailand. The school situated near a national reserve. Their parents are farmers. The school was founded and under the patronage of the late Princess Srinagarindra, the current

King' grandmother. She donated money to build a building and newer buildings were constructed from the donation of Princess Sirindhorn after visited. The goals of From School Garden to a Plate Project are to produce agricultural product to provide secure nutritious food for all students during school days and to get student involved in the production of crop so they gradually develop knowledge, skills, and positive towards sustainable agricultural practice which could pave way for their future career and high quality living in the near future.

The students from primary 1 to 6 learned a kind of vocational education program called Career subject two fifty-minute periods a week. One period is for agriculture and the other is for other careers. In the agricultural period, primary 1 to 3 students learn basic knowledge of agriculture. Primary 4 to 6 students engaged in hands-on activities in the field growing a variety of crops and feeding domestic animals such as pigs, chicken, ducks, fish, and frogs. The students learn how to do sustainable and organic farming. They were trained on how to make organic fertilizer. This learning experience was aligned with Princess Sirindhorn's idea about agricultural education, in her words, "get them to grow the crops, prepare and cook food. Teach them how to do toxic-free farming; sustainable agriculture, use fermented fertilizer, integrated pest control, reuse disposable materials to grow plants". The students under the supervision of their teachers plan what and how to grow seasonal crops appropriately, sufficient to all students with rich in nutritional value. The first author paid a visit to the school interviewing the principal, students, and a soldier teacher about putting the New Theory and the project into practice, challenges and limitations as well as being a participant observer to immerse himself in this authentic, lively, and fruitful learning experience to get in-depth understanding (Figs. 1, 2, 3 and 4).



Fig. 1. First author (right), the principal (middle), and the soldier teacher (left)



Fig 2. The school garden environment



Fig. 3. The soldier teacher and the youth farmers



Fig. 4. A student is feeding fish in a pond

The school reserved last period for the Agriculture subject so the student could have extra time out of class schedule, if they want, to nurture their plants and feed the animals. This is also a good time to get their parents who came to pick them up to get involved in the student learning. It is an effective strategy to extend the knowledge, skills, and good practice of sustainable agriculture and organic farming through this first-hand experience to a community. This strengthens the school-community partnership. It was reported that the school had been donated a pair of wild boars from a monk from a nearby temple. Teachers and students could successfully reproduce in a large number and in turn, sold the cubs to the villagers. In case the locals could not afford it, the school lent them the cubs. When they could grow and reproduce them, they return the new cubs to the school.

The schools recruit Youth Farmers from any interested primary 6 students in the school. These Youth Farmers volunteered to lead and participate in agriculture production activities such as harvesting the crops and selling them to the school's cooperative. School operative project was initiated by HRH Princess Sirindhorn to be a place where students were inculcated good ideology and morality and develop life and work skills such as collaboration, organizing a meeting, writing up a minute, and basic accounting. The cooperative bought the agricultural product for school lunch and sold some to the community.

From School Garden to a Plate Project was successful and as regarded education for sustainable development. In the short term, the school has a highly reliable source for nutritious food, cutting down expenditure to a great deal. They could use this school gardening program to be an authentic learning experience in which students could actively engage in agriculture and contribute to the school and community. In a long run, they applied their knowledge and experience of integrated agriculture according to the New Theory; resource allocation, balance and morality to improve agricultural practices at home for the consumption in their family as quoted "Grow all you can eat. Eat all you grow". If they have some extra, they could share with their neighbors or sell to earn some income. This is a good model for sustainability and food security in the school and beyond. The Princess said that this was how we prepared a new kind of farmers in the future. The school taught them right from the start to the end of a sustainable agricultural production process that is in harmony with the nature. This is also a partnership model to disseminate agricultural technology and good practice and gain support from and to the community.

3. Acknowledgement

The authors would like to express deepest gratitude to the school principal and the soldier teacher for coordination, collaboration, and insightful reflection on their good practice. Their kindness and insight are highly appreciated.

4. References

- Isvilanonda, S. and Bunyasiri, I. (2009) Food Security in Thailand: Status, Rural Poor Vulnerability, and Some Policy Options. Bangkok: Kasetsart University.
- Kraipinit, Y., Chantuk, T. and Siriwong, P. (2017) New Agricultural Management of Thailand. VRU Research and Development Journal Humanities and Social Science. 12 (2). 115-127.
- OECD. (2013) Economic Outlook for Southeast Asia, China and India 2014: Beyond the Middle-Income Trap. Retrieved 24 January 2020, from <http://dxdoi.org/10.1787/saeo-2014-en>
- Shozo, F. and Toushirou, M. (2006) Alternative Agriculture Development – Environment and Health-friendly Agriculture. Tokyo University of Agriculture Publisher, p.85-86.
- Thai Organic Trade Association. (2011) Overview of Organic Agriculture in Thailand. Retrieved 24

January 2020, from <http://www.thaiorganictrade.com/en/article/442>.

Thailand International Development Cooperation Agency. (2010) Thailand's Best Practices and Lessons Learned in Development. Retrieved 25 January 2020, from <https://www.undp.org/content/dam/thailand/docs/TICAUNDPbpVol1.pdf>

Wibulswasdi, C., Piboolsravut, P. and Potrakool, K. (2012) Sufficiency Economy Philosophy and Development. Bangkok: The Crown Property Bureau.

Education for Sustainable Development in Indonesia: A Special Case in Science Education

Fitri Khoerunnisa¹, Mita Nurhayati¹

*1. Department of Chemistry Education, Indonesia University of Education (UPI),
Bandung, Indonesia*

Abstract: The Sustainable Development Goals (SDGs) are a shared blueprint for people and the world, now and in the future, for peace and prosperity. There are 17 priorities of SGDs where good education is the 4th priority. Some education experts have formulated one of the involvements of the education sector in the implementation of SDGs. Education for sustainable development (ESD) is one of the initiatives. There are instruments to overcome those interconnected goals, such as social (justice, gender equality, human rights, democratic system, and healthcare), environment (effect of human activity on the environment, climate change, conservation of the environment as well as biodiversity), and economy (decent work and economic growth, sustainable city development). The curriculum of Indonesian education is an embodiment of ESD. The Indonesian education curriculum involves the idea of sustainable development, such as the application of science in daily life and environmental concerns. To address the environmental issue, students are required to have a meaningful learning and critical thinking. The example of ESD integration in science, technology, and environment in elementary school (natural event topic) and in junior high school (global warming topic) are presented.

Key Words: Education for sustainable development, Indonesian curriculum, Science and environment technology

Corresponding Author: Fitri Khoerunnisa (fitri@upi.edu)

1. The past and present situation of sustainable education in Indonesia

The Sustainable Development Goals (SDGs) was accepted by all Member States of the United Nations as Global Development Agreements. It offers people and the world, now and in the future, a common blueprint for peace and prosperity. There are 17 priorities resolved to address global problems such as poverty, injustice, climate change, destruction of the environment, peace, and justice. Each country should be able to overcome these challenges and work together to solve the problem of funding and policy changes that are required for the actualization of SDGs.

Bottom-up and participative SDGs have been formulated. To collect public responses, the United Nation has been affiliated with its partner organization. Four goals are suggested by the survey-based worldwide population, including good education, better health, better work prospects, safe and responsive governance structures. In 2015, more than 193 Indonesian Heads of State took part in the formulation of the SDGs and endorsed the 2030 SDGs for Indonesia (Holmean et al., 2016).

There are also national goals for the Indonesian government, named 'Nawacita.' Its main objective is to

improve the prosperity of the Indonesian communities. There is convergence and divergence between the SDGs and Nawacita. Some points are human growth, reduction of inequality, and economic development that in line with the Nawacita and SDGs. Nawacita should follow several points of SDGs in the field of ecology and environmental conservation (sustainable consumption and production, deforestation, water, and sea management, and so on). The compatibility of Nawacita with SDGs is shown in Table 1. Therefore, SDGs as a global development agenda is relevant with Nawacita as a national development program (Darajati, 2015).

Table 1. The compatibility between Nawacita and SDGs.

No.	National Development Agenda (Nawacita)	Relationship to SDGs
1	State existence to protect and provide safety for the citizen	Goals 3, 10, 16, 17
2	Government existence in developing clean, effective, democratic, and trusted governance	All goals
3	Develop country from the frontier and strengthening regions and village in Indonesia unity	Goals 1 – 11
4	Strong state role in reforming into a free corruption, dignity and trusted of system and law enforcement	All goals
5	Improving better human quality of life by ‘Indonesia Pintar’ program (compulsory education for 12 years), ‘Indonesia Sehat’ program to increase public health service quality, ‘Indonesia Kerja’ and ‘Indonesia Sejahtera’	Goals 2, 3, 4, 6
6	Increasing people’s productivity and competitiveness in international market	Goals 1 – 10
7	Self-reliant in economy by mobilizing strategic sector on domestic economy	Goals 1, 2, 3, 4, 5, 8, 9, 12
8	Nation character building by rearrangement of national education curriculum	Goals 3, 4, 11
9	Strengthening unity in diversity and social restoration	Goals 5, 10, 16, 17

An attempt has been made by the Indonesian government to introduce the SDGs. For example, point 4 of the SDGs on good education, the survey indicated that among 28,770 out of 28,554 Indonesian voters selected that good education is one of the most important priorities (data.myworld2015.org). It reflects that good education is the most priority for Indonesian community that should be established. Some points in Nawacita also concern to development in education. Improving better human quality of life to enhance the quality of public health service and building up the national by rearranging the national education curriculum are the points closely linked to education developments. It also showed that both the government of Indonesia and the communities pay great attention to the education development.

Some education experts have articulated the role of the education sector in the implementation of the SDGs. Education for sustainable development (ESD) is one of the ideas. It developed from environmental education, which is currently a global initiative. The ESD study, however, deals not only with the environment or natural resources, but also with cultures, social relationships, and communities.

They are tools to overcome some of the interconnected goals, such as social (justice, gender equality, human rights, democratic system, and healthcare), environment (effects of human activity to the atmosphere, climate change, environmental protection, and biodiversity) and economy (decent jobs and economic growth, sustainable city development) (Agung, 2010). On that direction, it is expected that humans must think globally. The seven criteria of ESD are shown on Fig. 1.

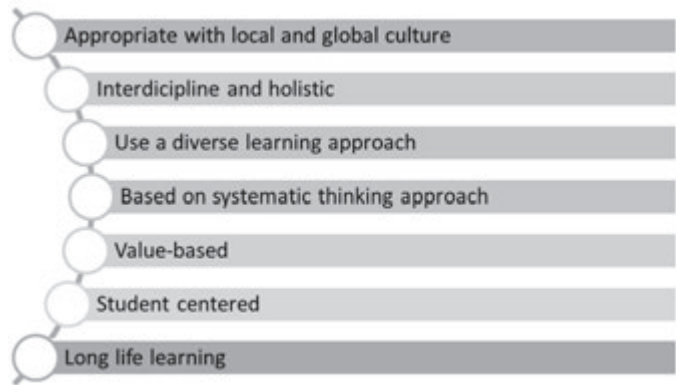


Fig 1. Seven Criteria of Education for Sustainable Development

The practice of fundamental value and SDGs

in Indonesia through the ESD cannot be segregated from the assistance of government agencies at central, province, and regional levels. The support at the central level is the arrangement of policies and programs, the provision of facilities and funding, as well as monitoring and evaluating the outcomes. Indonesia's Ministry of Education describes ESD as education that principally integrates the concepts and perspectives of the global environment widely and futuristically. The concept of ESD is education for the promotion of sustainable development, and meaningful education for all people and especially the next generation. Indonesian communities are expected to be able to build, to create, and to execute an action plan for the implementation of the ESD that can contribute to sustainable development. The implementation of ESD can be applied by various ways and various targets as an effort of community to contribute significantly to SDGs (Muhtar et al., 2014).

The national regulation offers the description of the implementation and management of Indonesian national education that relates to the 7 requirements of the ESD, which are:

- Article 40, verse (2) about meaningful, creative, dialogic, and fun learning;
- Article 50, verse (5) about local excellence based education;
- Article 51, verse (1) about school based management;
- Article 54, verse (1) about role of community in the education.

Indonesia's ESD is applied across formal, non-formal, and informal systems of education. In the case of formal education, it has regularity and ability to provide guidance to incorporate ESD based on level characteristics. ESD implementation can be seen from the curriculum that covering environmental education subjects in elementary, junior, and high school. Additionally, in Indonesia, non-formal education is conducted in educational units, such as study groups, courses, training, learning center, and any other units. Depending on needs and community circumstances, they run several services. ESD is executed by academic learning or skill testing. Informal education, on the other hand, is the smallest unit from community, it is family. In the family, ESD is implemented particularly in socio-cultural development (maintaining and evolving values, culture, and norm systems) that are applied in the community (Syakir, 2017).

ESD is reflected in the Indonesian education curriculum. It accommodates seven criteria of ESD. Some features of Indonesian education curriculum include:

1. Balancing the advancement of spiritual, social, interest, creativity, and teamwork with intellectual and psychomotor.
2. School is a part of society that delivers a well-planned experience of learning. In this case, learners extend what they learn to society and utilize society as a learning source.
3. Developing socially applicable behavior, awareness, and skills.
4. Providing enough time to develop attitudes, expertise, and skills.
5. Competence is described in the core competency that is detailed by the subjects' basic competency.
6. Core competency is the organization of specific competency components. To achieve core competency, all basic competencies and learning processes are created.
7. Basic competency is built based on accumulative, reinforced, and enriched between subjects and the educational stage.

2. Examples of learning on science and environmental technologies as the implementation of ESD in Indonesia

Indonesia is a country that intensively developing a lot of sectors such as education, economy, etc. Some activities that involved in the development process leads the impact to the environment. Environmental awareness, therefore, should be introduced in the education system. By means of environmental education in schools, the creation of environmental awareness in the community can be successful. Schools have a special role to play as a place of learning where schools may enable students to understand the effect of human activities on this earth. The environment issue such as natural resource, climate change, environmental conservation, and biodiversity is one of the ESD perspectives. The Indonesia's education curriculum involves the idea of sustainable development, such as the application of science in daily life and environmental issues. In addressing the environmental problems, students are required to have a meaningful learning and critical thinking (Shantini, 2015; Segara, 2015).

In elementary school, ESD incorporation into learning experiences has been introduced. The integration of science, technology, and society (STS) approach is the paradigm used in learning activities. The learning activity is divided into the initial stage, the main stage, and the final stage that can be carried out in three meetings (cycles). The main stage consists of five steps, i.e., preliminary, development of concepts, implementation of concepts in daily situations, stabilization of concepts, and evaluation. For instance, this approach was applied to 5th grade students at elementary school in Indonesia (Nurjanah, et al., 2016). The result demonstrated that this model improved the student's learning outcomes more effectively than that of conventional model.

Practically, in the initial stage, through this model, teacher will open the meeting with apperception by discussing the natural disaster that ever happened in Indonesia and experienced by students. The preliminary phase is started on the first meeting with the question "how if there is a flood in your environment?". Based on the real experiences, this phase will lead students to create their initial awareness. The teacher presents the photos of flooding on the second meeting at the preliminary stage and addresses the causes of flooding. This stage will give students an insight about the natural evidence that can and cannot be prevented. A video of natural disasters/issues that have ever occurred in Indonesia is shown by teacher at the third preliminary stage meeting. This phase will allow students to describe the cause and to formulate the solution to prevent it.

The process of concept formation is identical at the first, second and third meetings. Students are divided into small groups and given a worksheet. They discuss within their group based on the worksheet and

later present the discussion results in front of the class. Teacher gives to recognize the student's efforts. In the concept application stage, students have an opportunity to give an opinion or comment on how to prevent natural events in Indonesia. Teacher emphasizes some suggested solutions offered by students and recommends one of the best solutions. Students and teacher on the second meeting plant trees around the school area to save the environment from natural disasters as a concept application in daily life. Students make a poster on "Environmental Care" at the third meeting and put it on school wall magazines. This activity will improve their psychomotor skills.

The concept stabilization step on the first, second and third meetings is similar. The teacher emphasis the concept that should be understood to avoid misconception. Students perform certain tests in the assessment step to see whether the learning objectives are accomplished. Building a conclusion and supplying student homework is the final stage activities conducted by teacher on the first, second and third meetings.

The Problem Based Learning (PBL) model is another approach that is suitable to be applied in ESD. ESD integration in PBL is carried out by combining ESD issues in PBL that will be solved by students in a group. The solution is explored by students based on an interdisciplinary framework, such as economy, environment, and socio-cultural. Students should be able to build their own knowledge by doing. In Junior High School, the PBL approach that integrated with ESD can be used to illustrate the concept of global warming. Students are given an issue with the present condition of the earth caused by global warming and are then asked to create "sustainable house" that considers the elements of ESD.

Learning activity are carried out in 3 sessions. Greenhouse effect, global warming, and recent environmental issues are the subtopics addressed. Students discuss about recent atmospheric conditions on the greenhouse effect sub-topic session. After that, students do a greenhouse effect experiment and compare the results with the atmosphere condition. Students conduct an experiment on water expansion on the sub-topic of global warming to illustrate the impact of climate change at the sea level height. This approach substantially improved students' comprehension remarkably (Latifah, 2018).

Indonesia is the world's largest island country, with a land area of 735,358 square miles. This contributes to distinctive diversity between one region and another, consequently, the implementation of ESD often varies. This creates certain challenges in the implementation of ESD in the Indonesian region, such as:

1. Public participation to build the ESD awareness is still quite low.
2. There is an increase in the total population of the country that requires high quality education.
3. It is also important to develop the capacity of educators and educational workers to incorporate ESD concepts and values.
4. School facilities and amenities are still insufficient.

Schools have a special role to play in helping students to understand the effect of human behavior on their environment. Specific environmental concerns, however, demonstrate that environmental education has not yet succeeded to profile the character of environmental protection. Such impediments are as follows:

1. Society participation to play a role in environmental education is still impoverished, owing to a lack of engagement, capacity, and skills to address the issue.
2. Some educators in formal education believe that it is not too essential to deliver environmental education.

3. Due to unique diversity of Indonesian populations, implementation of ESD involves various teaching methods should be developed.
4. The communication gap between educational institutions and educators is contributing to formal, non-formal and informal environmental education being non-synergistic and intermittent.

3. References:

- Agung, I. (2010) Perspektif multidimensional pendidikan pembangunan berkelanjutan: Pemikiran awal konsep dan penerapan. *Jurnal Pendidikan dan Kebudayaan*, 16 (4), 453-468. (in Bahasa)
- Darajati, W. (2015) Sustainable Development in the National Development Plan (RPJMN) 2015-2019. BAPPENAS, Jakarta, Indonesia. (in Bahasa)
- Hoelman, M. B., Parhusip, B. T. P., Eko, S., Bahagijo, S., & Santono, H. (2016) Sustainable Development Goals: Panduan untuk Pemerintah Daerah Kota dan Kabupaten dan Pemangku Kepentingan Daerah, International NGO Forum on Indonesian Development, Jakarta, Indonesia. (in Bahasa)
- Latifah, I., Nugraha, M. G., & Wijaya, A. F. C. (2018) Integrasi ESD (Education Sustainable Development) dalam pembelajaran Problem Based Learning (PBL) untuk meningkatkan penguasaan konsep siswa SMP. *Prosiding SINAFI 2018*, 75-81. (in Bahasa)
- Mochtar, N. E., Gasim, H., Hendarman, H., Indrastuti, N., Wijiasih, A., Suryana, C., Restuningsih, K., & Tartila, S. L. (2014) Pendidikan untuk Pembangunan Berkelanjutan di Indonesia Implementasi dan Kisah Sukses. Komisi Nasional Indonesia untuk UNESCO, Jakarta, Indonesia. (in Bahasa)
- Nurjanah, N., Panjaitan, R. L., & Kurnia, D. (2016) Pengaruh model sains teknologi masyarakat terhadap hasil belajar siswa kelas V pada materi peristiwa alam. *Jurnal Pena Ilmiah*, 1 (1), 831-840. (in Bahasa)
- Segara, N. B. (2015) Education for sustainable development (ESD) sebuah upaya mewujudkan kelestarian lingkungan. *Sosio Didaktika*, 2 (1), 22-30. (in Bahasa)
- Shantini, Y. (2015) Penyelenggaraan ESD dalam jalur pendidikan di Indonesia. *Pedagogia*, 13 (1), 136-141. (in Bahasa)
- Syakur, A. (2017) Education for sustainable development sebagai respon dari isu tantangan global melalui pendidikan berkarakter dan berwawasan lingkungan yang diterapkan pada sekolah dasar, sekolah menengah dan kejuruan di kota Malang. *Eduscience*, 1 (1), 37-47. (in Bahasa)

References (Translation in English by authors):

- Agung, I. (2010) Multidimensional perspective in sustainable education development: The primary concept and application. *Journal of culture and education*, 16 (4), 453-468. (in Bahasa)
- Darajati, W. (2015) Sustainable Development in the National Development Plan (RPJMN) 2015-2019. BAPPENAS, Jakarta, Indonesia. (in Bahasa)
- Hoelman, M. B., Parhusip, B. T. P., Eko, S., Bahagijo, S., & Santono, H. (2016) Sustainable Development Goals: A guidance for city government and stakeholders, International NGO Forum on Indonesian Development, Jakarta, Indonesia. (in Bahasa)
- Latifah, I., Nugraha, M. G., & Wijaya, A. F. C. (2018) Integration of ESD (Education Sustainable Development) in Problem Based Learning (PBL) to improve the conception of Junior School Students, *Prosiding SINAFI 2018*, 75-81. (in Bahasa)
- Mochtar, N. E., Gasim, H., Hendarman, H., Indrastuti, N., Wijiasih, A., Suryana, C., Restuningsih, K., & Tartila, S. L. (2014) Education for sustainable development in Indonesia: Implementation and success story. National committee of UNESCO for Indonesia, Jakarta, Indonesia. (in Bahasa)

- Nurjanah, N., Panjaitan, R. L., & Kurnia, D. (2016) The effect of Science Technology Society model on the elementary school grade 5 students' understanding of natural evidence. *Jurnal Pena Ilmiah*, 1 (1), 831-840. (in Bahasa)
- Segara, N. B. (2015) Education for sustainable development (ESD) as an effort on realizing environmental sustainability. *Sosio Didaktika*, 2 (1), 22-30. (in Bahasa)
- Shantini, Y. (2015) Implementation of ESD on educational platform in Indonesia. *Pedagogia*, 13 (1), 136-141. (in Bahasa)
- Syakur, A. (2017) Education for sustainable development as a respond of global issues through character education and environmental awareness applied at elementary school, middle school, and high school in Malang city. *Eduscience*, 1 (1), 37-47. (in Bahasa)

