Student’s green skills in agricultural vocational school

M N Handayani1, 2, *, M Ali3, D Wahyudin3 and M Mukhidin4

1 School of Postgraduate Studies, Universitas Pendidikan Indonesia, Jalan Dr. Setiabudhi No 229 Bandung 40154, Indonesia
2 Study Program of Agro-industry Technology Education, Fakultas Pendidikan dan Teknologi Kejuruan, Universitas Pendidikan Indonesia, Jalan Dr. Setiabudhi No 207 Bandung 40154, Indonesia
3 Faculty of Education, Universitas Pendidikan Indonesia, Jalan Dr. Setiabudhi No 229 Bandung 40154, Indonesia
4 Faculty of Technology and Vocational Education, Universitas Pendidikan Indonesia, Jalan Dr. Setiabudhi No 207 Bandung 40154, Indonesia

*mustika@upi.edu

Abstract. Nowadays labour market demands employees with green skills due to green economy transformation. Students of agricultural vocational school as prospective workers have to hold these skills. This study was designed to identify students’ green skills in agricultural vocational secondary schools at study program of agricultural food processing technology. Five aspects that make up green skills based on past research were examined in this study. Data were collected through a set of questionnaires intended to gauge perceptions involving 195 students from different agricultural vocational schools in West Java Province, Indonesia. The result revealed that mean score for overall green skills was fair enough. However, it needs to be increased to produce competitive graduates in accordance with employer needs. Moreover, three aspects of green skills, namely management of waste, communication skills and innovation skills to respond green challenges are lower than the mean score. Findings of this study are the initial step in describing green skills of agricultural vocational students due to the limitations of this related research. More studies should be conducted to better understand and stimulate the integration of green skills into agricultural vocational curriculum to improve students’ green skills.

1. Introduction

The concept of green growth is a way to achieve sustainable development [1-3] as well as a strategy to overcome the environmental issues. Green growth is closely related to the idea of a green economy oriented towards improving social welfare and social justice, while at the same time reducing environmental risks and ecological deficiency [4]. The global transition to green economy can create a large number of green jobs in all sectors in both developed and developing countries. Green jobs need trained people in certain skills to facilitate the transition to a green economy [5]. In terms of creating green jobs, Indonesia faces challenges related to greening of Indonesian industries, i.e. the limited development of skills (low level of education of prospective workers and lack of trainer skills in transferring green knowledge) [6]. Adoption of green growth policies in support of green jobs requires new skills to respond to the needs of the workforce.
Green growth requires the development of new skills for both new jobs in green sectors as well as existing jobs that are changing to be more environmentally friendly [7]. Green skills are those skills needed to adapt products, services and processes to climate change and the related environmental requirements and regulations [8]. The successful key of transition to green economy is skilled workers who can meet the demands of green industry to design and implement greener business models since the shortage of such skills can hamper the development of green economy in both developed and developing countries [9]. Vocational and technical training plays a very important role in building the necessary skills for green jobs [10].

Vocational education in Indonesia starts from the secondary education level, which is vocational high school, where students are aged 15-18 years. There are various fields of expertise where Agricultural food processing and technology is one of the programs in vocational schools of agribusiness and agro technology expertise field. Students from this program should master the basic concept of food processing technology since they are prepared to work in a formal sector such as a food manufactory or in a supermarket/retail store and informal labor market such as in micro and small firms of a food product, or in a food home industry [11].

As it is known that food industry is one of the biggest energy users in the world where food production, preservation and distribution contribute greatly to the total greenhouse gas emissions that produce global warming [12] and industrial waste that is not managed properly can endanger the environment. Furthermore, green manufacturing processes in food industries that protect the environment are becoming increasingly important, most companies will ensure that food quality and safety are improved in sustainability [13].

Development of these trends has led employers to start looking for workers with green skills that are urgently needed to promote sustainable development in social, economic and environmental fields [14]. Students of agricultural vocational school as prospective workers, are required to have green skills. However, until now there has not been a study of green skills in vocational school. This study aimed to identify students’ green skills in agricultural vocational secondary schools at study program of agricultural food processing technology.

2. Method
This study was designed as a descriptive study with a quantitative approach as a data collection tool to identify green skills in agribusiness vocational students. Data was collected through a questionnaire distributed to agricultural vocational high school students of agricultural food processing technology study programs around West Java Province, Indonesia. The study involved 195 students (71% female) as shown at figure 1, aged 15 to 19 years to fill out the questionnaire voluntarily.

![Figure 1. Students by region and gender.](image-url)
The questionnaire used consisted of 43 items using a 5-point Likert scale from '1' strongly disagree to '5' as strongly agree [15]. In educational research, people are generally used as a source of data, where the questionnaire is one of the techniques used [16]. The questionnaire has undergone a process of developing research instruments, development of questionnaire items based on theoretical studies [17, 18, 19, 14, 15], validation of readability test content with expert judgment, and tested on respondents to determine their validation and reliability. In addition, the questionnaire was revised according to expert advice, declared valid and reliable.

All items in the questionnaire answered by respondents were grouped according to five elements and indicators of green skills as follows: 1) Environmental awareness; 2) Skills of innovation; 3) Skills of Communication; 4) Skills of adaptability; 5) Waste management. All data were analyzed using Statistics Packages for Social Sciences (SPSS) version 23.0. Data analysis includes reliability analysis to check whether selected items are reliable for elements in green skills. This study uses Cronbach's alpha which is based on the average correlation in items. Cronbach's alpha for items belonging to environmental awareness, skills of innovation, skills of communication, skills of adaptability, waste management respectively 0.851, 0.838, 0.810, 0.813 and 0.836. Thus, these findings indicate that the reliability of the distributed questionnaire set is very reliable and can be applied in this study.

3. Results and discussions
This study was intended to identify student’s green skills in Agricultural vocational school at study program of agricultural food processing technology. All students gave almost the same response to each indicator in green skills, where the average score was in the range of 3.42 - 4.54 (table 1). The highest expected score is 5, which is assumed that the students' green skills are good, according to the demands of the workforce. The indicator 'understanding written information' is the lowest score, while the indicator 'care about the environment' is the highest score. However, they are categorized as 'agreed' responses and the standard deviation shows a low score, which means that data points tend to be close to the average.

Identification of students' green skills in this study includes four elements of green skills (table 1) that are part of generic green skills. The generic green skills needed in almost all jobs to understand and appreciate the problems and demands involved in the green economy, have been classified into four categories as follows: (1) Cognitive competence (e.g. environmental awareness and willingness to learn about sustainable development; system skills and risk analysis; innovation skills to identify opportunities and develop new strategies to respond to green challenges); (2) technological skills related to green processes (quantification and monitoring (waste, energy, water); management systems (waste, energy, water); procurement and selection; use of materials and impact quantification; impacts and impact minimization; impact assessment; and risk management; (3) interpersonal skills (e.g. coordination, management and business skills to facilitate holistic and interdisciplinary approaches that cover economic, social and ecological goals; communication and negotiation skills for discussion of conflicting interests in complex contexts; marketing skills to promote products and services that are more environmentally friendly); and (4) intrapersonal competence (e.g. adaptability and transferable skills to enable workers to learn and apply new technologies and processes needed to green their work; entrepreneurial skills to seize the opportunities presented by low-carbon technology) [17].

Environmental awareness is interpreted as the formation of environmental sensitivity where individuals who are aware of environmental problems will have the behaviour to protect the environment [16,20]. Environmental awareness is defined as a combination of motivation, knowledge and skills. The higher the level of environmental awareness of a person, the more likely he will act environmentally friendly. Raising environmental awareness supports sustainable development [20].

Each element of environmental awareness consists of several aspects, as follows: 1) Motivation, values and attitudes (concerns about environmental issues and willingness to act); 2) Environmental knowledge (information about environmental problems, knowledge of the causal relationships of environmental problems and information about environmentally friendly activities); 3) Skills and abilities to act at different levels (waste, transportation, housing, participation in organizational
activities, homes, places work, leisure, hobbies and intentional habits) [14]. Environmental awareness is influenced by various factors including a person's educational background, level of education, and socioeconomic status.

Table 1. Mean for indicators in green skills element.

| ELEMENT               | INDICATOR                                                      | N  | Mean | Std. Deviation |
|-----------------------|----------------------------------------------------------------|----|------|----------------|
| Environmental         | Understanding environmental issues                           | 195| 4.04 | 0.87           |
| awareness             | Understanding settlement to environmental issues             | 195| 4.08 | 0.98           |
|                       | Caring to environmental issues                               | 195| 4.54 | 0.72           |
|                       | Participating in environmentally friendly activities         | 195| 4.24 | 0.89           |
|                       | Having a habit to preserve the environment                   | 195| 4.44 | 0.76           |
| Skills of innovation  | Analyze chance to promote green growth                        | 195| 4.13 | 0.79           |
|                       | Evolving creative programs to promote green growth           | 195| 3.64 | 0.94           |
|                       | Commencing creative settlement to environmental issues       | 195| 3.81 | 0.92           |
| Skills of communication| Conveying written ideas                                      | 195| 3.98 | 0.81           |
|                       | Understanding written information                            | 195| 3.42 | 0.95           |
|                       | Delivering verbally ideas                                    | 195| 3.86 | 1.02           |
|                       | Listening actively                                          | 195| 4.14 | 0.83           |
|                       | Realizing shifting to green jobs                             | 195| 4.39 | 0.87           |
|                       | Having open mindedness to the working shifting               | 195| 4.42 | 0.73           |
|                       | Showing positive emotions to working shifting                | 195| 4.17 | 0.85           |
|                       | Tenacious in facing the working shifting                     | 195| 4.31 | 0.8            |
|                       | Proactive to the working shifting                            | 195| 3.81 | 0.9            |
|                       | Understanding liquid waste management in food industry       | 195| 3.98 | 0.78           |
| Waste                 | Understanding solid waste management in food industry        | 195| 3.79 | 1.01           |
| management            | Understanding gas waste management in food industry          | 195| 3.51 | 1.06           |
|                       | Understanding hazardous and toxic waste management           | 195| 3.69 | 1.1            |

Based on research findings (table 1), environmental awareness of agricultural vocational school students in West Java has an average range of indicators of 4.04 - 4.54, which can be interpreted fairly fair so that more efforts are needed to educate students. Students in developing countries need more education to increase their awareness of environmental problems and help them solve these problems [21]. Education is a key factor in developing public knowledge and awareness about issues affecting the future of a country and the world [22]. School curriculum needs to be changed and developed more environmentally friendly and the number of lessons related to the environment in the curriculum must be increased [21]. Various co-curricular activities in schools may be encouraged to help in developing student's environmental awareness [22].

The other element of green skills identified in this study is waste management. It is viewed as part of a generation, collection and disposal system [23]. Waste generation is increasing as food production and processing increases to compensate for the explosion in human population. therefore, waste must be minimized and processed properly throughout the food chain [24]. The global food system generates a lot of waste both from food packaging and processing which has an impact on global problems related to economic, social and environmental [25]. Food processing is a diverse sector, including the use of various raw materials, processes and final products; from minimal (for example, selling fresh carrots) to very complex (for example, carrots that are washed, cut and packaged to be sold to sauces-making food processors who prepare individual-sized foods for sale to supermarkets or for airline catering) [24].
Students of agricultural food processing technology study program must have an understanding of management waste in food industry to support the development of green industry. Environmental issues related to the food processing chain mainly include reduction in biodiversity, wastewater generation, particles and toxicity; and generation of packaging wastes and organic residues (including by-products production) as well as air pollutants emissions (i.e., volatile organic compounds, particulate matter, greenhouses gases, and refrigerant leaks) [24].

Based on research findings (table 1), management waste of agricultural vocational school students in West Java has an average range of indicators of 3.51 – 3.98, which can be interpreted dissatisfactory so it requires efforts to improve it. The curriculum needs to be specifically designed to meet the demands of the industry, providing subjects that can improve the basic skills of students as prospective workforce [26]. The Curriculum Framework must connect different educational traditions, like Environmental Education and Global Learning to within sustainability education [27]. Capacity building is needed through more practical education and training for personnel who reflect the latest knowledge [28]. Educational institutions are very important to develop waste management courses with support and input from the commercial and industrial sectors so as to create a balance between academic aspects and practical skills [27].

4. Conclusion
This study reveals that the average score for green skills possessed by vocational agricultural school students as a whole is fair. However, it needs to be improved to produce competitive graduates in accordance with industry needs. In addition, three elements of green skills, namely waste management, communication skills and innovation skills to respond to green challenges are lower than the average score. The findings of this study are the first step in describing the green skills of agricultural vocational students due to the limitations of this related research. Further research is needed to improve students' green skills such as the development of vocational education curriculum that can improve all elements of green skills as follows: environmental awareness, skills of innovation, skills of communication, adaptability and waste management.

References
[1] OECD 2011 Green Growth Strategy Paris: Organization for Economic Cooperation and Development
[2] UNEP 2011 Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. [Retrieved 2015-11-03] Available at: http://www.unep.org/greeneconomy/Portals/88/documents/ger/ger_final_dec_2011/Green%20EconomyReport_Final_Dec2011.pdf
[3] World Bank 2012 Inclusive Green Growth: The Pathway to Sustainable Development. Washington D.C.: The World Bank. [Retrieved 2015-11-03] Available at: http://siteresources.worldbank.org/EXTSDNET/Resources/Inclusive_Growth_May_2012.pdf
[4] UNEP ILO 2011 Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World.
[5] Shanghai S and Sharma J 2014 Local development strategy, green jobs and skills in the Indian context Greener Skills and Jobs 179
[6] Gunawan J and Fraser K 2013 Developing ‘green’labour in Indonesia: What is the current state of play? Labour and Management in Development Journal 14(1) 1-23
[7] Pavlova M 2017 Green skills as the agenda for the competence movement in vocational and professional education In Competence-based Vocational and Professional Education (pp. 931-951) Springer, Cham
[8] OECD 2014 Greener Skills and Jobs OECD
[9] UNESCO 2016 The implications of greening industries on education systems and training policies in developing and advanced economies Global Education Monitoring Report
[10] Mustapha R. B 2015 Green and sustainable development for TVET in Asia Indonesia University of Education
[11] Misbah Z, Gulikers J, Dharma S and Mulder M 2019 Evaluating competence-based vocational education in Indonesia Journal of Vocational Education & Training 1-29

[12] Tiwari B K, Norton T and Holden N M 2013 Sustainable food processing John Wiley & Sons

[13] Xian C Y, Sin T C, Liyana M R N, Awang A and Fathullah M 2017 Green perspective in food industry production line design: A review In AIP Conference Proceedings 1885(1) p 020103. AIP Publishing

[14] Kokkinen E 2013 Measuring environmental awareness in the world Lokakuu, University of Oulu 53

[15] Van Dam K 2013 Employee adaptability to change at work: A multidimensional, resource-based framework The psychology of change: Viewing change from the employee’s perspective 123-142.

[16] Coertjens L, Pauw J B, Maeyer S D and Petegem P V 2010 Do Schools Make a Difference in Their Students’ Environmental Attitudes and Awareness? Evidence From Pisa 2006 International Journal of Science and Mathematics Education 8(3) 497-522

[17] Pavlova M 2018 Fostering inclusive, sustainable economic growth and “green” skills development in learning cities through partnerships International Review of Education 64(3) 339-354

[18] Harris, K. L., Krause, K., Gleeson, D., Peat, M., Taylor, C., & Garnett, R. (2007). Enhancing assessment in the biological sciences: ideas and resources for university educators. Available at www.bioassess.edu.au.[8 Maret 2008].

[19] Spencer L M and Spencer P S M 2008 Competence at Work models for superior performance John Wiley & Sons

[20] Gadenne D L, Kennedy J and McKeiver C 2009 An Empirical Study of Environmental Awareness and Practices in SMEs Journal of Business Ethics 84(1) 45-63

[21] Özden M 2008 Environmental Awareness and Attitudes of Student Teachers: An Empirical Research International Research in Geographical and Environmental Education 17(1) 40-55

[22] Esa N 2010 Environmental knowledge, attitude &practices of student teachers International Research in Geographical and Environmental Education 19(1) 39-50

[23] Seadon J K 2010 Sustainable waste management systems Journal of Cleaner Production 18(16-17) 1639-1651

[24] Boye J I and Arcand Y 2013 Current trends in green technologies in food production and processing Food Engineering Reviews 5(1) 1-17

[25] Parfitt J, Barthel M and Macnaughton J 2011 Food waste within food supply chains: quantification and potential for change to 2050 Philosophical Transactions of the Royal Society 365 3065–3081

[26] Davis G 2008 Formulating an effective higher education curriculum for the Australian waste management sector Waste management 28(10) 1868-1875

[27] Ali M 2017 Curriculum Development for Sustainability Education Bandung: UPI Press

[28] Stone L 2005 From waste management to resource stewardship: revisiting business’ waste-related roles and responsibilities Waste and Recycle Conference 2005 pp 251–257