PROCEEDINGS

2015 3rd International Conference on Adaptive and Intelligent Agroindustry (ICAIA)

ICAIA 2015

August 3rd - 4th, 2015
IPB International Convention Center
Bogor, Indonesia

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Welcome Message from The General Chairs of ICAIA 2015

On behalf of the organizing committee, it is our pleasure to welcome you to International Conference on Adaptive and Intelligent Agroindustry, Bogor, Indonesia. This is the 3rd conference on the topic that is held by the Department of Agroindustrial Technology, Bogor Agricultural University, Indonesia.

The conference is expected to provide excellent opportunity to meet experts, to exchange information, and to strengthen the collaboration among researchers, engineers, and scholars from academia, government, and industry. In addition, the conference committee invited five renowned keynote speakers, i.e. Prof Irawadi from Bogor Agricultural University; Prof Kenneth De Jong from George Mason University, USA; Dr Yandra Arkeman from Bogor Agricultural University; and Dr Guillermo Baigorria from University of Nebraska-Lincoln, USA.

The conference committee also invited Prof Noel Lindsay from University of Adelaide, Australia; Kiyotada Hayashi from National Agricultural Research Center-Tsukuba, Japan; Prof Margareth Gfrerer from Islamic State University of Jakarta, Indonesia; Dr Barry Elsey from University of Adelaide, Australia; Dr Gajendran Kandasamy from Melbourne University, Autralia; and Imperial College London-British, Prof Allan O'Connor from University of Adelaide, Australia; Dr Wisnu Ananta Kusuma from Bogor Agricultural University ,Indonesia; and Dr Frank Neumann from University of Adelaide, Australia, as invited speakers.

This conference was organized by Department of Agroindustrial Technology, Bogor Agricultural University and Asosiasi Agroindustri Indonesia, and technically sponsored by IEEE Indonesia Section. Furthermore, it was supported by Departement of Computer Science, Bogor Agricultural University; Surfactant amd Bionegergy Research Center; PT Bogor Life Science and Technology; Indonesian Ministry of Industry; PT Pachira Distrinusa; and PT Kelola Mina Laut.

I would like to take this opportunity to express my deep appreciation to the conference's committee members for their hard work and contribution throughout this conference. I would like to thank authors, reviewers, speakers, and session chairs for their support to participate in the Conference. Lastly, I would like to welcome you to join ICAIA 2015 and wish you all an enjoyable stay in Bogor.

Sincerely,
Dr Yandra Arkeman
General Chairs, ICAIA 2015

WELCOMING ADDRESS

Prof. Dr. Ir. Nastiti Siswi Indrasti
Head of Agroindustrial Technology Department
Faculty of Agricultural Engineering and Technology
Bogor Agricultural University

on

3rd International Conference on Adaptive and Intelligence Agroindustry (3rd ICAIA)

Bogor, August, 3 – 4, 2015

Assalamu'alaikum Warohmatullahi Wabarokatuh
In the name of Allah, the beneficent and the merciful,

Distinguish Guest, Ladies and Gentlemen
Let me first thank you all for accepting the invitation to participate in this 3rd International Conference on Adaptive and Intelligence Agroindustry (ICAIA). In particular I would like to thank Rector of IPB (Institut Pertanian Bogor/Bogor Agricultural University) Prof. Herry Suhardiyanto for supporting this event as part of the series academic event in celebrating the 52nd Anniversary of Bogor Agricultural University.

We are certainly proud to have been able to assemble this event in IPB, Bogor. The range of participants and audience at this conference is precisely something I would like to stress. Participants who followed the event more than 150 people, coming from various countries including the USA, Australia, Japan, Vietnam, Philippine, Germany and Indonesia. The main goal of the conference is to provide an effective forum for distinguished speakers, academicians, professional and practitioners coming from universities, research institutions, government agencies and industries to share or exchange their ideas, experience and recent progress in Adaptive and Intelligent Agroindustry.

The 2015 3rd International Conference on Adaptive and Intelligent Agro-industry (ICAIA) is the third forum for the presentation of new advances and research results on various topics in all aspects of innovative agro-industry that highlights the development and improvement for today and tomorrow's global need for food, energy, water and medicine. The aim of the conference is to stimulate interaction and cohesiveness among researchers in the vast areas of innovative agro-industry. Innovative Agro-industry has the ability to adapt intelligently to future global challenges, i.e. food, energy, water, and medical. Global challenges needs a new breed of Agroindustry which could produce innovative products to fulfill the needs through advanced processing technology, production systems and business strategy supported by cutting-edge information and communication technology.

The topic for this event is "Empowering Innovative Agroindustry for Natural Resources, Bioenergy and Food Sovereignty". The topics clustered into four main parts:
Track 1 : Innovative Agroindustrial and Business System Engineering

Track 2 : Frontier Approaches in Process and Bioprocess Engineering
Track 3 : Frontier Approaches in Industrial Environmental Engineering
Track 4 : Intelligent Information and Communication Technology for Adaptive Agroindustry of the Future

This event also hosts four (4) workshops: (1) Strategies for Agroindustry Development (2) LCA for Agroindustry (3) Innovation and Technopreneurship for Agroindustry and (4) Agroindustry Informatics.

Distinguish Guest, Ladies and Gentlement,
Agroindustry transforms agricultural commodities into high value-added products. Agroindustry is industry that process agricultural products to increase their value added significantly by using technology and by considering environmental aspect and sustainability. However, with changing global demand and technology advancement, innovative agroindustry is needed in order to be competitive as well as sustainable. The challenge of future agroindustry is not merely efficiency and productivity anymore, but also the challenge to appropriately apply frontier technology as well as meeting future global demands.

Agroindustry needs to deal with the application of advance technologies and cope future global issues. Current global issues which arise and expected to exist in the future are food sovereignty, renewable energy, sustainable water management and pharmacy. The ability of agro-industry to respond the future global issues and the undoubtedly substantial increase in demand in future decades will be highly dependent on the increased application of existing technologies as well as the exploitation of new and innovative technologies.

The emergence of high technology could be applied in the agro-industry are: nanotechnology, biotechnology, bioinformatics, food processing, food packaging-waste, state-of-the-art computation and many others. The aforementioned high-technology along with computation technology could greatly advance agro-industry from a traditional system into a smart-intelligent and innovative technology. Therefore, in the new millennia, adaptive-intelligent and innovative agro-industry will contribute to solutions to global problems and brings agriculture into perfection.

Hope this conference will also discuss this issue in more detail as it is an important matter for all of us. We should no more think just how to produce high value product but it is also necessarily important how to keep our live in good quality by understanding following old saying… “You do not live at once. You only die once and live every day”.

I do not to take up any more of your time with these opening remarks. Let me simply thank you once again for sharing your thoughts with us. Here’s wishing every success for the conference. May Allah bless all of us.

Thank you for your kind attention,
Wassalamu’alaikum Warohmatullahi Wabarokatuh

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AGENDA

Time	Activities
Monday, August 3rd 2015	
08.00 - 09.00	Registration
09.00 - 10.00	Opening Ceremony • Welcoming Address: Prof. Nastiti Siswi Indrasti (Head of DAT, Fateta, IPB) • Welcoming Speech Head of Bogor Regency • Conference Opening: Prof. Herry Suhardiyanto (Rector of IPB) • Opening Speech and Conference Opening : Minister of Industry Indonesia * • Launching Expose International program DAT
10.00 – 10.05	*Photo Session*
10.05 - 10.15	*Coffee break*
10.15 - 10.45 10. 45 - 11.30 11.30 – 12.00 12.00 – 12.30	Keynote Speech : 1. Prof Irawadi (Bogor Agricultural University, Indonesia) 2. Prof. Kenneth De Jong (George Mason University, USA) 3. Dr. Yandra Arkeman (Bogor Agricultural University, Indonesia) 4. Dr. Guillermo Baigorria (University of Nebraska, Lincoln, USA)
12.30 – 13.30	Lunch break
13.30 – 13.50 13.50 – 14.10 14.10 – 14.30 14.30 – 14.50 14.50 – 15.10 15.10 – 15.45	Plenary Session 1 : Prof. Noel Lindsay (University of Adelaide, Australia) Dr. Kiyotada Hayashi (National Agricultural Research Center, Tsukuba, Japan) Prof. Margareth Gfrerer (Islamic State University of Jakarta, Indonesia) Dr. Barry Elsey (University of Adelaide, Australia) Ir. M. Novi Saputra (Marketing Director KML Food Group) *Discussion*
15.30 – 15.45	*Coffee break*
15.45 – 18.00	Parallel session A, B and C
18.00 – 21.00	Welcome Dinner

Time	Activities
Tuesday, August 4rd 2015	
08.30 – 09.00	Registration
09.00 – 09.20 09.20 – 09.40 09.40 – 10.00 10.00 – 10.20 10.20 – 10.45	Plenary Session 2 : Dr. Gajendran Kandasamy (PhD in Physic, Melbourne University ; PhD in Innovation Imperial Collage, London) Prof. Allan O'Connor (University of Adelaide, Australia) Dr. Eng. Wisnu Ananta Kusuma, ST, MT (Bogor Agricultural University, Indonesia) Dr. Frank Neumann (University of Adelaide, Australia) *Discussion*
10.45 – 13.00	Parallel Session A, B and C
13.00 – 14.00	Lunch break
14.00 – 15.30	Parallel Workshop • Strategies for Agroindustry Development • LCA for Agroindustry • Innovation and Technopreneurship for Agroindustry • Agroindustrial Informatics
15.30 – 15.45	Coffee Break
15.45 – 16.15	Closing remark

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How to Deal with Diversity in Cultivation Practices Using Scenario Generation Techniques: Lessons from the Asian Rice LCI Initiative

Kiyotada Hayashi [1)], Yandra Arkeman [2)], Elmer Bautista [3)], Marlia Mohd Hanafiah [4)], Jong Sik Lee [5)], Masanori Saito [6)], Dhani Satria Wibawa [2)], Koichi Shobatake [7)], Suprihatin [2)], Minh Tien Tran [8)], Thi Khanh Van Vu [9)]

[1)] *National Agriculture and Food Research Organization, Japan,* [2)] *Bogor Agricultural University, Indonesia,* [3)] *Philippine Rice Research Institute,* [4)] *National University of Malaysia,* [5)] *Rural Development Administration, Korea,* [6)] *Tohoku University, Japan,* [7)] *TCO2 Co. Ltd., Japan,* [8)] *Soils and Fertilizers Research Institute, Vietnam,* [9)] *National Institute of Animal Sciences, Vietnam*

E-mail: *hayashi@affrc.go.jp, yandra.arkeman@gmail.com, bautista_elmerg@yahoo.com.ph, marlia.mhanafiah@gmail.com, jongslee@korea.kr, msaito@bios.tohoku.ac.jp, dhani.sw@gmail.com, shobatake@tco2.com, suprihatin@indo.net.id, tranminhtien74@yahoo.com, vukhanhvan2002@yahoo.com*

***Abstract*—We established a research initiative to construct life cycle inventory (LCI) database of agricultural production systems in Asian countries. Our activities started from the preparation of LCI data on rice production systems in each country, because rice is an important common crop in Asian countries. In order to deal with diversity of cultivation practices, we used the methodology of scenario generation techniques, in which an agricultural production system is defined as combinations of many elements, i.e., agricultural management practices. This paper provides an outline of our activities so far and future perspectives on the development of LCI databases for agriculture and foods in Asian countries.**

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Kiyotada Hayashi is with National Agriculture and Food Research Organization, Agricultural Research Center, Tsukuba, Japan (phone: +81-29-838-8850; fax: +81-29-838-8515; e-mail: hayashi@affrc.go.jp).

Yandra Arkeman is with Department of Agroindustrial Technology and Surfactant and Bioenergy Research Center, Bogor Agricultural University, Kampus IPB Baranang Siang, Bogor, Indonesia (e-mail: yandra_ipb@yahoo.com).

Elmer Bautista is with Rice Engineering and Mechanization Division, Philippine Rice Research Institute, Nueva Ecija, Philippines (e-mail: bautista_elmerg@yahoo.com.ph).

Marlia Mohd Hanafiah is with Faculty of Science and Technology, National University of Malaysia, Selangor, Malaysia (e-mail: mhmarlia@ukm.edu.my).

Jong Sik Lee is with National Academy of Agricultural Science, Rural Development Administration, Jeonju-si, Jeollabuk-do, Republic of Korea (e-mail: jongslee@korea.kr).

Masanori Saito is with Field Science Center, Graduate School of Agricultural Science, Tohoku University, Osaki, Japan (e-mail: msaito@bios.tohoku.ac.jp).

Dhani Satria Wibawa is with Surfactant and Bioenergy Research Center, Bogor Agricultural University, Kampus IPB Baranang Siang, Bogor, Indonesia (e-mail: dhani.sw@gmail.com).

Koichi Shobatake is with TCO2 Co. Ltd., Tokyo, Japan (e-mail: shobatake@tco2.com).

Suprihatin is with Department of Agroindustrial Technology, Bogor Agricultural University, Kampus IPB Baranang Siang, Bogor, Indonesia (e-mail: suprihatin@indo.net.id).

Minh Tien Tran is with Soils and Fertilizers Research Institute, Hanoi, Vietnam (e-mail: tranminhtien74@yahoo.com).

Thi Khanh Van Vu is with Department of Livestock Environment, National Institute of Animal Sciences, Hanoi, Vietnam (e-mail: vukhanhvan2002@yahoo.com).

I. Introduction

One of the important objectives of applying life cycle assessment (LCA) to agricultural production systems is to support decisions made by farmers and policy makers whether to introduce alternative agricultural practices. A typical example is the decision problem to select conventional or organic agricultural production. In this case, it is important to assess the changes in environmental impacts and profitability caused by the conversion to organic systems [1]. Another example is the decision whether to use functional materials such as fertilizers made from by-products of food products. Although they tend to increase crop yields, the assessment of environmental impacts cause by the application of the materials is not straightforward [2].

However, in earlier studies of LCA of agricultural production systems, the definition of agricultural production processes is conventionally conducted during the phase of "goal and scope definitions" and no explicit effort has been devoted to the problem of how to generate alternative agricultural production systems. If we use the terminology of decision analysis [3]–[5], the issue is how to invent innovative alternatives through the use of alternatives generation techniques in problem structuring. This is especially applicable to LCA of agriculture and food in Asia, because there are a

wide variety of agricultural systems under a wide variety of climatic conditions.

Therefore, we established an research initiative to develop life cycle inventory (LCI) databases of agricultural products in Asian countries. As a first step, we tried to make LCI data for rice production systems under site-specific conditions using scenario generation techniques. This paper outlines our recent activities on the development of LCI data of rice production systems in each countries.

II. METHODS

A. Scenario generation techniques

One of the most important ideas in our initiative is how to understand site-specific agricultural practices from more general and methodological perspectives. Although general procedures to construct LCIs have already been developed (e.g., [6], [7]), there is room to develop procedures to deal with diversity of cultivation practices in the real world. Therefore, we employed a scenario generation techniques derived from "the strategy generation table" [8], which has been used for inventing creative alternatives in decision analysis, in order to systematically define agricultural production systems as combinations of management practices under site-specific conditions [9].

TABLE I
ITEMS FOR RICE CULTIVATION SCENARIOS

No.	Item
1.01	Crop name
1.02	Variety (cultivar)
2.01	Location
2.02	Soil type
2.03	Average yield
2.04	Transplanting or direct seeding
2.05	Maximum depth of water
2.06	Proceeding crop (if rotated)
2.07	Following crop (if rotated)
3.01	Plowing and land preparation
3.02	Border coating
3.03	Raising of seedling
3.04	Basal fertilize application
3.05	Application of other organic materials
3.06	Start of flooding
3.07	Soil puddling
3.08	Transplanting
3.09	Weeding
3.10	Midseason drainage
3.11	Water management after midseason drainage (intermittent irrigation)
3.12	Additional fertilizer application
3.13	Fungicide application
3.14	Insecticide application
3.15	Herbicide application
3.16	Herbicide application (ridges between rice fields)
3.17	Weeding in ridges between rice fields
3.18	Harvesting
3.19	Drying
3.20	Management of rice straw

B. Scenario generation of rice cultivation in Asian countries

As a method to generate rice cultivation scenarios in each country, we prepared items of management practices, which are equivalent to strategy elements in strategy generation tables. The list of items are shown in Table I.

C. From scenario generation to inventories

On the basis of the rice cultivation scenarios, we made LCI data for foreground processes of rice production systems.

III. RESULTS

A. Rice cultivation scenarios

This section summarizes the current progress of scenario generation in our initiative.

Indonesia: Rice production systems in West Java are tentatively defined.

Japan: Since paddy rice is cultivated all over Japan, we made cultivation scenarios for conventional, environmentally friendly, and organic rice production systems in several prefectures. Organic production systems are, in many cases, based on the use of weeding machinery [10]– [12].

Korea: Conventional, no-pesticide, and organic rice production systems in the southern part of Korea were defined. No-pesticide and organic production systems are based on the use of river snails [12].

Malaysia: Rice production systems in in Peninsular Malaysia were tentatively defined.

Philippines: Two rice production systems, including NSIC (National Seed Industry Council) Rc varieties and NSIC hybrid rice varieties, in Nueva Ecija and one rice production system in Cagayan Valley, which uses NSIC Rc varieties, were defines [13].

Vietnam: Two rice production systems were defined. One is located in the Mekong River Delta and the other in the Red River Delta [14].

B. Construction of Foreground processes

We prepared the foreground process data on the basis of the scenarios. As a first step to the construction of LCI data for rice production systems in each country, we gathered data on yield, fossil-fuel consumption, electricity consumption, cultivation condition, agricultural machinery, greenhouses, fertilizers, pesticides, seedling, and other materials.

IV. DISCUSSION

A. Representativeness

We tried to construct our data empirically so far. The reason is that our primary purpose is the development of a common framework to assess rice production systems under the site-specific conditions, rather than preparing

a comprehensive database for environmental labelling policy making. Although the term "representativeness" is sometimes used for expressing the appropriateness of background data used for the assessment of a foreground process, we have now clarified that suitability and compatibility of scenarios are more appropriate terminologies in understanding the relationship between foreground and background process data. For example, in modeling processed foods made from rice, the issue is what kind of rice is used as the raw material for the processing and not whether the rice cultivation is representative in the country.

B. Inheritance of data structure

Although it seems to be a reasonable way to derive regionalized data (children) from global data (parents) as explained in ecoinvent 3 [7], our experience on tentative data development illustrates that further considerations on data structure and their inheritance are necessary for constructing LCI databases.

C. Background processes

Our project on the development of LCI data for rice production systems is still in progress in the sense that LCI data for agricultural inputs (such as fertilizers, pesticides, and agricultural machinery) have not yet been established. The situation we face makes a striking contrast to the case for AGRIBALYSE [15], which uses ecoinvent data for agricultural inputs in European regions. Although ecoinvent, for example, uses such European data in constructing LCIs for agricultural production systems in Asia (e.g., oil palm production in Malaysia) and South America (e.g., soybean production in Brazil), we have to reconsider the appropriateness of such LCI practices.

V. CONCLUDING REMARKS

This paper is an outline of our initiative on the development of Asian LCI databases of agricultural production systems. We started our activities on rice production systems, because rice is an important common crop in Asian countries. Our next step would be the extension of our activities into food supply chains including rice processing, distribution, and consumption. Paying attention to the other commodities such as palm oil and coffee is also important from the perspective of regional development. Recent diet shifts in Asian countries necessitate the assessment of animal products.

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