Biosecurity and Biodiversity

Keys to Promoting Local Food for Food Security and Food Sovereignty

Collected papers

Salatiga, February 2019

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Editors: John Lovett
Titi S. Prabawa
Linda Susilowati
Ian Falk

About biosecurity and biodiversity and APBSF

The Australian Plant Biosecurity Science Foundation supports plant biosecurity research, development, extension and capacity building, particularly focused where there is a need for investment in environmental, capacity building, international linkages, non-levy payer, cross-sectoral and strategic plant biosecurity research. The Foundation was established to follow the Plant Biosecurity Cooperative Research Centre (PBCRC) which finished operations in June 2018.

Plant Biosecurity is a set of measures designed to protect a crop, crops or a sub-group of crops from emergency plant pests at national, regional and individual farm levels. Plant Biosecurity is a global issue. Harmful plant pests and diseases can impact on our unique environment and biodiversity, food safety, agricultural trade and market access.

In this proceedings, biosecurity has an additional meaning: namely, the use and cultivation of Indonesian native plant resources, not only to prevent extinction of that genetic material through being overlooked and possibly cleared, but also to reduce reliance on imports of non-indigenous grains which potentially carry pests and diseases.

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- Universitas Mahasaraswati, Denpasar (UNMAS)
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Participants provided in-kind return transport and accommodation.
(See list of Participants on pages vi–vii.)

Front and back cover images, courtesy of the Crawford Fund.

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FOREWORD

In the on-going national and international debate and discussion about meeting the global imperatives of securing food security and food sovereignty, a vital objective is that regional and local connotations, challenges and opportunities shall be very much 'front of mind'.

The International Master Class (IMC) in Plant Biosecurity held in Denpasar, Bali, in January 2018 brought together participants from many parts of the vast Indonesian archipelago. One of the principal outcomes of two weeks of concentrated activity was the overwhelming support for projecting biosecurity thinking into Indonesian regions. This was seen as a cost-effective way of facilitating out-reach, thus achieving the objective.

The network which was established following the Denpasar IMC has remained very active, generating several proposals for Regional Master Classes (RMC). Universitas Kristen Satya Wacana based in Salatiga, Central Java, has long been a participant in bilateral activities between Indonesia and Australia and offered to host the first RMC on a cost-sharing basis with The Crawford Fund and the Australian Plant Biosecurity Science Foundation.

Representatives of the Centre for Agriculture and Bioscience International (CABI), the Centre of Excellence for Biosecurity Risk Analysis (CEBRA), the Indonesian Biosecurity Foundation (IBF), and Yayasan Qaryah Thayyibah (a farmer cooperative) made significant contributions to the RMC Program through their presentations and contributions to analysis of outputs and outcomes. Emphasising the regional focus, invaluable input was made by a number of local speakers.

All the Participants declared their experience an unqualified success, confirming that a shorter, focussed Master Class could deliver considerable benefit. Each Participant had prepared a case study before the RMC and undertook to draft brief papers concerning completed, current or proposed work. These papers would be published and would complement the formal reports made to the co-funders. This proceedings is the result.

In addition to highlighting key aspects pertaining to food security and food sovereignty, the RMC (i) helped to grow the network established following the IMC of 2018; (ii) raised the profile of the Indonesian Biosecurity Foundation as a peak body for the nation; (iii) further strengthened bilateral ties with Australia; and (iv) through CABI, cemented linkages to the rest of the biosecurity world.

A second RMC is in the planning stage. It will follow the Salatiga model and we look forward to its success and to those of other RMCs which may follow.

The Editors: JOHN LOVETT
TITI S. PRABAWA
LINDA SUSILOWATI
IAN FALK

Canberra, Salatiga and Darwin, May 2019

PRESENTERS

Mr Bahruddin	Founder, Yayasan Qaryah Thayyibah (Serikat Paguyuban Petani/Farmer Association), Kalibening, Salatiga.
Dra. Lusiawati Dewi, M.Sc.	Senior Lecturer in Biology, Universitas Kristen Satya Wacana, Salatiga.
Professor Ian Falk	Supervisory Board, Indonesian Biosecurity Foundation.
Dr Susan Hester	Senior Research Fellow, Business School, University of New England, Armidale, NSW; Deputy Director, Centre of Excellence for Biosecurity Risk Analysis (CEBRA).
Theo Litaay, Ph.D.	Senior Policy Adviser in The Executive Office of The President, Republic of Indonesia.
Professor John Lovett	Chair, Australian Plant Biosecurity Science Foundation (contributor, unable to present).
Dr Eka Martiningsih	Secretary, Indonesian Biosecurity Foundation; Senior Lecturer in Agriculture, Universitas Mahasaraswati, Denpasar, Bali.
Dr Wiske Rotinsulu	Senior Lecturer in Agriculture and Head of International Affairs at Sam Ratulangi University, Manado, Sulawesi.
Dr Sivapragasam	Regional Director of CABI, Malaysia.
Dr Drs. I Made Sukamerta, M.Pd.	Rector, Universitas Mahasaraswati, Denpasar, Bali.
Dr Suryasatriya Trihandaru	Vice Chairman, Indonesian Biosecurity Foundation; Pro-Vice Chancellor (Research), Universitas Kristen Satya Wacana, Salatiga.
Ms Dina Banjarnahor M.Sc.	(Moderator) Universitas Kristen Satya Wacana, Salatiga.
Dr Yohanes Martono M.Sc.	Universitas Kristen Satya Wacana, Salatiga (contributor, unable to present).

Image courtesy of Linda Susilowati

PARTICIPANTS

Mr Shofyan Adi Cahyono is a young entrepreneur in an organic farming business named Sayur Organik Merbabu Farm. He is also currently taking his Master degree in Agriculture at Universitas Kristen Satya Wacana. Mr Cahyono is organising young farmers to manage organic farming businesses and encourage youth in his areas to be resourceful farmers.

Mr Yudhi Vanstepan Simorangkir is a student of the Postgraduate program in Development Studies in Universitas Kristen Satya Wacana. He is actively working as a coordinator in Gerakan Mahasiswa Kristen Indonesia (GMKI-Indonesian Christian Student Movement, a youth not-profit organisation that consists of Christian students from various regions in Indonesia). His work is related to indigenous crops from Sumatra named Andaliman.

Mr Bhakti Yudha Prawira is a staff member in Jetty and Silo Operation Department from PT Indofood Sukses Makmur, Bogasari Flour Mills Division, Jakarta. He is actively working on monitoring the quality of wheat production in Bogasari, including pests and diseases management.

Mr Muhammad Dudi Salmon Bayu Aji is a Section Head of Milling from PT Indofood Sukses Makmur, Bogasari Flour Mills Division, Jakarta. His work is related to food safety management progress. Some of his activities are leading his team on flour mixing, retail packaging, and premium packing.

Mr Wahyono is a Genetic Resources Officer from PT East West Seed Indonesia, West Java. His main responsibility is to provide genetic materials in order to support the breeding programmes. His works are related to plant breeding, DNA extraction, plant genomics, and genetic engineering.

Mr Muhamad Taufik Hariyadi is a Genetic Resources Officer from PT East West Seed Indonesia, West Java. He is actively working on collecting genetic materials around Indonesia, exchanging genetic materials from International GeneBanks, and conserving genetic materials through rejuvenation.

Mr Slamet Haryono is a Senior Assistant Manager on Plasma Support from PT Austindo Nusantara Jaya Agri. He is also currently taking his Master degree in Sociology at Universitas Sumatera Utara. His works are related to oil palm plantations, especially in West Kalimantan.

Ms Maria Matoetina Suprijono is a lecturer in Nutrition and Food Biochemistry from the Faculty of Agriculture Technology, Universitas Katholik Widya Mandala, Surabaya. Her background is in Community Nutrition and Food Science. She focuses her research and teaching in Food Nutrition, Food Biochemistry, Nutrition Evaluation, Nutrient Formulation and Fortification. She is a member of the Indonesian Association of Food Technologists. (Unable to attend.)

Mrs Lina Mardliyah is a farmer and member of Serikat Paguyuban Petani Qaryah Thayyibah (SPPQT – Qaryah Thayyibah Farmer Groups Association). As a member of SPPQT she has a role on women empowerment programs in her village. Her ongoing program is to empower housewives from her village to have ability to process raw materials into various products.

Miss Hayuningtyas Dyah Cressidawati is a farmer and member of Serikat Paguyuban Petani Qaryah Thayyibah (SPPQT – Qaryah Thayyibah Farmer Groups Association). Her work is related to the production of alternative local food. She is currently working on alternative healthier flour substitution from cassava named Mocaf flour.

Miss Endang Dwijayanti is a farmer and member of Serikat Paguyuban Petani Qaryah Thayyibah (SPPQT – Qaryah Thayyibah Farmer Groups Association). She is currently working on organic farming management for her village through SPPQT.

Participants, continued

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Mrs Niken Widya Palupi is a program officer on training and development from Swisscontact Indonesia. She is also currently taking her doctoral degree in the Faculty of Agricultural Technology at Universitas Gadjah Mada, Yogyakarta. Her works are related to green production, market development, supply chain, and technology food-nutrition.

Mrs Rohning Sulistyani is on the extension staff from Department of Agriculture, Salatiga City Government. Her major work is on pests and diseases management. She is also working with local farmers and other stakeholders to develop an agritourism spot in Salatiga.

Mr Wilhelmus Terang Arga Sanjaya is a doctoral student in Microbiology, Department of Soil Science and Land Resources, Institut Pertanian Bogor, West Java. His current work is about bio-organic fertilizer for soil health and rice security.

Mr Dhanang Puspita is a Lecturer in Food Technology, Faculty of Medicine and Health Science, Universitas Kristen Satya Wacana. His research interests include natural pigments, food innovation, and food microbiology.

Mr Andreas Binar Aji Sukmana is a Lecturer in Microbiology, Faculty of Biology, Universitas Kristen Satya Wacana. His works are related to local food, microbiology, and biodiversity.

Mr Risya Pramana Situmorang is a Lecturer in Faculty of Biology, Universitas Kristen Satya Wacana. His works are related to biology education, food management, and farming systems.

Miss Monika Rahardjo is a Lecturer in Food Technology, Faculty of Medicine and Health Science, Universitas Kristen Satya Wacana. Her works include food technology, local crops, and food management.

Participants' locations, 'Regional Master Class in Plant Biosecurity 2019'

MASTERCLASS PROGRAM, 11–16 FEBRUARY 2019

Day 1 – 11 February 2019 (Monday)

08.00 – 09.00	Registration & Briefing about the program.
09.00 – 09.30	Opening Ceremony: Rector UKSW.
09:30 – 10:30	Orientation of Master Class and discussion of desired outcomes, led by Professor Ian Falk & Dr Titi Susilowati.
11:00 – 12:30	"What is biosecurity?": interactive discussion with the participants, led by Prof. Ian Falk & Dr Susie Hester.
13.30 – 14.30	"Bilateral Plant Biosecurity Initiative BPBI: Developing the Indonesian Biosecurity Foundation IBF", led by Prof. Ian Falk.
14.45 – 15.30	Participants' presentations.
15.30 – 16:30	"Biosecurity policy development in Indonesia", led by Theo Litaay, Ph.D.
16.30 – 17:30	Concurrent sessions (3): responses to biosecurity issues raised from the opening addresses and Participants' presentations, moderated by Ms Dina Banjarnahor, M.Sc.

Day 2 – 12 February 2019 (Tuesday)

08.30 – 09.00	Review of previous day's activities, led by Prof. Ian Falk.
09.00 – 10.30	"Biosecurity risk", by Dr Susie Hester.
11:00 – 12:30	"Biosecurity response", by Dr Susie Hester.
14.00 – 15.30	Simulation exercises, led by Dr Susie Hester.
16.00 – 17.00	Group exercises concluded.

Day 3 – 13 February 2019 (Wednesday)

08.30 – 09:00	Review of previous day's activities, led by Dr Susie Hester.
09:00 – 10:30	"Biosecurity, food security and food sovereignty", by Dr Sivapragasam.
11:00 – 12:30	"Trade and market access", by Dr Sivapragasam.
14.00 – 15.30	Group exercises, led by Dr Sivapragasam.
16.00 – 17.00	Simulation exercises concluded.

Day 4 – 14 February 2019 (Thursday)

08.30 – 09:00	Review of previous day's activities, led by Dr Sivapragasam.
09.00 – 10.30	"Community involvement to strengthen food security in Indonesia", by Mr Bahruddin.
11:00 – 12:30	"Education, training, and community awareness: capacity building: case study in Subak Bali", by Dr Eka Martiningsih.
14:00 – 15:15	"Local food to contribute to food security", by Dr Wiske Rostinsulu.
15:45 – 17:00	"Local foods for food security and food sovereignty", by Dra. Lusiawati Dewi, M.Sc.
17:00 – 17:45	Discussion groups (3), led by Ms Dina Banjarnahor, M.Sc.

Day 5 – 15 February 2019 (Friday)

08:30 – 09:00	Review of previous day's activities, led by Dr Titi Susilowati.
09:00 – 10:30	"What happens when things go wrong?", by Dr Sivapragasam.
11:00 – 12:30	"The value to universities and other institutions of collaborating with IBF", by Dr Suryasatria Trihandaru and Dr Drs. I Made Sukamerta, M.Pd.
14:00 – 15:30	Future contributions to biosecurity and biodiversity by Participants, led by Ms Dina Banjarnahor, M.Sc.
16.00 – 17:30	Feedback: Consideration of papers to be produced from Master Class, led by Prof. Ian Falk.

Day 6 – 16 February 2019 (Saturday)

08:30 – 09:00	Review of the week's activities, led by Dr Sivapragasam.
09:00 – 10:30	"Where to next?", led by Dr Titi Susilowati, Prof. Ian Falk and Dr Sivapragasam.
11:00 – 12:00	Closing Ceremony and presentation of Master Class Certificates.

LOCAL FOOD AND BIODIVERSITY

1. ***Andreas Sukmana***. Fast action in saving local plant biodiversity in Salatiga to support food security.

2. ***Dhanang Puspita***. Local legumes for food security on Timor Island, East Nusa Tenggara.

3. ***Muhamad Taufik Hariyadi***. Rescuing and preserving local vegetable varieties as genetic resources through collaboration between a genebank, local communities and universities.

4. ***Yudhi V. Simorangkir***. Utilization of Andaliman for local food diversification and empowerment of Andaliman farmers.

5. ***Wahyono, SP***. Collection, conservation, and utilization of Indonesian local genetic resources to support plant breeding programs and promote food security.

Images (left, both) courtesy of Dhanang Puspita and (above) courtesy of Muhamad Taufik Hariyadi.

1. FAST ACTION IN SAVING LOCAL PLANT BIODIVERSITY IN SALATIGA TO SUPPORT FOOD SECURITY

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Abstract
Salatiga is a small city located in Central Java Province with no severe food security problems in the past. However, Salatiga is still under a food security threat because of the dependency on rice as a staple food. The threat can be prevented by replacing rice with carbohydrate-producing plants sourced locally. Unfortunately, Salatiga is facing the disappearance of many local plants due to community unawareness of food security and biodiversity concepts. The fastest possible action to prevent this loss is by conserving and identifying local plants in the Salatiga area. This action can be accomplished effectively by employing the human resources available in Satya Wacana Christian University (UKSW) Salatiga. Stronger collaboration with all community elements is required for the continuation of this program in the future.

Keywords: local plants, food security, biodiversity, conservation

Abstrak
Salatiga adalah kota kecil di Provinsi Jawa Tengah yang tidak pernah dilanda permasalahan ketahanan pangan yang parah. Meskipun demikian, Salatiga masih diintai oleh ancaman ketahanan pangan akibat ketergantungan penggunaan beras sebagai bahan makanan utama. Ancaman ini dapat dicegah melalui penggantian beras dengan sumber karbohidrat lain dari tumbuhan lokal. Sayangnya, saat ini Salatiga justru kehilangan tumbuhan-tumbuhan lokal yang disebabkan oleh ketidakpahaman masyarakat terhadap konsep ketahanan pangan dan biodiversitas. Cara yang paling cepat dan dapat dilakukan untuk mencegah kehilangan ini adalah dengan mengkonservasi (mengumpulkan dan mengidentifikasi) tumbuhan-tumbuhan lokal di daerah Salatiga. Cara ini dapat dilakukan dengan memanfaatkan sumber daya dari universitas di Salatiga. Untuk menjamin keberlanjutan program ini di kemudian hari, dibutuhkan kolaborasi yang lebih kuat antara semua elemen masyarakat.

Kata kunci: tumbuhan lokal, ketahanan pangan, biodiversitas, konservasi

Introduction
Salatiga is a small city in Central Java Province, Indonesia. Salatiga and its supporting area surrounding it are blessed with sufficient crop production. Therefore, no major food security problem has been observed in past years[1]. Despite the sufficient food supply, Salatiga is still under the threat of a food security problem because of the community dependency on rice as the staple food. The threat can come in the form of rice price instability or rice stock shortage which would lead to a massive disturbance in the community[2,3].

The threat can be minimized by introducing rice alternatives in the daily diet. Some local plants that can be an excellent rice replacement are cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*), ganyong (*Canna edulis*), kimpul (*Xanthosoma sagittifolium*), gembili (*Dioscorea esculenta*), and gadung (*D. hispida*). They produce starchy tubers, and some offer additional nutritional value. Ganyong, for example, is known as a gastritis and hypertension remedy. Importantly, food diversification using local plants can minimize the high demand for rice, lowering the risk to food security[4].

Unfortunately, many local plants are becoming harder to find. Decades ago, ganyong was a common commodity in Salatiga market. Nowadays, it is extremely difficult to find it in the market. The loss is confirmed by the Food Department and the Agricultural Department of Salatiga. The lack of community awareness towards these local plants is suggested to be the main reason for their disappearance. The community perception is that local plants are less important, less

versatile, and have less economic value. The disappearance of local plants is not only threatening food security but also threatening biodiversity[5]. The loss rate is worsened by fast land conversion from fields into housing. Therefore, an effort should be made immediately to prevent further loss.

Approach

The fastest form of action is a movement in which the local plants are conserved, including their collection and identification in a secure area. Using data from the Department of Agriculture Salatiga about the number and distribution of these local plants, the conservation process will be more effective and efficient. This fast action is doable with support from UKSW. The university can allocate a small area in the campus to be turned into a living library planted with conserved local plants. The conserved plants will later be identified for their uses as food, medicine, and/or cultural practices. The identification is critical to better inform the community about the importance of local plants.

Discussion

The conservation program will be directly beneficial in preventing the loss of biodiversity in the Salatiga region, supporting the effort to secure national biodiversity. The preservation of the local germplasm ensures that the potential is still intact for the future. The local plants living library is expected to not only conserve the germplasm but also promote an open comprehensive education on their potential.

The involvement of UKSW faculty members and students will provide an excellent opportunity to transfer the concepts of food security as well as biodiversity. Having diverse students coming from many regions in Indonesia will benefit the spreading of information on food security and biodiversity.

Future work

To ensure the continuity and further development of this program, greater support from all sectors, including the government and industry, is needed. Many attempts have failed to introduce the importance of biodiversity and food security concepts to the community. An alternative approach, with the emphasis on the economic value of the local plants, can be applied to gain more attention from the community. With more appreciation of the value of local plants by the community, a lot less effort may be needed for promoting local plants to support food security and biodiversity.

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2. LOCAL LEGUMES FOR FOOD SECURITY ON TIMOR ISLAND, EAST NUSA TENGGARA

Dhanang Puspita

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Abstract

Timor Island in East Nusa Tenggara has a dry season that is longer than the rainy season, affecting agriculture. Local legumes on Timor Island, an important part of agricultural production, have adapted to a dry climate. The purpose of this study is to inventory local legumes on Timor Island and optimize their use. A qualitative descriptive method is used to show how the variety of legumes is integrated into all aspects of local people's lives. There are 27 types of legumes on Timor Island, each with a different nutrient content. In the future, nutritional testing needs to be done so that legumes can be mapped based on nutritional composition. Nutritional information can then be used to determine utilization and processing to achieve optimal food innovation.

Keywords: East Nusa Tenggara, legumes, Timor island.

Abstrak

Pulau Timor di Nusa Tenggara Timor memiliki iklim kering yang lebih lama dibandingkan musim hujan. Iklim ini akan mempengaruhi pertanian. Salah satu produk pertanian di Pulau Timor adalah kacang-kacangan lokal. Kacang-kacangan lokal di Pulau Timor sudah teradaptasi dengan iklim kering. Kacang-kacangan memiliki nutrisi yang tinggi, sehingga dapat digunakan untuk memenuhi kebutuhan nutrisi, mencegah gangguan gizi, dan menjadi ketahanan pangan. Tujuan dari penelitian ini adalah untuk menginvetarisasi kacang-kacangan lokal di Pulau Timor dan mengoptimalkan pemanfaatannya. Metode yang digunakan adalah deskriptif kualitatif untuk mengetahui keberagaman kacang lokal dan pemanfaatanya oleh penduduk setempat. Terdapat 27 jenis kacang di Pulau Timor. Masing-masing kacang-kacanga memiliki kandungan nutrisi yang berbeda. Untuk kedepannya, perlu dilakukan pengujian nutrisi sehingga dapat memetakan kacang-kacangan berdasarkan komposisi gizi. Dengan adanya informasi gizi dapat dijadikan alasan dalam pemanfaatan dan pengolahan agar lebih optimal.

Kata kunci: legume, pulau timor, Nusa Tenggara Timur.

Introduction

Timor Island is one of the islands in the Province of East Nusa Tenggara. This island is formed from tectonic activity. The convergence of three plates, namely Eurasia, Pacific, and Indo-Australia, has forced the island upwards. Slopes are often steep and soil conditions variable[1]. Timor Island has a dry climate, with a longer dry season than rainy season.

The geographical and climate conditions of Timor Island affect agricultural production. The short rainy season means the Timorese people are not able to farm throughout the year. In other words, there is only one planting season. Towards the rainy season, farmers start planting and harvesting ahead of the end of the dry season. Harvest failure is a threat to farmers on Timor Island. If crop failure occurs there will be hunger, which results in nutritional disorders. This problem will also cause disruption to food security on Timor Island.

Agricultural products on Timor Island are dominated by corn and cassava which are staple foods, although rice is also an option. Other agricultural commodities include fruits, palm sugar and legumes.

The solution to maintaining food security is to diversify and increase agricultural production through use of local food. Increasing agricultural production can be done by land management, protection from pests and weeds, and post-harvest treatment. Local food utilization is a solution

because local plants are adapted to the geography and climate conditions of Timor Island, are familiar to the community, and are part of the local culture. On Timor Island, many local types of legumes have been found[2].

Communities on Timor Island use legumes as food. The legume will be cooked together with corn into *bose* corn. *Bose* corn is a traditional food from East Nusa Tenggara based on local corn mixed with legumes and boiled for 1–2 hours. Boiling aims to make corn soft. However, boiling for a long time will damage (denature) the nutritional content of the legume protein. Proteins will be denatured if overheated[3].

The purpose of this study is to inventory local legumes from Timor Island and optimize their use.

Approach

This research uses a qualitative descriptive method. Samples of legumes are obtained from Timor Tengah Selatan District. Information about legumes is carried out by interviewing native residents. Identification of legumes is carried out by a literature study.

Result and Discussion

The results of the study are shown in Table 1. The table contains local names, scientific names, character in nature, cultivation, and prices in the market of the 27 types of local legume that have been found. There are 4 poisonous local legumes which can be used as food after special treatment. These local legumes may also be found in other regions.

Table 1. Local legumes on Timor Island[2]

Number	Local name (Scientific name)	Information
1	Arbila Beracun / Kota laos (*Phaseolus* sp.)	• Toxic • wild • Rp. 2.000/ounce
2	Arbila hitam / kot metan (*Phaseolus* sp.)	• Toxic • wild • Rp. 2.000/ounce
3	Arbila kuning / kot molo (*Phaseolus* sp.)	• Toxic • wild • Rp. 2.000/piring
4	Arbila kuning-putih / kot msolmuti (*Phaseolus* sp.)	• Toxic • wild • Rp. 2.000/piring
5	Arbila biji besar / kot biji esahan (*Phaseolus* sp.)	• Cultivated • Rp. 5.000/kg
6	Arbila lipak / kot lipa (*Phaseolus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
7	Arbila loreng / kot obibi (*Phaseolus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
8	Arbilla pohon / kot hab (*Phaseolus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
9	Arbila telur cicak / koto biklu (*Phaseolus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
10	Arbila ungu / kotobe (*Phaseolus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
11	Arbila wangi / kotbonak (*Phaseolus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg

12	Kacang buncis (*Phaseolus* sp.)	• Cultivated • Multicrop culture with corn and cassava • 2 × planting/year • Rp. 5.000/kg
13	Kacang Hijau (*Vigna radiata*)	• Cultivated • Multicrop culture with corn and cassava • 2 × planting/year • Rp. 20.000/kg
14	Kacang merah (*Phaseolus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
15	Kacang nasi merah (*Vigna umbellata*)	• Cultivated • Multicrop culture with corn and cassava • Rp. 10.000/kg
16	Kacang nasi putih (*Vigna* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 10.000/kg
17	Kacang panjang lokal hitam (*Vigna* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
18	Kacang panjang lokal loreng (*Vigna* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
19	Kacang panjang lokal merah (*Vigna* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
20	Kacang panjang lokal putih (*Vigna* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 50.000/kg
21	Kacang tanah fokase mtasa (*Arachis* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 10.000 – Rp. 20.000/kg
22	Kacang tanah putih / fokase muti (*Arachis* sp.)	• Cultivated • Multicrop culture • Rp. 10.000 – Rp. 20.000/kg
23	Kacang turis hitam (*Cajanus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
24	Kacang turis putih (*Cajanus* sp.)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
25	Kacang kecipir (*Psophocarpus tetragonolobus*)	• Cultivated • Multicrop culture with corn and cassava • Rp. 5.000/kg
26	Prei merah / babe mtasa	• Cultivated • Multicrop culture with corn and cassava • Not for sale
27	Prei putih / babe muti	• Cultivated • Multicrop culture with corn and cassava • Not for sale

Typically, legumes have a nutritional content of protein (16–41%), carbohydrate (22–70%), fat (1–48%), fiber (3–10%), and ash (3–5%). However, nutritional composition depends on the type, species, and variety of legume. Legumes are processed according to their nutritional composition. As Figure 1 shows, a legume with high protein content, such as soybean, is versatile. Soybean products include tofu, tempeh, and yogurt. Legumes with high carbohydrate content can be used for flour, noodles and pasta, while legumes with high fat content can be used as vegetable oils[4].

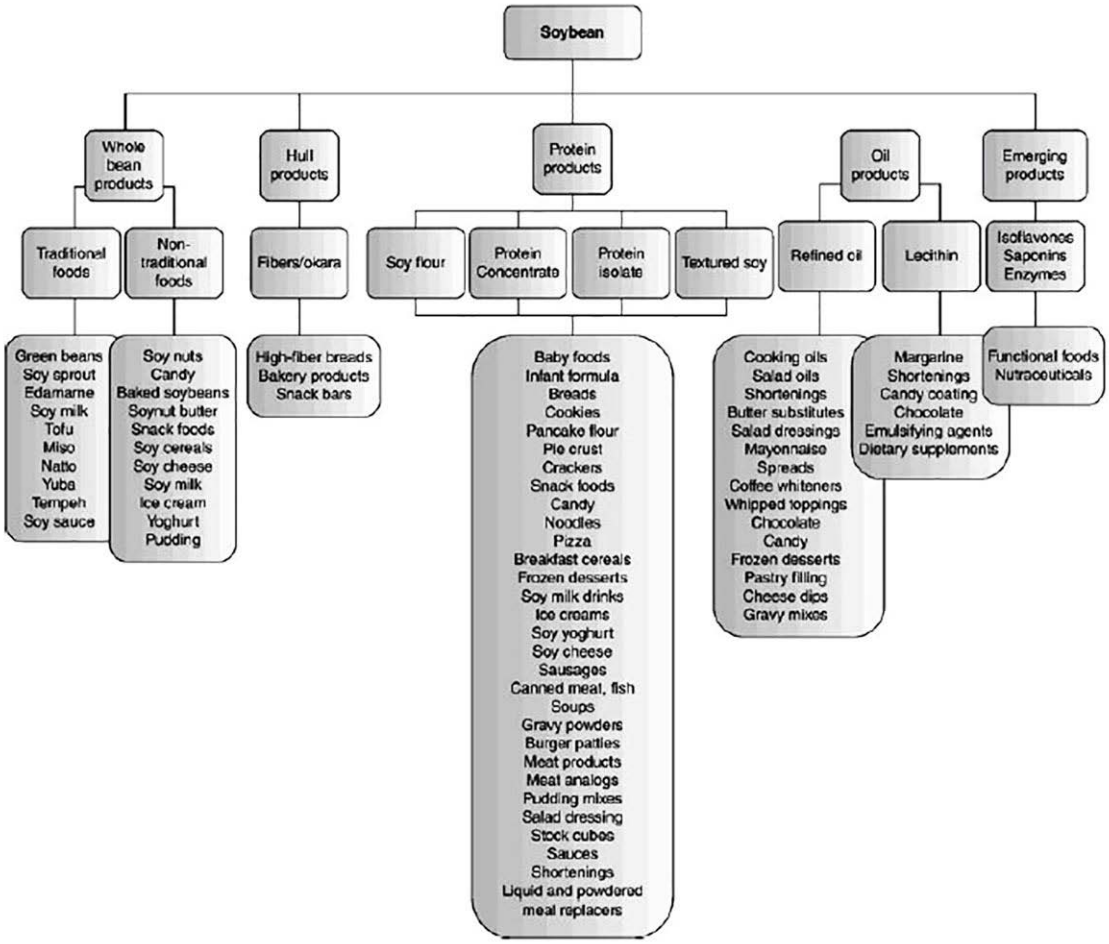

Figure 1. Diversification of food from legumes (soylegume)[5].

Legumes are rich in nutrition so the processing must be correct to protect nutritional value. Proteins are susceptible to heat, so legumes with high protein content cannot get excessive heat. Legumes with high oil content should not be exposed to free air (oxygen) because it will cause oxidation which results in the aroma becoming rancid. Legumes with high carbohydrate content can be processed in various types of processing. Processing legumes into food can be done by boiling/cooking, roasting, fermenting, germinating, milling, sieving, frying, and canning.

Future work

It is necessary to identify the nutritional content of the legumes. With information on nutrient content, legumes can be mapped based on their highest nutrient content. Nutritional content will be the reason for the selection of processing and product types, driving food innovation.

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3. RESCUING AND PRESERVING LOCAL VEGETABLE VARIETIES AS GENETIC RESOURCES THROUGH COLLABORATION BETWEEN A GENEBANK, LOCAL COMMUNITIES AND UNIVERSITIES

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Abstract

The National Commission of Genetic Resources states that Indonesia has more than 700 species of vegetables and fruits. However, around 75% of local genetic resources are lost before being used because the preservation of local genetic resources is not carried out properly. It is very important to rescue local vegetable genetic resources from extinction or genetic erosion. Preservation of genetic resources in the Genebank for long-term storage is also very important, to rescue the local varieties. This paper is aimed at empowering university students and local communities in rescuing and preserving local vegetable genetic resources. Collection of local varieties can be done through involving university students with a Community Services Program. The student can be assigned to explore and collect local varieties in their Community Services Area. Besides, they can encourage local communities in participatory preservation through producing and consuming the local vegetable genetic resources in their backyards to fullfill their daily needs for vegetables.

Keywords: genetic resources, vegetable, local varieties, collection, preservation

Abstrak

Komisi Nasional Sumber Daya Genetik menyatakan bahwa Indonesia memiliki lebih dari 700 spesies sayuran dan buah. Terjadi erosi sumber daya genetik sekitar 75% yang hilang sebelum sempat digunakan karena pelestarian sumber daya genetik lokal yang tidak sesuai. Sumber daya genetik lokal sangat penting untuk diselamatkan dari kepunahan atau erosi genetik. Pelestarian sumber daya genetik dengan penyimpanan jangka panjang di bank genetik sangat penting untuk menyelamatkan varietas lokal. Artikel ini bertujuan untuk memberdayakan mahasiswa dan masyarakat lokal dalam menyelamatkan dan melestarikan sumber daya genetik sayuran lokal. Koleksi varietas lokal dapat dilakukan dengan melibatkan mahasiswa dalam program Kuliah Kerja Nyata (KKN). Mahasiswa bisa diberikan tugas untuk mengeksplorasi dan mengoleksi varietas lokal di lokasi KKN. Selain itu, mereka bisa mempromosikan kepada masyarakat lokal untuk melakukan pelestarian partisipatif melalui produksi dan konsumsi sumber daya genetik sayuran lokal di pekarangan untuk memenuhi kebutuhan sayuran mereka sehari-hari.

Kata kunci: sumber daya genetik, sayuran, varietas lokal, koleksi, pelestarian

Introduction

Indonesia has plentiful genetic resources with abundant economic value. There is an obligation to maintain these resources in the interests of sustainability and contributing to the people's prosperity, as mandated in the Opening of the 1945 Constitution of the Republic of Indonesia. Based on data from the National Commission of Genetic Resources, Indonesia's genetic resources in vegetables and fruits potentially comprise more than 700 species in total. However, due to erosion of genetic resources, around 75% of the genetic potential is lost before being used[1]. One of the causes of erosion is that preservation of the local genetic resources is not carried out properly.

In today's agriculture only a small part of Indonesia's biodiversity is used for research. This is despite the many genetic resources which are spread throughout Indonesia. Potential cultivars with narrow genetic distribution can be completely eliminated because of disease attack, while the quality of existing genetic materials can be decreased due to deterioration if not managed properly. Therefore the collection and proper management of genetic resources is very important

to enrich the genetic material collection and to maintain the genetic materials in good condition for further research and development.

Local vegetable genetic resources must be rescued from extinction or genetic erosion because these have been and will always be used for the welfare of the communities, especially to fulfill and improve nutrition. Factors that may cause the loss and extinction of local vegetable genetic resources include: development policies that do not appreciate the value of environmental sustainability; irresponsible genetic resources exploitation; the development of modern technologies; and even climate change.

Approach

This project is to explore local vegetable genetic resources all around Indonesia through Community Service Programs. Community Service Programs send university students to every rural area. The local varieties are collected during the program by assigning the student to collect every local vegetable which grows in their Community Service area. Beside exploration and collection of local varieties, the students are also assigned to encourage the local communities, where they are placed, to produce and consume the local vegetable varieties. This activity will help to overcome current issues with hunger and nutritional disorders that occur in some rural areas.

Community Service Programs will send many student units all over Indonesia. Every student unit consists of several students with various major skills. Besides doing the existing Community development program, the students will also be assigned to conduct exploration of local vegetable genetic resources around their area. Briefing and training about the technical procedure will be conducted before students depart to their Community Service area. Every student group will be provided with a manual and toolkit for collection of the local varieties.

The collected local varieties are to be submitted to the Genebank in the form of seeds when the students have finished the program. The submission of seed is complemented with passport data that consists of information about the origin of the seeds. The Genebank can then identify the submitted samples and input the data into its database system.

Discussion

The Genebank as a center for collection and preservation of vegetable genetic resources outside of its natural habitat (*ex-situ*) is needed to save the genetic resources of Indonesian vegetables so they can be used for current and future agricultural development[2]. In addition, the establishment of a Genebank can also be a facilitator for use of vegetable genetic resources by both domestic users and those from other countries. The establishment of the Genebank for long-term preservation is indispensable today to rescue the local vegetable genetic resources. PT East West Seed Indonesia (EWINDO) in collaboration with Gadjah Mada University (UGM) launched a National Vegetable Genebank in Yogyakarta on 24 August 2018. This is aimed at saving and preserving Indonesia's local vegetable genetic resources through inventory, collection, preservation and sustainable use for the advancement of agriculture today and in the future through synergy between relevant stakeholders. The Genebank needs to collaborate with the local communities and universities for exploration and utilization of the uncollected local vegetable varieties.

The preservation of local varieties needs the participation of the local communities to encourage them to know about the potential resources which can be utilized in daily life[3]. One of the efforts is a land use program to plant crops for daily needs for sustainable food. In the future this program has the potential to be developed for preservation and promotion of the use of local varieties. The participatory preservation of local varieties between the Genebank and local communities will encourage the utilization of the varieties by the local communities through planting them in their backyards to fulfill their daily needs of vegetable foodstuffs. This is the traditional way of preservation *ex-situ* of local varieties. On the other hand, local varieties can also be deposited in the Genebank in the form of seed to maintain longevity with good viability. The local communities

will take on the role of collecting the local varieties, then send their local variety collection to the Genebank for long-term storage as duplicate preservation.

The important thing in preservation is the availability of the local varieties that will be conserved. The local varieties should be collected from all areas in Indonesia. It is a costly activity involving identification of local varieties in every area with specific characters. Every university has a program of Community Service which sends the students to every rural area. Collaboration between the Genebank and the universities can be an example of 'win win' cooperation, where the students can be assigned to explore the local varieties where they are placed. Besides, they can also encourage the local communities to produce their own vegetables in their backyards, and promote them for vegetable consumption. This assignment will grow the awareness of the students about the importance of preservation of local varieties as the genetic resources for developing new varieties.

Future work

Preserving local varieties means the collection and saving of genetic resources in the Genebank. The most important aspect of preservation is how the genetic resources which have already been collected and saved are stored and utilized. The utilization of local genetic resources can be done through breeding programs to create new superior varieties which will help to overcome biosecurity issues such as hunger and nutritional disorders. The identification and characterization of the genetic resources will also provide very important information for the user. The Genebank can collaborate with university students to do the identification and characterization of the genetic resources and can also collaborate with related researchers, such as plant breeders, for genetic resources utilization.

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4. UTILIZATION OF ANDALIMAN FOR LOCAL FOOD DIVERSIFICATION AND EMPOWERMENT OF ANDALIMAN FARMERS

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Abstract
Maintaining the balance of nature and the environment is one part of the Indonesian culture of agriculture. Among the local biological resources in the area is a variety of new food sources that will be used by humans. Andaliman (a wild pepper) is a distinctive cooking spice that is very popular among the Batak people. It is used in food offerings in traditional events, tastes spicy and needs to be promoted. Empowerment of farmer groups is part of an important solution to agricultural problems, including developing their Andaliman farming businesses. The strategy is to strengthen farmer capacity in overcoming problems such as understanding agricultural regulations and farmers' rights, and to improve agricultural literacy education.

Keywords: food security, Andaliman, empower farmers

Abstrak
Menjaga keseimbangan alam dan lingkungan hidup merupakan salah satu bagian dari budaya pertanian bangsa Indonesia. Salah satu sumber hayati lokal, dikatekorikannya berbagai sumber makanan baru yang akan digunakan oleh manusia. Andaliman menjadi sebuah ikon bumbu masak yang sangat populer dikalangan masyarakat batak yang digunakan dalam sajian makanan dalam acara adat, yang beraroma khas dan perlu di promosikan. Pemberdayaan kelompok tani merupakan bagian dari solusi yang penting ditengah permasalahan pertanian serta ketidakberdayaan petani dalam pengembangan usaha taninya. Strateginya dengan penguatan kapaitas petani dalam mengatasi permasalahan seperti pemahaman regulasi pertanian, hak – hak petani, serta pendidikan literasi pertanian.

Introduction
Biosecurity is a strategic and integrated approach to analysing and managing relevant risks to human, animal and plant life and health and associated risks to the environment. Agriculture is an integral part of human civilization. Procedures for managing agriculture were set up in ancient times and have developed to the technological systems of today. Maintaining the balance of nature and the environment is one part of the Indonesian culture of agriculture. It is highly desirable to consider environmental ecology, saving local plants which can survive and be used by humans.

Preserving local biological resources is all humans' responsibility. Almost all Indonesian food has a characteristic of being spicy, and its main ingredient is chili (*Capsicum* spp.). However, the price of chili is uncertain. If the price of chili continues to jump up, it will affect the economy of the community and people's purchasing power will decline. Seeing that the reality and conditions of chili marketing are erratic, it is very necessary to look for substitute foods or spices. Andaliman (*Zanthoxylum acanthopodium*), a plant in the citrus family, is a local biological resource which can be used as an alternative to chili.

Andaliman is a local plant that grows in the North Sumatra area, more precisely in the Batak plateau area. Andaliman grows at an altitude of 1400 metres above sea level. People around the Batak land use Andaliman for food recipes in traditional Batak events; it has a distinctive taste that is different from other plants.

Andaliman plants as local food have their own problems. Andaliman as a local plant only grows in mountainous areas, such as the Batak land province in North Sumatra. The plant is still not widely

used by Indonesian farmers or by consumers. It is highly recommended to develop it in order to contribute greatly to the world of Indonesian food.

Approach

To help improve Indonesian food security, the government must really examine the usefulness of biosecurity for the Indonesian people. One important aspect of biosecurity is for local foods to be more widely used by the people of Indonesia. Empowerment of farmer groups is an important challenge in dealing with every aspect of agricultural problems. The lack of empowerment of farmers by the government in developing agriculture is a reason why now Indonesian farmers are less prosperous. Today's agricultural development has implemented sophisticated agricultural technology that can accelerate the agricultural process. Countries with low technology have agricultural land that only provides agricultural products that can be used for daily needs.

Andaliman farmers are currently facing a very serious problem. On average, farmers and families are not prosperous. Andaliman products, while valuable, have not been able to compete with alternative agricultural products at the national level because they are less well known to the people of Indonesia. The government does not provide education and training and strategies to market Andaliman agricultural products.

There are several approaches to answering the farmers' problems. One approach is for farmer organizations that have clear vision, influence and locally based training methods to give all potential local users access to technology.

Other approaches include:

1. exploring human resources based on local wisdom;
2. assessing the government's budget for farmers, which can be used as a reference for the welfare of farmers, because it is part of human rights;
3. receiving farmer capital as part of efforts to improve the economic well-being of farmers, encouraging them to continue farming;
4. improving literacy and Internet culture among farmers so they can take advantage of globalization and understand the information that develops, and can access various information sources related to farmers;
5. designing a locally based agricultural curriculum that can be used by farmers as a reference in developing agriculture.

Discussion

Andaliman has a soft orange aroma, but 'bites', causing a sensation of numbness in the tongue, even though it is not as spicy as chili or pepper. This feeling of spasm on the tongue is caused by the presence of hydroxy-alpha-sanshool in the spice. In addition to Batak cuisine, the use of Andaliman as a cooking spice is also known in East Asian and South Asian cuisine.

Andaliman trees are quite lush shrubs. The trunk carries pointed maroon-colored spines. The tip of the pointed shaft hides the young shoots of the Andaliman fruit. The fruit itself grows from the stem. Andaliman is very similar to pepper. The similarity is the reason why Andaliman is often referred to as Batak Pepper, also called 'intir-intir' by some people. It is a required ingredient for Batak specialties such as arsik, saksang, etc.

In Indonesia, Andaliman is known and used only in limited circles, even though it has been trafficked outside its area of origin. Through promoting the uniqueness of sensory perceptions and perhaps also physiological activities, it is possible that this spice can be one of the spices that has the potential to seize an export market opportunity.

The up-skilling of farmers by strengthening the capacity of farmer organizations is a moral responsibility to bring Indonesian farmers to understand their rights as farmers. These have been neglected by government systems that do not have a vision for the welfare of farmers to enable them to leave the poverty line.

Future work

Andaliman as a local diversification plant must be developed widely. As an endemic plant for sustainability, the Andaliman plant needs to be cultivated in better ways so it can be found as a substitute for kitchen spices. Strengthening farmer organizations can be a way and strategy to continue biosecurity-based Andaliman farming. Education Advocation, the government's budget for farmers, can be used as a reference for the welfare of farmers, because it is part of human rights. Designing a locally based agricultural curriculum that can be used by farmers as a reference in developing agriculture can also be carried out in the future.

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5. COLLECTION, CONSERVATION, AND UTILIZATION OF INDONESIAN LOCAL GENETIC RESOURCES TO SUPPORT PLANT BREEDING PROGRAMS AND PROMOTE FOOD SECURITY

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Abstract

Food availability is still a main concern for all humans due to increasing world population, including in Indonesia. One of the solutions to fix this problem is through plant breeding approaches that rely on genetic resources as a basic requirement. Indonesia has a lot of biodiversity containing valuable traits which can be used to support plant breeding programs. Until now, Indonesian local germplasm has been under-valued and in decline. Collection, conservation, and utilization are important approaches for saving local genetic resources, to support breeding programs and to encourage food security.

Keywords: local genetic resources, plant breeding, food security.

Abstrak

Makanan masih menjadi persoalan utama bagi manusia yang disebabkan oleh peningkatan populasi dunia, termasuk Indonesia. Salah satu solusi untuk menanggulangi permasalahan tersebut adalah dengan menggunakan program pemuliaan tanaman yang membutuhkan bahan genetik sebagai salah satu kebutuhan dasarnya. Indonesia memiliki keragaman hayati yang sangat tinggi yang memiliki sifat-sifat spesial yang bisa kita gunakan untuk mendukung program pemulian tanaman. Sampai saat ini, jumlah plasmanutfah Indonesia mulai mengalami penurunan yang disebabkan oleh beberapa faktor sebelum di identifikasi. Koleksi, konservasi, dan penggunaan plasmanutfah lokal Indonesia adalah suatu hal yang sangat penting untuk dilakukan untuk menyelamatkannya dan untuk mendukung program pemuliaan tanaman dalam rangka mendorong program keamanan pangan.

Kata kunci: plasma nutfah lokal, pemuliaan tanaman, keamanan pangan.

Introduction

The world currently faces the problem of supplying good quality food that can be easily accessed by its inhabitants. This is a universal problem and especially for developing countries. In 2016 the Food and Agriculture Organization of the United Nations (FAO) estimated that 815 million people (10.7% of world population), including children, were suffering from chronic under-nourishment.

The problem will become increasingly complex given that the human population of the world is predicted to rise to 9 billion by the year 2050. In Indonesia, population growth has increased quite rapidly, reaching 1.49% per annum for the decade ending 2010. The central Statistic Agency of Indonesia (BPS) states that in 2025 Indonesia is predicted to have a population of 273 milion. The existence of such a large population will affect the amount of food consumed each year.

Increasing agricultural production to meet demand is currently faced with some problems, including deforestation, land degradation, the occurence of natural disasters, pest and disease attacks, inadequate cultivation practices, and government policies. Plant breeding programs can provide high quality seeds, tailored to prevailing conditions and producing sustainable high yield, and will be essential for future food security.

Breeding activities begin with germplasm collection for desirable traits: agronomic, physiological, and resistance characteristics. Indonesia is known as a mega biodiversity country including local germplasm, but genetic resources are being lost before they have been properly identified. Therefore, collection, conservation, and utilization of local genetic resources are vital.

Approach

Indonesia has 515 species of mammals or 12% of the total number of world mammal species, 511 reptiles or 7.3% of all world reptiles, 1594 bird species or 17% of the world's birds, and there are around 38,000 flowering plants. These are the genetic resources that have been identified; there are still many endemic biological properties that have not been identified.

We have begun a project to go around Indonesia to locate endemic germplasm planted by local farmers and to collect them. After that, we plan to identify, characterize, and conserve this local germplasm in order to benefit from special traits that these plants have. We shall also collaborate with government, researchers, and local farmers to look for some information about the existence of local germplasm around their places including special plants and traits in each place.

When we arrive in the field in a targeted area, we are usually guided by a local farmer who plants local seed and can present information about this local variety.

Discussion

A total of 4 regions of 16 targets have been explored around Indonesia. We stayed a week in Sumatra island looking for local germplasm.

In some of the places we visited, surrounding farmers still planted local varieties grown from one generation to another, but the number is in decline. This can occur due to several factors.

1. Local varieties' total production tends to be lower than that of the introduced varieties. In some places the difference in production is very significant, so that many farmers gradually switch to using introduced seeds.
2. Local varieties are limited in number. In some places we met only a few farmers in one area who have these local varieties and store them in the form of seeds. That results in other farmers not being able to plant these local varieties every planting season.
3. The range of market demand for the products of local varieties is more limited than for the introduced varieties. This is because local varieties are more in demand by the surrounding community and less attractive (or available) to other communities.
4. Local varieties usually command a lower price range compared to the introduced variety products.

Through the projects we are working on, we know that farmers in these areas continue planting these varieties because one of the characteristics possessed by local varieties is their resistance to pest and disease attacks. This is attractive to farmers because they do not need to allocate large amounts of money to prevent pests and diseases.

Unfortunately, most of the local varieties that we have found have not yet been fully identified as to the resistance properties or other special traits that exist in them. With the decreasing use of local varieties at the farm level, we are concerned that these genetic resources will become extinct before they are properly identified.

Future work

During the trip, in the framework of germplasm collection in the targeted area, we found that there are some farmers who carry out plant breeding programs simply by inter-breeding introduced varieties with local varieties that have certain superior characteristics, as well as with local varieties from other regions. We also found a number of plants produced from these breeding programs that were being planted on their land.

As a step to support the program, as well as to keep local germplasm from extinction, we hope to cooperate with farmers in Indonesia to take part in collecting local germplasm in their respective regions. We also hope to work together with the UGM Center for Innovation and Agrotechnology through the national vegetable genetic bank to be able to centralize and centrally conserve local germplasm collected by farmers. So if one day farmers, researchers and other people want to do a breeding program they can access the local Indonesian germplasm with good information about its characteristics.

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FOOD SECURITY, FOOD SOVEREIGNTY AND FOOD SAFETY

6. ***Achmad Darojat JK***. Approaches to food security should not conflict with achieving food sovereignty.

7. ***Muhammad Dudi & Naila Huriati***. Plant biosecurity and food safety – flour milling industry's perspective.

8. ***Zainal Andi Kusuma & Bhakti Yudha Prawira***. Biosecurity planning for wheat from the origin country to Indonesia.

9. ***Agnes Cela Purwani***. Biosecurity: strengthening community awareness and capacity building for food sovereignty.

10. ***Rohning Sulistyani***. Farm biosecurity plans: preventing pests, diseases and weeds in rice fields of Salatiga to ensure food security.

11. ***Susie Hester.*** Biosecurity risk analysis: an overview.

Images courtesy of Dhanang Puspita (above left), Agnes Cela Purwani (above right), and Linda Susilowati (right).

6. APPROACHES TO FOOD SECURITY SHOULD NOT CONFLICT WITH ACHIEVING FOOD SOVEREIGNTY

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Abstract
Food security sought by the government should not conflict with the rights of the farmers to farm as they wish. Driven by the necessity of fulfilling food needs on a national scale, farmers may be required to do things that actually undermine their independence in farming. Buying superior seeds, fertilizing and spraying pesticides, these things make farmers dependent on corporations. Moreover, those practices can have negative effects on the environment. Nevertheless, there are serious targets for food production. Better biosecurity will assist in gaining food security while not abandoning the objective of achieving food sovereignty for Indonesia.

Abstrak
Ketahanan pangan yang diupayakan pemerintah semestinya tidak bertabrakan dengan hak Pertani untuk berdaulat. Petani, karena dikejar oleh keharusan terpenuhinya kebutuhan pangan dalam skala nasional, lalu dituntut untuk melakukan hal-hal yang sebenarnya mencabut kemerdekaan mereka dalam bertani. Membeli bibit unggul, melakukan pemupukan dan penyemprotan pestisida, hal-hal tersebut menjadikan petani bergantung kepada korporasi. Bahkan sering memberi dampak buruk pada lingkungan. Namun memang ada target produksi pangan yang harus dicapai dengan serius. Maka upaya-upaya dalam ketahanan pangan seyogyanya tidak mengabaikan ketahanan hayati dan tidak meninggalakan kedaulatan pangan.

Introduction
In Indonesia there are two terms that often counter each other: Food Security and Food Sovereignty. The first term is often used by the government while the second term is more often used by non-governmental organizations.

Food Security, in accordance with Indonesian Law No. 18, 2012, is

> "the condition of the fulfillment of Food for the state and individuals, which is reflected in the availability of sufficient food, both in quantity and quality, safe, diverse, nutritious, equitable and affordable and does not conflict with the religion, beliefs, and culture of society, for a healthy, active and productive life on an ongoing basis".

Whereas Food Sovereignty is the right of the state and nation to independently determine food policies that guarantee the right to food for the people and which give the community the right to determine the food system in accordance with the potential of local resources.

Food security speaks of availability while food sovereignty speaks of independence. The need for food must be fulfilled in quantity and quality, but there must be no harm to individual dignity. The most appropriate way to achieve this is to invite all small farmers to sit equally with giant farmers in terms of providing food in adequate quantity and quality.

Approach
The main focus of this research is on members of SPPQT (a farmer union at Salatiga, Central Java, Indonesia). They are farmers who had done regular farming in the Green Revolution of Indonesia until 1998. They have been converting to organic approaches since 1998. Despite their efforts, they are having an unsolved problem in encouraging other farmers to adopt organic farming methods. The main obstacle is the decrease of harvest by about 60%, a very serious threat that can certainly make farmers resist adopting organic approaches.

In December 2018, SPPQT started a pilot project on a new system in organic farming. From that day, a record has been made of all the processes that have been carried out and all the results that have been achieved. Particular attention has been paid to soil conditions and the growth of the padi plant. This project continues until March 2019.

The information in this paper is collected from the farmers who are involved in the project. It is about what they had been doing in the old way and what they can now see and feel using the new methods.

Discussion

Farming sovereignty: The best way to support farmer independence (sovereignty) is to make sure that there is no interference with farmers from outside interests. Farmers should plant as independent operators. They must be able to enjoy planting as a life, not merely as a business circle. Farming is an activity to maintain social and environmental fabric, not merely fostering capital to make profits. The interference often comes from the government. It can put farmers in a difficult position. Farmers have to plant the commodity that the government decides. It means that farmers have to buy certain seed, fertilizer and pesticide. This is not right. Food security sought by the government should not conflict with the rights of the farmers to farm using their own methods.

Farming in quantity: The idea is how to multiply farming products in order to achieve the maximum amount of harvest. At the national level there are still a number of targets to achieve. In general, the yield of rice on farming land, both in regular and in organic farming in Salatiga, Indonesia, is about 2.5 tons per hectare. So if one farmer can achieve a rice harvest of 7.5 tons per hectare, surely that technique is worth learning? SPPQT is now piloting this technique. Although at the time this report is written the process is still on-going, the result is outstanding. On the same soil, with the same seed, starting at the same time, but with a different treatment, the different results appear. At the 80th day rice stalks grown with old techniques grow at 28 straws at the most, while with new techniques they grow at around 70 straws. Some have reached 80 straws. Almost certainly, the yield to be achieved will be far more than with the old way.

Farming in norm: The idea is to maintain good relations among farmers, and good relations between farmers and the ecosystem including plants, animals, microorganisms, soil, and water. Farmers believe that everything they have now is entrusted from God. They have to preserve it and they will pass it to their next generation in a good condition. They believe that this is God's mandate. Not damaging the environment can be realized by not using pesticides to control pests. Alternative techniques are preventive techniques that allow pests not to approach naturally. They grow plants that are not liked by pests around the farm land. Also they do not use substances that can damage the soil or water. This usually occurs during fertilizing. So they do not use urea salts or other substances that endanger the environment. They use natural fertilizers from animal waste, plant compost, and fermented organisms.

All the three farming orientations mentioned are organized and cooperate in a union of farmer groups. Farmers living in the same area together solve problems at the local level. Then they send their leaders to be their representatives in order to solve the bigger problems at the higher level. This form of gathering farmers also can be applied to any problem related to farming. And all of these are starting from food sovereignty.

Future work

There are still a lot of farmers that are not aware of their right to food sovereignty. They need to be awakened. Government concerns at not achieving the food-security target are unrealistic because independent and motivated farmers have greater possibilities in multiplying their food production. They just need to learn how to organize themselves and to direct their objective to the right way. Government and NGOs should be encouraged to take a facilitative part in this.

7. PLANT BIOSECURITY AND FOOD SAFETY – FLOUR MILLING INDUSTRY'S PERSPECTIVE

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Abstract
Biosecurity is a global issue. Harmful plant pests and diseases can impact on our unique environment and biodiversity, food safety, agricultural trade and market access. Food safety concerns all factors along the value chain from farmers to consumers including the Flour Milling industry. As a food processor, the industry has legal and moral obligations to ensure food safety. An analytic approach will describe the potential methods used to implement appropriate preventive measures to reduce food safety risk. The result will illustrate the food safety management process from incoming raw material to storing finished products.

Keywords: biosecurity, food safety, flour milling industry

Abstrak
Keamanan hayati adalah sebuah isu global yang besar. Beberapa tanaman, binatang dan penyakit dapat berakibat buruk terhadap lingkungan, keanekaragaman hayati, keamanan pangan, dan jaringan pasar pertanian yang memiliki keunikan tersendiri. Keamanan pangan mempertimbangkan seluruh faktor dari sektor hulu (petani) hingga hilir (konsumen) termasuk industri pengolahan gandum. Industri pengolahan gandum sebagai industri pengolah makanan, memiliki kebijakan resmi untuk memastikan keamanan pangan terhadap produknya. Pendekatan analitis dilakukan untuk menjelaskan potensi metode untuk menerapkan tindakan pencagahan dengan pendekatan yang tepat untuk mengurangi resiko keamanan pangan. Hasil pendekatan tersebut akan menggambarkan penggunaan manajemen keamanan pangan dimulai dari kedatangan bahan baku hingga penyimpanan produk jadi di gudang.

Kata kunci: keamanan hayati, keamanan pangan, industri pengolahan gandum

Introduction
Wheat flour is described in the Turkish Food Codex Wheat Flour Notification (2013/9)[1] as the flour obtained by milling wheat. It is in parallel with the technique of being separated from inorganic and organic substances like sand, soil, stone, metal, animal, plant and insect residues in hygienic conditions. That does not include strange taste, smell and substance and having its own unique colour and appearance. It is stated in the notification that the flour should be produced in accordance with food safety.

It is a fact that one of the basic conditions of ensuring food safety at a high level is supplying low-risk raw materials. Producing the flour products in accordance with food safety begins with obtaining safe wheat. Thus, while the flour industrialist has the main responsibility for providing flour safety, the farmers producing the wheat, the persons carrying out the harvest and transportation operations and traders should also apply hygiene and sanitation rules in their operations.

As the absolute right of the consumers, food safety is a concept expressed as a set of measures that should be taken at each stage from production to consumption for making the food products safe for human consumption. In order to achieve the flour safety from the field to the table, the wheat should be grown by good agricultural practices (GAP). Moreover, the wheat should be milled by good and halal manufacturing practices (GHMP).

The factors that form food safety risk in flour production are basically classified as physical, biological and chemical.

Physical risks. The physical risks mostly coming with wheat consist of foreign material such as oats, barley, metal, wood, plastic, stone, etc. All foreign material should be separated from the wheat, well before the storing and milling operations, because of the risks from their chemical components and the microbial loads they carry. Inorganic impurities cause disruption of the integrity; immature grain may have high water content. Both can become the source of mould infections.

Biological risks. The most important biological risks endangering flour safety are microorganisms and pests. Grains are really open to microorganism and pest contamination due to production, harvesting and transport conditions. There is an important amount of bacteria, yeast and mould load on the grains because of these contaminations. Moulds create more important risks on flour safety compared to bacteria and yeasts as they can breed in low water conditions and heat conditions due to their physiologies, and can form dangerous mycotoxins with high heat resistance.

Chemical risks. Chemical factors that threaten flour safety consist of pesticides used in the fields, pesticides used in the businesses to control insects and rodents, fumigation, hygiene and sanitation products, personal hygiene materials, metals, heavy metals, dyes, radioactivity, etc. Beside the mycotoxins formed by the moulds, the chemicals in insect feces and trash and the alkaloids of weeds also risk flour food safety.

Approach

These are methods that can be used to prevent deterioration in flour safety as explained above.

1. ***Sanitation and cultural methods.*** These methods focus on building-construction and style, machine maintenance, product transportation, and employee awareness of standard operating procedures to maintain sanitation.
2. ***Physical methods.*** These method focus on pest eradication using approaches and tools which are adjusted for certain pests.
3. ***Chemical methods***. These methods depend on using chemical agents such as phosphine (PH3) and methyl bromide.
4. ***Biological methods*****.** These methods use the natural enemies of pests to control their populations.

Discussion

This section outlines how these methods can be applied in flour mills.

1. Building-construction, choice of machines and food safety conditions in the milling industry. The production site and the storages should be constructed so as to be convenient for filling, evacuation, internal transport physically and cleaning, and not include ‘dead’ points. The walls should have smooth surfaces without any flaking, swelling, exfoliation, recesses, projections and pits. The ceiling should be covered with smooth and impermeable material, and the floor should be solid, durable, vacuum concrete that doesn’t powder or release epoxy material.

The windows and doors that are kept open should be covered with plastic curtains. The doors and windows at the lower floors should be made of metal in order to prevent the entry of rodents. The doors should be able to be fully closed with solid rubber to exclude dust and pests and also to avoid ‘dead’ zones. The windows should have insect screens that can be demountable. The entrances of the building should not be lighted directly at night to avoid attracting insects.

A flour mill has a daily, monthly and yearly cleaning and pest control plan. The content and process of this plan should always be updated according to internal and external evaluations. Flour mills should also have a good dust collecting and discharge system. A flour mill whose inside and outside is clean, tidy and well-groomed should be evaluated as the basic condition of flour safety and quality.

The factory owners and employees should have basic hygiene and sanitation information, attach importance to personal hygiene and care, be well-intentioned, open to innovations and learning, care for their health, inform the workplace when they are ill and understand the risks and costs of producing unsafe food. The staff should be ready in the working areas with the proper factory uniform and also safety shoes. Visitors can enter the production areas with apron and galoshes. Even if they are inoculated, pets should not be allowed in the production areas.

Realization of the wheat and flour transportation inside the factory should be, as far as possible, by pneumatic systems. Working with air would facilitate separating the insects from the products at the flour milling cyclones because of the terminal speed difference. These systems decrease the protected areas for insects.

2. Physical methods. Insects and their eggs can be destroyed and separated by using the entoleter machine without giving any harm to the wheat. The scoured machine is one of the most effective machines that can reduce numbers of mycotoxins. One of the most important methods for pest control is using traps. Covered or sticky traps can be used effectively for pest control by making the traps attractive with light or sex hormone lures.

3. Chemical methods. The most effective method to ensure food safety against pests is fumigation with phosphine (PH3) gas. Phosphine fumigation is preferred because it leaves only small amounts of residuals, and because of its ease of application. During fumigation, a concentration of 650 ppm in the storage atmosphere is determined as the optimum value for pest control. As the phosphine gas is oxidized into phosphoric acid in the presence of light, it is more suitable to make the fumigation applications in the evening. Besides, as phosphine gas reaches high concentration (>1.79%) in the closed atmosphere, great attention is needed in terms of job security.

It should be noted that insect resistance to phosphine is increasing and that alternatives are actively being sought.

4. Biological methods. Flour millers will not apply biological methods to control pests because all biological creatures represent a contaminant risk for flour. However, in recent research, some biological agents including enzymes, pathogenic microorganisms and parasites are being developed. For example, applying the phytase enzyme on insects causes direct death or death with infections by smashing the chitin-based integument of the insects. Besides, the effects of some biological agents that disrupt the development of insects or render them infertile are being researched.

Future work

In order to provide flour safety and to protect community health, great importance should be given to staff training; the 'dead' spaces in facilities should be closed; the equipment should be kept clean; scattering around of wheat and flour should be prevented; and continuous monitoring and improvement for flour safety should be implemented.

References and further reading

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8. BIOSECURITY PLANNING FOR WHEAT FROM THE ORIGIN COUNTRY TO INDONESIA

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Abstract

To fulfill the needs of the wheat flour-based food industry, which requires each company to ensure the quality of its production, Bogasari, one of the wheat flour companies in Indonesia, constantly provides quality assurance with food safety certainty through wheat raw materials delivery from the origin country to flour-based products. All imports from the origin country need to be further monitored to ensure that there is no risk of contamination prejudicing food safety for the next process. The qualitative methods design was applied to explore risk and threats occurring along the journey of the wheat. Biosecurity planning is applied to ensure that wheat is delivered from the origin country in good condition, reducing the risk of spreading pests and diseases in wheat.

Keywords: food safety, contamination, biosecurity planning

Abstrak

Untuk memenuhi kebutuhan industri pangan berbasis tepung terigu menuntut setiap perusahaan menjamin kualitas hasil produksinya, Bogasari salah satu perusahaan tepung terigu di Indonesia selalu memberikan jaminan kualitas dengan kepastian keamanan pangan melalui bahan baku gandum yang dikirim dari negara asal sampai menjadi produk berbasis tepung terigu. Gandum yang diterima bogasari keseluruhan nya impor dari negara asal yang secara keamanan pangan perlu dimonitoring lebih lanjut untuk menjamin tidak ada resiko kontaminasi untuk proses selanjutnya. Metode kualitatif diterapkan untuk memudahkan identifikasi resiko dan ancaman yang terjadi sepanjang perjalanan gandum. Perencanaan ketahanan hayati dilakukan untuk memastikan gandum yang dikirim dari negara asal kondisi yang baik melalui pengurangan risiko penyebaran hama dan penyakit pada gandum.

Kata Kunci: keamanan pangan, kontaminasi, perencanaan biosecurity

Introduction

Biosecurity is the management of risks to the economy, industry, the environment and the community from pests and diseases entering, establishing or spreading. Biosecurity threats have the potential to kill millions, cost billions in economic losses, and create political and economic instability, whether the threat is naturally occurring, accidental, or man-made. The risk of a catastrophic biological event is magnified by global travel, urbanization, terrorist interest in weapons of mass destruction as well as rapid advances in technology, including risks posed by newly developed or manipulated pathogens with pandemic potential.

Bogasari Flour Mills is the biggest flour mill in Indonesia, located in three locations: Jakarta (>10,000 ton/day), Surabaya (>6,000 ton/day) and Cibitung-Bekasi (1,100 ton/day). The products of Bogasari are wheat flour, wheat bran/pollard, wheat bran pellets and pasta, all made from 100% wheat. For domestic needs, Bogasari covers +/- 50% market share.

The wheat is totally imported. Today, Indonesia imports more than 8 million tons of wheat, increasing by 5–6% per year. Bogasari expects to reach 2.4–2.5 million tons per year. Countries of origin for the wheat used by Bogasari, sorted from largest to smallest, are Australia (40–60%), Canada (15–20%), USA (10–15%), the Black Sea Region (5–10%), and others (up to 5%).

From the origin country, the wheat is delivered in bulk by ships. Then, from the ship at the jetty, it is discharged and transferred by conveyors to silos where the wheat will be stored and treated to keep it in good condition for milling.

Threats to biosecurity occur along the wheat chain process. Wheat imported to Indonesia brings the risk of spread of pests and diseases from the country of origin to the destination.

Approach

Qualitative methods are used for identifying potential risk and threats in each process. Potential cross-contamination is initially detected from the handling process; specifically:

1. starting from the discharging process: (a) in bulk handling from the ship, the hatch is opened and the discharging process involves a 'grabber' which lifts the wheat up and across the ship and puts it in trucks. This is a very open process, allowing the wind and birds potential to contribute to spreading pests and diseases; (b) shipping terminals control the spillage, which is treated as domestic garbage or put in the incinerator.
2. delivery process: (a) especially for open delivery by trucks. Using the bulk truck for delivering the wheat in bulk, for efficiency reasons, transporters need the maximum load. This condition potentially leads to 'sowing' along the road from the shipping terminals to the storage or silo with 'contaminated seed/grain' when grain in the truck is naturally spilled by the truck shaking on the road; grain moves to the edge of the truck and spills out. This can happen also with unsuitable containers/trucks.
3. receiving process: (a) before going into the storage system the wheat goes through a receiving process equipped with a cleaning facility to deliver cleaner grain to the silo. The cleaning process involves a separator to separate the foreign material such as wood, stone and so on from grain. However, foreign material may still carry contamination to the grain.
4. in storage: (a) grain may stay in the silo for months, but not alone; it stays with its 'followers'. A silo complex stores many types of grain, using the same transport lines and facilities.
   (b) In a silo, after emptying, a cleaning process can be done, but only a very limited area can be cleaned, especially the bottom to make sure there is no remaining cargo left. Dust left on the wall may still be contaminated.

All of the above are potential conditions for cross-contamination in handling grain, and a normal risk in a grain handling process.

Threat reduction is a shared responsibility between governments and the private sector. Everyone involved raises awareness, thinks about solutions, facilitates implementation of solutions, and fosters new thinking about these challenges. Actions to be taken to reduce biological risks include the following:

1. (a) biological hazards controlled: pests via Integrated Pest Management programs.
   (b) proper grain storage programs: infrastructure, aeration, rotation, avoiding ground storage.
2. defining concrete actions to reduce risks posed by advances in technology and engaging global stakeholders to implement them.
3. identifying gaps in the capacity of individual countries to mitigate high-consequence biological events and motivate governments and other stakeholders to fill them.
4. developing new approaches for curbing the catastrophic outcomes from a high-consequence biological event, including catalyzing progress toward real-time bio-surveillance and pandemic forecasting.
5. increasing international biosecurity capabilities and raising the profile of biosecurity within the Global Health Security Agenda (GHSA), which is a group of over 60 countries and international organizations dedicated to preventing, detecting, and responding to infectious disease threats.

Discussion

When importing wheat, buyers depend on its condition meeting specifications. They expect that farmers and all the parties related to the wheat delivery are aware of, and have a commitment to reduce the risk of spreading any pests and diseases on wheat by:

1. being aware of biosecurity threats. Make sure farm workers and all parties related are familiar with the most important grains pest threats. Conduct a biosecurity induction session to explain hygiene practices for people, equipment and vehicles.

2. ensure seed is pest free, and preferably certified. Ensure all seed and other farm inputs are fully tested, pest-free and preferably certified. Keep records of the farm inputs.
3. keep it clean. Practicing good sanitation and hygiene will help prevent the entry and movement of pests onto the facilities and properties. Workers, visitors, vehicles and equipment can spread pests, so make sure they are decontaminated before they enter and leave the farm. Have a designated visitors' area and provide vehicle- and personnel-disinfecting facilities.
4. check your crop. Monitor the crop frequently. Knowing the usual appearance of the crop will help in recognising new or unusual events and pests. Keep written and photographic records of all unusual observations. Constant vigilance is vital for early detection of any exotic plant pest threat.
5. abide by the law. Support and be aware of laws and regulations established to protect the grains industry. And
6. report anything unusual. If there is a suspicion of a new pest, report it.

Future work

A strategy for biosecurity for wheat in the future depends on:

(a) policy: ensuring policy keeps up with changing biosecurity risks driven by changes in market demand.

(b) technology: fully exploring the potential opportunities that exist for a single monitoring system to detect multiple pests and diseases, rather than developing surveillance systems for each potential threat. Develop and leverage a better understanding of the relationship between biodiversity and biosecurity.

(c) communication: traceability and surveillance need to be maximized to increase the speed at which information on a pest or disease and its management can be accessed.

Further reading

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9. BIOSECURITY: STRENGTHENING COMMUNITY AWARENESS AND CAPACITY BUILDING FOR FOOD SOVEREIGNTY

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Abstract
Trade globalization generates wealth for countries exporting products but opens large pest and disease risk among different regions/countries. Lack of awareness about biosecurity and the limitations of farmers to optimize pest and disease management may affect yield decline up to 100% (economic loss). Wrong handling of OPTK (Quarantine Plant Pest) will actually have a negative impact on the environment. This paper analyzes how to involve farmer communities in mitigating the impacts of biosecurity threats and how to develop the capacities of farmers and institutions to manage biosecurity threats, to be able to compete in a global market-place and to be resilient in facing global competition. The method used is a case study and literature review.

Keywords: biosecurity, community awareness, capacity building, food sovereignty

Abstrak
Globalisasi perdagangan menghasilkan kekayaan bagi negara eksportir tetapi membuka risiko hama dan penyakit di antara berbagai daerah / negara. Kurangnya kesadaran tentang biosekuriti, dan keterbatasan petani untuk mengoptimalkan pengelolaan hama dan penyakit dapat mempengaruhi penurunan hasil hingga 100% (kerugian ekonomi) dan salah penanganan OPTK (Organisme Pengganggu Tanaman Karantina) akan menimbulkan dampak negatif terhadap lingkungan. Metode yang digunakan adalah studi kasus dan tinjauan pustaka. Makalah ini menganalisis bagaimana melibatkan komunitas petani dalam mengurangi dampak ancaman biosekuriti dan bagaimana mengembangkan kapasitas petani dan lembaga untuk mengelola ancaman biosekuriti, untuk dapat bersaing di pasar global dan bagaimana bertahan menghadapi persaingan global.

Kata kunci: biosekuriti, kesadaran komunitas, peningkatan kapasitas, kedaulatan pangan

Introduction
Indonesia is vulnerable to biosecurity threats, because it imports agricultural seeds or products that may contain bacteria, viruses and other plant diseases. For example, the case of shallots (*Allium cepa* var. *aggregatum*) in 1997, where imported shallots were consumed but seeds were kept for subsequent planting. The shallots turned out to contain group A1 disease (*Fusarium oxyporum* f.sp). In 2016, four Chinese nationals were arrested for planting imported chili seeds which were stated to be positively infested with a bacterium (*Erwinia chrysantemi*) in Bogor, East Java (based on the results of laboratory tests published by the local Center for Agricultural Quarantine Standard Test). According to Plant Clinic Records, IPB (Institute Pertanian Bogor) Plant Protection Department, from 1994 until 2016 there have been 12 types of new plant pest organisms identified. These organisms are known as Class A1 Quarantine Plant Pest, which is a plant pest that has not previously been found in the country.

Pests and diseases will spread to other plants through water flow, splashes of water, wind, insects, other vectors, agricultural equipment and trade in these products. Once a pest or disease enters a country it is very difficult to eliminate it, the inclusion of diseases through seeds being particularly detrimental. The disadvantage is not only reducing production but harming farmers because it can increase production costs, and reduce farmer income. Improper handling of pests and diseases, such as by using excessive pesticides, will also kill beneficial organisms and have a negative impact on the environment.

Approach

Biosecurity is an interdisciplinary activity that covers a wide range of subjects and approaches. The study data was obtained from several references, mainly from the case study from the misused imported shallots, the importation of chili seeds and other results of research. Data and information related to biosecurity and biodiversity challenges from several sources, including through multi-media and newspapers, are further analyzed in order to obtain information about biological involvement in mitigating the impacts and developing the capacities of farmers and institutions in carrying out agricultural issues to be able to compete and be resilient in facing global competition.

Discussion

Indonesia has tropical forests that hold a unique biological wealth. This condition makes Indonesia one of the countries with the highest biodiversity in the world. Indonesia as a country with abundant natural resources should be balanced by increasing capacity-building for the human resources to be able to develop and process these natural resources. The level of capacity possessed involves knowledge, attitudes and abilities in overcoming various problems faced by farmers in managing farming in the form of technical, managerial and social abilities. Raising community awareness of emerging biosecurity and biodiversity risks is useful in early detection, rapid response to incursions and preventing the accidental introduction of biosecurity threats.

As with the examples previously mentioned, pests and diseases classified as OPTK (Class A1 Quarantine Plant Pest) must be handled appropriately, such as by:

- protecting countries against pests and diseases that can be a biodiversity threat;
- reducing risk of spread of pests and diseases on farm;
- detecting and rapidly eradicating pests and diseases when they occur; and
- minimising impact by using long-term pest and disease management strategies.

The lack of knowledge of farmers on integrated pest management results in farmers being dependent on chemical pesticides. According to research, the use of chemical pesticides will cause problems, ranging from health problems to environmental pollution. That education needs to be given to farmers so that they can adopt integrated pest control to achieve optimal yields and not adversely affect the environment.

Future work

Collaboration is needed from researchers, government, NGOs and other stakeholders to attain the goal of this paper. All must agree that food sovereignty is a universal responsibility. The ease of accessing information and the right education for farmers must be the main focus for strengthening their skills, competencies and abilities. The government also needs to take a role, by making and implementing regulations related to biosecurity. Importantly, the development of community-based agricultural programs starts from the village scope by considering local wisdom.

10. FARM BIOSECURITY PLANS: PREVENTING PESTS, DISEASES AND WEEDS IN RICE FIELDS OF SALATIGA TO ENSURE FOOD SECURITY

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Abstract
Farm biosecurity plans contain a set of measures designed to protect individual farms from the entry or spread of pests, diseases and weeds. A recent report on the biosecurity status of Salatiga's 1269 hectares of rice fields stated that 18.9% were threatened by pests, disease or weeds and 7% suffered failed harvests. A key focus of the Agriculture Department in Salatiga is preventing biosecurity emergencies. Their aim is to promote the concept 'prevention is better than cure' through encouraging farmers to develop biosecurity plans. Prevention strategies will differ depending on the specific threat. Biosecurity plans will also contain surveillance activities aimed at early detection, and how to respond if a threat is detected. This will include details on the correct use of agricultural and veterinary chemicals. Development and implementation of farm biosecurity plans will enable the protection of local and national agriculture and will improve Indonesia's food security.

Keywords: biosecurity, farm biosecurity, prevention.

Abstrak
Ketahanan hayati dibidang pertanian adalah satu paket yang didesain untuk melindungi daerah pertanian dari masuk dan menyebarnya hama, penyakit dan gulma. Laporan terbaru tentang status ketahanan hayati di Salatiga, dari 1.269 Ha padi, 18,9% terserang hama, penyakit atau gulma, and 7% dilaporkan gagal panen. Fokus program adalah untuk mensosialisakan konsep " Pencegahan lebih baik dari mengobati" untuk pengembangan kemampuan petani dalam hal ketahanan hayati. Strategi pencegahan akan diterapkan pada komoditas yang spesifik. Ketahanan hayati juga akan meliputi kegiatan tanggap darurat pada deteksi dini, dan bagaimana merespon serangan yang terdeteksi. Ini akan meliputi cara penggunaan yang baik untuk bahan kimia pertanian dan peternakan. Pengembangan dan penerapan dari rencana ketahanan hayati di bidang pertanian akan melindungi pertanian lokal dan nasional, dan akan meningkatkan keamanan pangan di Indonesia.

Kata kunci: ketahanan hayati, ketahanan hayati pertanian, pencegahan.

Introduction
Biosecurity has a direct relevance to food safety, the conservation of the environment (including biodiversity) and sustainability of agriculture. Biosecurity is fundamental to health, well-being and prosperity. Pests and diseases can threaten the agricultural sector, environment, animal industries and, potentially, human health[1].

In the face of global climate change, a growing human population, and the threat of global pandemics, pests and diseases are an increasingly important threat to human, animal and plant biosecurity and, ultimately, global food security.

A great reference for basic biosecurity information is farm biosecurity. Wrong use of agricultural or veterinary chemicals can damage or contaminate land, animals, plants or produce. The Agriculture Department, especially in Salatiga, provides information on prevention, management and treatment of these issues[2].

Rice is the favoured and most important crop in Indonesia, as everyone needs rice. In Salatiga we plant 1269 ha of rice every year. The population in Salatiga township as of 2018 was 186,417 people. On average, one person consumes 0.54 kg of rice every day[3].

Approach

Farm biosecurity is a set of measures designed to protect a farm from the entry or spread of pests, diseases and weeds. If a new pest or disease becomes established on a farm, it will have effects such as increased cost, reduced productivity, or loss of markets, many of which have serious economic implications.

The introduction or spread of new weeds, pests and diseases onto the property can reduce production and cost time and money. The best defence is prevention, by implementing sound biosecurity practices. Quick and simple measures built into everyday practice will help protect the farm and the future.

Discussion

Weeds, pests and diseases can enter a farm and be spread by vehicles, machinery and equipment. They can be carried on vehicles by tyres, undercarriages, grills, floors and trays, and canals, as they are present in or on plant material, soil or manure. It is important to maintain equipment hygiene and ensure all vehicles that visit your property are clean and well-maintained. Special consideration should be paid to people who are returning or visiting from overseas to ensure clothing and footwear are free from contamination.

In 2017, Salatiga farmers planted 1284 ha of rice of which 16.4% was threatened by pests, disease, or weeds. From that number 3% suffered a failed harvest. It was also reported in 2018 that from 1269 ha of rice fields in Salatiga 18.9% was threatened by pests, disease or weeds and 7% failed to harvest[4].

Salatiga township needs a record of identifying and managing biosecurity risks in the natural environment, and in primary industries. Modernization and greater mobility of people, animals and plants bring new and emerging pest and disease threats. These new challenges require new solutions.

A key focus of the Agriculture Department is preventing biosecurity emergencies: for example, emergence of a serious rice disease. The Agriculture Department works with jurisdictional partners to ensure that agricultural areas continue to operate and trade without any debilitating pest and disease outbreaks.

Future work

By developing a biosecurity plan, responses to priority issues can be developed at farm and regional levels. Familiarisation with high-priority weed, pest and disease threats for our farms and for our region is essential, as its continuation. Research on how to reduce the risk of these threats and implement appropriate preventative measures is required. Also, knowledge of endemic weeds, pests and diseases already on the farm and how to manage them effectively is vital.

An effective on-farm program will include a clean-down area where farmers can clean and decontaminate all vehicles, machinery and equipment entering the farm. Training should be available to all farmers in regard to biosecurity and farm hygiene practices. Farmers and visitors need to be advised about a declared or notifiable weed, pest or disease which has been confirmed on a property. It may be practical to assign equipment (including tools, clothing, and footwear) for use in weed-, pest- and disease-affected areas. Ideally, common areas should be well gravelled and kept free of pests, diseases and weeds. Farm inputs such as seed, fertilizer, feed and propagation material may contain weeds, pests or diseases. Purchasers should ask for weed- and pest-free certifications for any produce coming onto a farm.

Importantly, records of all inputs (and outputs) that can be traced-back or traced-forward in the event of a pest incursion or disease outbreak are very important, even when nothing is found. Everyone has a role to play in protecting individual farms and the region from biosecurity threats. Future work will help to achieve this objective.

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11. BIOSECURITY RISK ANALYSIS: AN OVERVIEW

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Abstract

Governments have an important role to play in managing the significant losses caused by Invasive Alien Species (IAS) to agriculture, human health and the environment. Because budgets are limited, governments must make choices about which biosecurity activities receive funding. Making appropriate funding decisions involves understanding the risks posed by particular pests and diseases through a formal risk analysis process. Risk analysis is explained in this paper, along with suggestions for how it can be used to inform decisions.

Keywords: risk analysis, invasive alien species, prioritization, budget allocation

Abstrak

Pemerintah memiliki sebuah peran penting dalam mengelola kerugian yang disebabkan oleh Jenis Asing Invasif (Invasive Alien Species) terhadap pertanian, kesehatan manusia, dan lingkungan. Karena anggaran-anggaran yang terbatas, pemerintah wajib menentukan aktivitas-aktivitas biosekuriti mana yang dapat menerima dana. Membuat pengambilan keputusan yang tepat dalam penentuan alokasi dana tentunya melibatkan pemahaman resiko yang ditimbulkan oleh hama dan penyakit tertentu melalui analisis risiko yang formal. Asrtikel ini menjelaskan resiko analisis tersebut, beserta saran-saran mengenai bahaimana hasil analisis tersebut dapat digunakan sebagai referensi pengambilan keputusan.

Kata kunci: analisis risiko, Jenis Asing Invasif, pengutamaan, alokasi anggaran

Introduction

Invasive Alien Species (IAS) cause significant losses through their effects on agriculture, human health and the environment. As a result, governments routinely invest in biosecurity activities across the biosecurity continuum (pre-border, at border and post-border) aimed at minimising impacts of IAS. Investment occurs when the outcomes of activities are considered to be *public goods*; that is, once undertaken, no-one can be excluded from their benefits. Examples include expenditure on quarantine and biosecurity systems, media campaigns to promote awareness of pests; and weed control in national parks. If governments do not fund these types of activities the market will not 'produce' enough of them, compared to the amount required by the community.

Because budgets are limited, governments must make choices about which biosecurity activities receive funding. Budgets are often apportioned according to the risks posed by IAS: for example, activities that mitigate the highest risks would receive funding ahead of those that address lesser biosecurity risks; and surveillance might be undertaken at the border for those IAS that pose the greatest risk of entering, establishing and spreading. Understanding the risks posed by particular pests and diseases is, therefore, key to efficient government investment in biosecurity.

The term 'risk' has a wide range of connotations but all imply that the outcome of an action or event is uncertain. Risk is typically defined as the combination of the likelihood of occurrence and the consequence of exposure of assets to a hazard. The magnitude of the risk is influenced by the level or frequency of exposure and the vulnerability of the assets, the characteristics of the hazard, and how likely an event is to occur. Biosecurity risk analysis is an important part of identifying potential threats, and responding appropriately to those threats.

Approach

*Risk analysi*s is the accepted approach for evaluating biosecurity risks. It provides a scientific, structured, systematic and transparent method for decision-making and is built on a set of

internationally accepted guidelines in the areas of animal, plant and human health risks. These are provided by institutions such as the World Organisation for Animal Health, the International Plant Protection Convention, and the Codex Alimentarius Commission. Risk analysis comprises three distinct but interrelated components: i) risk assessment; ii) risk management; and iii) risk communication.

Risk assessment refers to the scientific part of risk analysis, where experimental and other data are used to arrive at a conclusion about the likelihood and consequence of a hazardous event or risks associated with a product. The basic questions posed in a risk assessment are:

- what could cause harm?
- what could go wrong?
- how likely is it to happen?, and
- how bad will it be?

Despite the use of data in assessment of risks, the absence of complete scientific certainty typically means that subjective judgments will be required. International best-practice guidelines should be followed in undertaking risk assessments, and these are listed in Section IV of the *Codex Alimentarius*[1].

Risk management is the part of risk analysis that considers the options for managing the identified risks. It is a consultative and iterative decision-making process, beginning before risk assessment, running in parallel with it and continuing beyond it when the implemented decisions are monitored and reviewed.

The third component of a risk analysis – ***risk communication*** – involves promoting a clear understanding of all aspects of risk (including uncertainty and variability) in order to help people make decisions, minimise conflicts, improve understanding of perceptions and positions, and achieve equitable outcomes. It includes communication between those involved in assessing risk and those managing risk, as well as with the public and other stakeholders.

Discussion

Governments should use biosecurity risk analysis methods to assess risks across the biosecurity continuum – pre-border, border and post-border. In the pre-border and border parts of the continuum governments could use risk analysis to implement rules that restrict entry of certain plants and animals that would be potentially damaging to a particular country. Risk analysis might also be used to decide which ports of entry should be monitored in order to detect potentially damaging IAS; or to construct lists of IAS of national significance. In the post-border space, risk analysis might be used to allocate a fixed budget between surveillance and control activities for particular pests and diseases that have established.

Future work

It would be useful for the Indonesian Government to undertake a biosecurity risk analysis of potentially damaging plant pests and animal diseases. The review would allow the Indonesian Government to check that its inspection protocols and permits for import were appropriate. The establishment of the Indonesian Biosecurity Foundation envisaged that such an analysis would be taken, with biosecurity interests across all sectors being involved.

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CASH CROPS, FOOD CROPS, TRADE AND MARKET

12. ***Hayuningtyas Dyah Cressidawati***. Mocaf (modified cassava flour) for food diversification in Indonesia.

13. ***Lina Mardliyah & Mujab***. Empowering housewives on processing raw materials from yields into food to strengthen local/domestic economy in Ketanggi village, Salatiga.

14. ***Monika Rahardjo & Mayer Tinting Sirenden***. Utilization of by-product from small beef floss industries into potentially commercial food product.

15. ***Shofyan Adi Cahyono***. Use of information technology on organic farming to increase the interest of young people to become farmers.

Images courtesy of Agnes Cela Purwani (above left), Muhamad Taufik Hariyadi (above right), and Linda Susilowati (right).

12. MOCAF (MODIFIED CASSAVA FLOUR) FOR FOOD DIVERSIFICATION IN INDONESIA

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Abstract
Mocaf, fermented cassava flour, is seen as healthier than other cassava products. Mocaf differs from tapioca where the cassava is not fermented. One area that has begun to develop this mocaf product is Kudus, especially for the Jamaah Produksi Akar Tani Makmur, a group guided by Serikat Paguyuban Petani Qaryah Thayyibah (Qaryah Thayyibah Farmer Groups Association). The method of promotion is interview and direct practice, so the results obtained are in accordance with the real situation and needs. Using mocaf as an alternative flour can reduce dependence on wheat flour. Production and consumption of mocaf flour has helped utilize local wisdom, reduce the rate of imports, reduce the dependence on wheat flour, and support promotion of food diversification to achieve food security.

Keywords: mocaf, food diversification, food security.

Abstrak
Mocaf adalah salah satu alternatif bahan pangan sehat yang terbuat dari tepung singkong. Mocaf berbeda dengan tepung tapioka. Tapioka adalah singkong yang diolah menjadi tepung tanpa difermentasi, berbeda dengan mocaf. Mocaf adalah singkong yang dibuat menjadi tepung melalui proses fermentasi. Salah satu daerah yang sudah memulai untuk mengolah produk mocaf adalah Jamaah Produksi Akar Tani Makmur, yang merupakan salah satu anggota SPPQT. Metode yang digunakan adalah wawancara dan praktek langsung, sehingga hasil yang didapatkan sesuai dengan keadaan dan kebutuhan nyata. Menggunakan mocaf bisa menjadi alternatif untuk mengurangi konsumsi tepung terigu. Dengan memproduksi dan mengonsumsi mocaf dapat membantu menggunakan kearifan lokal, mengurangi import, mengurangi ketergantungan terhadap tepung terigu, dan mendukung promosi keanekaragaman pangan untuk ketahanan pangan.

Kata Kunci: mocaf, keragaman pangan, ketahanan pangan.

Introduction
In Indonesia today many processed carbohydrate-rich food products, such as bread, noodles and junk food, are based on wheat flour. This causes the import of wheat to be very high. One of the efforts to reduce the rate of wheat imports is food diversification, the aim being to restore national food sovereignty. The pattern of food diversification refers to the use of domestic raw materials based on local wisdom, utilizing natural resources that are actually owned by Indonesia. Cassava was chosen as an alternative local product to promote diversification in order to reduce the rate of wheat imports.

Mocaf is flour made from cassava which is one of the alternative healthier flour substitutes. Some people consider mocaf to be the same as tapioca flour, but tapioca and cassava cannot replace the position of wheat flour. Further, mocaf is fermented cassava while tapioca is not.

Table 1 below shows the difference in composition between mocaf flour and cassava flour. From the table we can observe that protein content is higher in cassava flour compared to mocaf, but starch content, amylose content and fiber content are higher than cassava flour, although other content such as water content, ash content, and fat content are similar. So consumers do not need to worry about consuming mocaf as a food that is safe for consumption.

Approach
One area that has begun to develop this mocaf product is the Kudus area, especially for the Jamaah Produksi Akar Tani Makmur, a group which is guided by the Serikat Paguyuban Petani Qaryah Thayyibah (SPPQT).

Table of differences in chemical composition between mocaf and cassava flour[1]

Parameter	Mocaf	Cassava flour
Water content (%)	Max. 13	Max. 13
Protein content (%)	Max. 1.0	Max 1.2
Ash content (%)	Max. 0.2	Max 0.2
Starch content (%)	85 – 87	82 – 85
Amylose content (%)	23.03	17
Fiber content (%)	1.9 – 3.4	1.0 – 4.2
Fat content (%)	0.4 – 0.8	0.4 – 0.8
Level of HCN (mg/kg)	Not detected	Not detected

The method used is interview and direct practice. Interviews were conducted with members from Akar Tani Makmur Farmer Group. The interviews provided much useful information from local sources. Through direct practice the measurement of the cassava flour and mocaf processing is able to be made.

Discussion

Akar Tani Makmur process cassava as a mocaf in hopes of increasing the selling price of cassava in the market. In addition, there are concerns about the consumption of wheat flour which is getting higher. Wheat flour is not recommended for children who have special needs (disabilities) and suffer from diabetes, because that flour cannot be absorbed perfectly by children with special needs. Therefore mocaf is the most suitable alternative substitute for wheat flour for children with special needs and people with diabetes.

Akar Tani Makmur also creates processed products from mocaf to make it easier to be known to the public and more practical. Mocaf processed products include cendol mocaf, mocaf brownies, mocaf layers and many more.

There are several benefits[2] that are obtained by using mocaf flour, including:

- the raw material for flour is widely available in the country, so the possibility of product scarcity can be avoided because it does not depend on imports;
- the price of mocaf flour is relatively cheap when compared to the price of wheat flour and rice flour, so the cost of making products can be lower; and
- the food self-sufficiency program from the government can be realized with the use of foodstuffs originating from domestic production.

Future work

Mocaf does also have a disadvantage compared to wheat flour. Mocaf does not contain gluten which makes the processed product become chewy. The texture of the mocaf itself is more fibrous compared to refined flour. Therefore we need counselling and assistance to the community regarding food and health.

Using mocaf as an alternative flour can reduce dependence on wheat flour. Producing and consuming mocaf flour has helped reduce the rate of wheat imports, reduce dependence on wheat flour, utilize local wisdom, and support the promotion of food diversification to achieve food security.

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13. EMPOWERING HOUSEWIVES ON PROCESSING RAW MATERIALS FROM YIELDS INTO FOOD TO STRENGTHEN LOCAL/DOMESTIC ECONOMY IN KETANGGI VILLAGE, SALATIGA

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Abstract

The income of Ketanggi Farmers in Suruh District, Kabupaten Semarang is very low because they only own very small land areas. The average income is around Rp 1.25 million per month (USD 87 approx). Farmers are accustomed to selling the yields directly from the fields (usually called 'tebas') without any processing, so the price falls. Post-harvest processing needs to be controlled by farmers to add value to their harvest. There are examples of the success of the community in carrying out post-harvest processing by farmers in Getas Village, Kaloran, Temanggung. They successfully process raw corn from the harvest into instant corn rice products, and the products have quite high value. This results in increased income for the farmers. This study is trying to develop a similar project in Ketanggi by building community awareness, production skills and management skills among the farmers.

Keywords: harvest, processing, added value, women

Abstrak

Pendapatan yang diperoleh oleh para petani di Ketanggi, Suruh, Kabupaten Semarang sangatlah rendah. Hal ini dikarenakan para petani yang ada cenderung hanya memiliki luas lahan yang sangat kecil. Pendapatan rata-rata yang diperoleh petani sepanjang tahun hanya sekitar Rp 1250.000 per bulan. Petani terbiasa menjual beras langsung dari sawah (biasa disebut dengan “tebas”) tanpa diproses terlebih dahulu, sehingga harga yang diperoleh jatuh. Pemrosesan pasca panen perlu dikendalikan oleh petani untuk memberikan nilai tambahan bagi hasil panen mereka. Sebelumnya, telah ada contoh daerah yang telah berhasil melakukan pemrosesan hasil panen yaitu di desa Getas, Kaloran, Temanggung. Mereka berhasil memroses jagung hasil panen menjadi beras jagung instan, dan hasil dari produk tesebut dihargai cukup tinggi. Hasil tersebut diikuti dengan peningkatan pendapat petani. Studi ini berusaha mengembangkan proyek di Ketanggi yang serupa dengan proyek yang ada di desa Getas dengan membangun kesadaran komunitas, juga ketrampilan produksi dan mejemen bagi petani.

Introduction

Female farmers in Getas Kaloran Temanggung Regency are skilled in making corn rice. Corn is processed into instant ‘corn rice’, a substitute for rice-paddy. The price of a kilogram of dried corn is around Rp 6,000, but when processed into corn rice, the price can reach Rp 16,000/kg. One kilogram of dried corn can be processed into 0.6 kg of instant corn rice at a price of Rp 9,600. When the costs of labor and supporting materials, such as packaging and marketing, are taken into account they can still earn a 22% margin. This margin contributes significantly to their household economy.

Processing raw corn into corn rice is an additional burden for female farmers on top of their traditional tasks. They have to cut grass for livestock and collect firewood for cooking. They buy the corn cheaply, and then process it into corn rice with the assistance of a number of people. Through this process the female farmers pass on knowledge and skills of making instant corn rice to the people who help them.

In Ketanggi village, the female farmers are vulnerable to being entangled in poverty. They sell their grain in the rice fields with a slash system (tebas), without drying, let alone post-harvest processing. The price is low and often does not cover production costs. Sometimes there are attacks of pests and diseases. Besides the season and the uncertain climate farmers are

increasingly squeezed because they have to think about the cost of working in the rice fields the following season and the cost of living until the next harvest.

In a famine season, the price of rice in the market will increase, while the farmer's family at this time has no rice stock. They inevitably buy rice on the market. We observed 266 farmers as food producers, 80% of whom had become buyers (rice) about a month after harvest. They are farmers but are vulnerable to food shortage.

The problem faced by Ketanggi farmers in post-harvest management is the lack of means of managing crop yields and not having calculations for the benefits obtained when adopting sustainable processes.

The success of women in Temanggung inspires the development of food sovereignty in the area by increasing the added value of farmers' products. It also provides additional employment for female farmers. The habit of processing yields will increase the bargaining power of farmers in Ketanggi.

Approach

Qaryah Thayyibah (QT), a Farmer Groups Association which has interests in working on this issue, has been visiting Temanggung to learn how to process corn into instant corn rice regularly. QT also has been holding a program which gathers women from households and assists them to process the crops into higher selling products. QT also collaborates with related agencies to provide knowledge and the tools for post-harvest processing, and assists the farmer groups to market their products.

Discussion

From female farmers in Temanggung, a lesson can be learned that processing food crops will provide added value as well as new jobs for the women. Training and developing management methods, such as drying, storing, packing, making rice flour and so on, are essential. Processing may also be implemented with other crops such as cassava and peanuts. Developing successful processing needs to be accompanied by developing skills and habits so that the processing can be sustainable.

For developing food security and sovereignty there is a need to consolidate and strengthen farmers, including women farmers. Organized farmers will make it easier to influence policy. Farmers will have bargaining power related to water resources, pricing, processing, and policies at the regional or village level. One of the factors in the success in Temanggung is that they have access to assistance from the local government through related agencies and villages.

A production business sometimes gets stuck because it is not accompanied by maintaining quality and strong marketing and sales. By enhancing the marketing ability, the sustainability of the production processing of the crop will be maintained. Female farmers can share work with male farmers regarding work in the fields and post-harvest management work.

Ketanggi farmers need support from the government, the private sector and other stakeholders in the village in capacity building, such as comparative studies, visiting studies, training and other skills development, to prepare themselves to process crops so they can provide added value, increase employment and increase welfare. Ketanggi female farmers have been marginalized for public activities, decision making and policy making. In the agricultural sector women are still not involved in policy making. Likewise, adopting processing needs a program to improve the skills of women farmers.

The central, regional and village governments must take part in the development of processing of crops with policies that can accommodate farmers’ needs. The budget allocation in the Village Revenue and Expenditure Budget also needs to support the processing of these agricultural products through farmers' economic development programs, increasing women’s capacity in production management and other programs. Female farmers need to get priority programs

because processing practices involve a lot of women. Other stakeholders such as universities, community organizations and farmer organizations can share the work of skills development programs, market development and economic institutions for farmers.

Future work

Training for post-harvest management is absolutely necessary especially for women, considering that women are taking the biggest role in producing products after harvest. Optimizing the training by delivering knowledge and tools which suit the needs will help us to maximize local food cultivation and to preserve biodiversity.

14. UTILIZATION OF BY-PRODUCT FROM SMALL BEEF FLOSS INDUSTRIES INTO POTENTIALLY COMMERCIAL FOOD PRODUCT

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Abstract

Food wastage is a combined term for food loss and food waste and is a problem almost all over the world. The amount of food wasted globally increases, followed by the amount of people that go hungry in the world. Salatiga has approximately ten small beef floss industries. Their daily production produces wasted beef broth as a by-product which, from the nutrition aspect, can be utilized because it has a high nutritional value. Therefore, the aim of this research is to analyze how to utilize the beef broth by-product as well as to create a marketable food such as instant cream soup. Analyses done for instant cream soup in this research were proximate analysis and sensory evaluation. Results of the proximate analysis show that instant cream soup's contents were 58.02% carbohydrates and 23.34% protein, which make this product nutritious. Based on sensory evaluation for instant cream soup, 21 out of 50 panellists like the cream soup on a four out of five scale (between 'like' and 'like very much').

Keywords: food security, food waste, instant cream soup

Abstrak

Food wastage merupakan istilah gabungan antara food loss dan food waste dan merupakan masalah yang dialami di hampir seluruh dunia. Jumlah pangan yang terbuang secara global meningkat, diikuti dengan meningkatnya jumlah orang kelaparan di dunia. Salatiga mempunyai kurang lebih sepuluh industri abon sapi, yang dari produksi hariannya dihasilkan produk samping berupa kaldu daging sapi yang hanya dibuang saja, padahal dari aspek gizi, kaldu sapi tersebut masih dapat dimanfaatkan karena mengandung nilai gizi yang baik. Sehingga tujuan dari penelitian ini adalah untuk memanfaatkan produk samping kaldu sapi dan mengolahnya menjadi produk siap jual seperti krim sup instan. Analisis yang dilakukan pada penelitian ini adalah analisis proksimat. Hasil analisis proksimat menunjukkan kandungan dalam krim sup instan pada penelitian ini adalah karbohidrat 58,02% dan protein 23,24% yang membuat produk ini bergizi. Dari uji sensori krim sup instan diperoleh bahwa 21 dari 50 orang panelis menyukai produk ini pada skala 4 dari 5 (antara suka dan sangat suka).

Kata kunci: ketahanan pangan, makanan terbuang, krim sup instan

Introduction

According to the United Nations (UN), food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preference for an active and healthy life[1]. The most widely mentioned linkage between food wastage and food security is the implicit link between food wastage and food *in*security. Food wastage is a combined term for food loss and food waste and is a problem almost all over the world. The latest available estimates indicate that about 795 million people in the world were undernourished in 2014–2016[2,3]. Recent estimates are that 30–50% of all food produced for human consumption is wasted: 1.2–2 billion tons. It is estimated that just 25% of the global food waste would be enough to feed all the hungry people worldwide[4].

Global levels of food waste are attracting growing concern and require immediate action to mitigate their negative ecological and socio-economic ramifications. For example, in the developed world, 20–40% of food waste is generated at the manufacturing stage of the supply chain[5]. Most food waste is generated at only two stages: that is, during manufacture, and at the consumption stage. Consequently, the food industry often manages its food waste in non-optimized ways, basing decisions on a limited number of factors such as cost, availability of waste management

facilities, and resource requirements to implement the solution[5]. Additionally, large proportions of industrial food waste are unavoidable, which are commonly known as food by-products.

Salatiga, a city in central Java, has some 10 beef floss industries. These industries produce beef floss every day to cover daily consumer demand, thus also producing a by-product from the production process. The by-product, specifically in the form of beef broth, still has good nutritional value and can be processed for potential sale as commercial food products.

Broth is liquid that is usually used as a base for soups and sauces. Preparation of broth involves cooking of meat by simmering, sometimes including fish, vegetables and herbs. During boiling, meat compounds are extracted into water and give a rich flavour to it. According to USDA[6], beef broth typically comprises 95% water, 2% protein, 1% carbohydrate, and low concentrations of lipids. Beef broth may be used as a flavour enhancer or as one of the main ingredients in food.

Instant food is popular especially for breakfast. It is still developing and growing to meet consumer demand every year. Instant foods consist of three main types: appetizer, main course, and dessert. However, many of them are classified as main course since the objective of instant food is breakfast. Many workers often forget or do not have time to have breakfast, though this meal is important to give energy for the whole day. Therefore, the need to prepare meals quickly is an issue that can be addressed by instant food.

Cream soup is one type of soup that is often served as breakfast or as a dinner appetizer. The base ingredient for cream soup is mainly broth. So for utilization of beef broth and to make food easier to handle and serve, the idea for this research is to make instant cream soup.

Methodology

Cream soup ingredients consist of beef broth, chopped white onion, garlic, salt, carrot, parsley, white pepper, eggs, corn starch, medium protein flour, lemongrass, and full cream milk powder. First the beef broth is boiled and clarified. The clarified solution continues to boil until it has reduced to half the original volume. The remaining ingredients are added into the solution which is boiled for 10 minutes, strained, and then boiled further until it is 10 times thicker. Then it is allowed to cool.

Corn starch and medium protein flour are prepared in a 1:1 ratio and weighed. This flour mixture is added and blended into the thick solution. The blended solution containing flour is then vacuum dried for 1 hour 15 minutes at 80^{o}C. The dry product is then scattered using a powdery blender; then strained with 100 mesh strainer. Full cream milk powder is added and mixed until it is spread finely throughout the total mixture. Granulated salt is powdered by blender then added to the cream soup mixture as preferred. We used 3% salt by total mixture weight for this research.

To cook instant cream soup, 100 grams of instant cream soup was added to 1.5 litres of water. The mixture was blended thoroughly, then boiled at medium heat for 10 minutes. Cream soup was then served in shot glasses for sensory evaluation[7] and also subjected to proximate analysis (carbohydrate and protein)[8]. Sensory evaluation was done using a hedonic test with 5 scales (like very much = 5, like = 4, neither like nor dislike = 3, dislike moderately = 2, dislike very much = 1) with 50 randomized panellists.

Results and discussion

Instant cream soup was chosen for this research as a model to introduce beef broth as a by-product. Cream soup is a liquid food type that, when consumed, will be easier and faster to digest than other solid food. Smaller size food dimensions correlate with better digestion, resulting in fast energy release[9]. Fast energy release will support the whole day activity.

Based on the results of the proximate analysis in this research, the instant cream soup made from beef broth waste was high in protein content at 23.34%, the protein coming not only from the broth but also from other ingredients added during the preparation. The carbohydrate content of the instant cream soup was around 58.02%, making this food product nutritious. Based on sensory evaluation for instant cream soup, 21 out of 50 panellists liked the cream soup on a four out of

five scale (like and like very much). So, instant cream soup in liquid form after combining with boiling water can be a food option for those who want a quick-served food, and also this product can be one idea for utilizing beef broth by-product from beef floss industries, thus reducing food waste.

Future work

Food technologists have a role in achieving food security. In this example, an industry by-product can be used to reduce food waste. For an instant cream soup product, we will continue to develop the formulation for the flavour so this product can be preferred by consumers.

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15. USE OF INFORMATION TECHNOLOGY ON ORGANIC FARMING TO INCREASE THE INTEREST OF YOUNG PEOPLE TO BECOME FARMERS

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Abstract
The number of farmers in Indonesia decreases annually. This is compounded by the decreasing interest of young people in becoming farmers because this is synonymous with work that is a low level job and underestimated by most people. One agricultural sector that has the potential to be developed by young farmers is organic farming because it has a higher selling value with a market segment that is different from the conventional market. Information technology can also be used to get information and develop a market system so that agricultural products can be sold directly to consumers without going through middlemen. SOM, 'Merbabu Farm Organic Vegetables', is an example of a business unit that applies information technology in organic farming. Through this paper, it is expected to increase the interest of young people in becoming young farmers so that food security can be maintained for the future.

Keywords: young farmer, organic farming, information technology

Abstrak
Jumlah petani di Indonesia tiap tahunnya mengalami penurunan. Hal tersebut makin diperparah dengan menurunnya minat pemuda untuk menjadi petani karena identik dengan pekerjaan yang rendah dan dipandang sebelah mata oleh kebanyakan masyarakat. Salah satu sektor pertanian yang berpotensi untuk di kembangkan petani muda adalah pertanian organik karena memiliki nilai jual yang lebih tinggi dengan sekmen pasar yang berbeda dengan pasar konvensional. Teknologi informasi juga dapat dimanfaatkan untuk memperoleh informasi dan mengembangkan sistem pasar sehingga hasil pertanian dapat dijual langsung kepada konsumen tanpa melalui tengkulak. SOM "Sayur Organik Merbabu Farm" merupakan salah contoh unit usaha yang menerapkan teknologi informasi dalam pertanian organik. Melalui tulisan ini diharapkan dapat meningkatkan minat pemuda untuk menjadi petani muda sehingga ketahanan pangan dapat terjaga untuk masa yang akan datang.

Kata Kunci: petani muda, pertanian organik, teknologi informasi

Introduction
The decline in the number of farmers is a serious problem in Indonesia. Every year, many people switch from the farming profession. According to the 2013 Central Bureau of Statistics (BPS), there was a 16.32% decline in farmer households from 31.17 million households in 2003 to 26.13 million households in 2013. In addition, the average age of 65% of farmers was above 65 years old. This is compounded by the decline in interest of young people to become farmers, so that if there is no regulation and support from government it is feared that food security and sovereignty in Indonesia will be threatened in the future.

Indonesian society's mindset still considers farming as a low-level job with low income, a mindset that often causes young people to feel reluctant to become farmers. This is the case even though youth has many advantages compared to the older generation; for example, more expertise in the application of science and technology to support the agricultural sector for the better.

Agriculture is actually a promising sector if it can be managed well because it meets basic needs, one of which is a food source. Organic food originating from organic farming has a higher selling value and is profitable. In terms of markets, the demand for organic food tends to increase as people become more aware of a healthy lifestyle. Young people can use information technology

to get market access. This paper aims to provide an overview of the application of information technology in organic farming systems in order to increase the interest of young people to become farmers.

Approach

The Organic Farming System in Indonesia is regulated in the Indonesian National Standard (SNI 6729: 2016)[1] which includes guidelines for the application of good agricultural practices starting from the selection and management of land and water, selection of plant seeds, organic fertilizers and pesticides that may be used, and plant care up to harvest, post-harvest and distribution. Using information technology, that national standard can be accessed through www.bsn.go.id in the form of a pdf file so that it can be downloaded by anyone – especially by young people or young farmers as a guideline for organic farming.

Conventional marketing of agricultural products in Indonesia has a very long supply chain and is controlled by middlemen, so the price of agricultural products is usually low and unfavourable at the level of farmers while expensive to consumers. Various technologies sourced from the Internet can be used as marketing media which are referred to as 'e-commerce'. Now there are many free platforms, including websites, Android applications, or social media that can be used to offer agricultural products so farmers can sell directly to consumers without going through the middlemen.

Sayur Organik Merbabu (SOM Farm) has implemented an organic farming system to produce various vegetables and has been using social media as a market platform since 2014. SOM uses social media such as Instagram, Facebook and WhatsApp to increase direct market access to improve the continuity, quality and quantity of vegetable products. In 2015 SOM invited young farmers to grow organic vegetables in the form of 'Citra Muda' young farmer groups. On Instagram and Facebook, this group can be accessed at @sayurorganikmerbabu with hashtag #yangmudayangbertani. In Indonesian, this hashtag means 'the young people do the farming'.

Discussion

Organic agriculture is a farming system that is very suitable to improve food security and sovereignty for the present and the future because it does not use synthetic chemical fertilizers or pesticides. Hence, natural sustainability will be maintained. With the growing technology and science of organic agriculture, accessible from the Internet, the process for organic farming is made easier and the quality of organic products can be improved.

Damardjati[2] says that the demand for organic food continues to increase throughout the world and if Indonesia can help to meet this need, by increasing the export of organic products, it will increase the competitiveness of agricultural businesses in Indonesia and can increase foreign exchange income and farmers' income .

In terms of the economy, organic farming is also more beneficial because operational costs can be reduced. Organic farmers can make their own organic fertilizers and pesticides and the prices of organic vegetables are relatively higher and more stable than conventional vegetables. In addition, multiple cultivation in organic farming can also increase farmers' income because the yields are more diverse. However, such a business model must be based on farmers calculating the costs and benefits of producing organic vegetables.

Indonesia is the country with the sixth largest number of Internet users in the world, namely 143 million, and it is the third largest social media user in the world. This means there is the potential to develop an online marketing system. Instagram, Facebook and WhatsApp are social media that can be used to offer organic vegetable products. Garden and product photos can be displayed on Instagram and Facebook, then the sale and purchase process can be done using WhatsApp and the payment process can be done virtually, through m-banking or e-banking. This system can deliver profitable prices for farmers and affordable produce for consumers, so that more consumers are interested in consuming organic products and market share can increase.

Future work

By cultivating organically and utilizing technology and information it is hoped that young people develop an interest in becoming young farmers. Government and academics can help increase the interest of young people to farm, both in terms of training and advice and through infrastructure assistance so that food security and sustainability in Indonesia can be maintained for the future.

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FOOD MANAGEMENT, FARMING SYSTEMS AND THE ROLE OF GOVERNMENT

16. ***Endang Dwi J***. Implementation of the integrated farming system through field schools to achieve the Sustainable Development Goals (SDGs): Case study in Kalibening Salatiga Central Java.

17. ***Niken Widya Palupi***. Corn challenges in Madura.

18. ***Wilhelmus Terang Arga Sanjaya***. Bio-organic fertlizer for soil health and rice security in Indonesia.

19. ***Ni Gst. Ag. Gde Eka Martiningsih***. Education, training and community awareness: a case study of capacity building in Bali's irrigation system.

20. ***Risya Pramana Situmorang***. Pest control through multiple cropping systems in Gunung Kidul Regency: a qualitative study.

21. ***Slamet Haryono***. Emerging biosecurity and biodiversity in oil palm plantations: a case study from Ketapang, West Kalimantan.

Images courtesy of Mr Bahruddin (above) and Agnes Cela Purwani (left above & below).

16. IMPLEMENTATION OF THE INTEGRATED FARMING SYSTEM THROUGH FIELD SCHOOLS TO ACHIEVE THE SUSTAINABLE DEVELOPMENT GOALS (SDGs): CASE STUDY IN KALIBENING SALATIGA CENTRAL JAVA

Endang Dwi J

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Abstract

One of the Sustainable Development Goals is to end hunger, achieve better food security and nutrition, and encourage sustainable agriculture. The System of Rice Intensification (SRI) Nuswantoro Organic is an integrated farming system that is currently being developed in Qaryah Thayyibah Farmer Groups Association. Before the program launched by Qaryah Thayyibah, the community planted chilis using chemical fertilizer and inorganic pesticides. After some time, the soil becomes hard and infertile caused by chemical and pesticide use. With the SRI program, Qaryah Thayyibah plans to improve the physical properties of the soil and develop a more sustainable agricultural system.

Keywords: integrated farming system, nature conservation, SDGs

Abstrak

Salah satu target pembangunan berkelanjutan adalah untuk mengakhiri kelaparan, mencapai ketahanan pangan dan nutrisi yang lebih baik, serta mendorong pertanian berkelanjutan. Sistem Intensifikasi Padi (SRI) Nuswantoro Organik adalah sistem pertanian terintegrasi yang saat ini sedang dikembangkan di Qaryah Thayyibah. Sebelum program diluncurkan oleh Qaryah Thayyibah, masyarakat menanam cabai menggunakan pupuk kimia dan pestisida anorganik. Setelah beberapa waktu, tanahnya menjadi keras dan tidak subur. Dengan program ini, Qaryah Thayyibah ingin meningkatkan sifat fisik tanah dan mengembangkan sistem pertanian yang lebih berkelanjutan.

Kata kunci: sistem pertanian terintegrasi, konservasi alam, SDGs

Introduction

Based on Nuswantoro Organic SRI, it is estimated that more than 60% of paddy fields in Java have experienced degradation of soil fertility (physical, chemical and biological) which is indicated by the low content of organic matter (below 1%). The impact of this low organic matter content (BO) is that the soil becomes hard and tough so it is difficult to process; response to fertilizer is low; certain nutrients are deficient; the soil becomes acidic; irrigation water use is inefficient; and crop productivity tends to 'level off'.

Farming behaviour is still focused on the sustainability of plants even though the land as the main medium in agriculture also needs to be preserved. SRI Organik Nuswantoro offers an integrated farming system through an understanding of soil ecology. Before conducting cultivation, efforts are made to improve soil texture and structure, revitalize natural substances and animate organisms with organic matter. The materials used can be from animals or plants.

In one kilogram of organic matter there are about 46 macro-organisms that will decompose, including spiders, small caterpillars, mites, beetles and worms. In addition, there are riches of microfauna and microflora. When these organisms die they become useful nutrients for plants. The application of organic material is expected to be able to unite natural substances, make the soil texture more friable, and improve the capacity to bind and store water so that it does not quickly evaporate.

Farmers who implement this system are not permitted to use chemical fertilizers and synthetic pesticides. In addition to destroying natural microorganisms in the soil, fertilizers and pesticides can disrupt ecosystem food chains.

Approach

The Farmers Association of Qaryah Thayyibah is an organization that is starting an Integrated Farming System (IFS) program using the System of Rice Intensification (SRI) method. One of the program areas developed is currently on the Kalibening land in Salatiga. The soil is hard, because previously the land was planted with chili and the cultivation process used pesticides. This condition is a challenge to develop the SRI method, so before planting the rice, repairs are carried out. First, spreading compost on the right and left side of the land, then removing up to 30 cm and re-plowing to make the compost mixture evenly distributed.

Then a spacing of 30 x 30 cm is planted in a single planting system: one seed in one point with a depth of 0.5–1 cm using the L letter pattern. This is done to facilitate weeding, while also providing space for the development of rice parent plants, avoiding the plants competing for nutrients. Availability of more plant nutrients stimulates the growth of roots and stems of rice.

Weeding is done four times, using a method called 'matun' in Javanese terms. This means pulling the handle while walking forward. The function of weeding is to loosen the soil, clean the grass, maintain a stable soil structure, and make room for the soil to absorb oxygen.

When weeding, the land must be soaked so that the soil texture is slightly soft. After completion, some of the water is removed to prevent water overload while maintaining the soil moisture. Too much water in the plantation will also potentially kill biota that support land development. Besides, rice is actually not a water plant: although it needs a lot of water it does not need to be overloaded.

Discussion

SRI has created a learning model called 'field school'. Participants are invited to observe, do, analyse, conclude and apply. The field school is conducted 10 times every two weeks. Observations are made starting from measuring leaf length, calculating the number of rice stems, paying attention to soil conditions and observing the ecosystem. All findings are recorded, discussed and then recommendations made.

During four series of meetings weeding and spraying were consistently recommended. Weeding is done in vertical and horizontal directions in each row of the planting matrix. One day it is done in a vertical direction, then the next day it is in the horizontal direction, and so on. The weeding schedule should not be delayed because if it takes too long the land will harden again.

Because the system does not allow the use of inorganic fertilizer, the nutritional needs of plants are supplied by local microorganisms: bacteria from plants fermented for 14 days. Local microorganisms also function as plant stimulants. The types vary. Some are made from bamboo shoots, maja fruit, banana stems, and sweet fruit waste like papaya, banana. Even snails, from ecosystems around rice fields, can be processed. Snails are higher in nutrients than microorganisms.

After weeding four times there is a change in soil texture. Little by little it starts to soften. The leaves on the yellowing plants begin to green again after being sprayed with a snail MOL (Mikro Organisme Lokal – a compost starter) and bamboo shoot MOL. The two MOLs are mixed in doses of 2 litres each. One day after spraying the leaves are fresh and green again.

Now the leaf length reaches an average of 78 cm; the number of rice stems increases to 56–60 and some even reach 131. The field school is halfway complete: there are still five more meetings to observe and make recommendations to maximize production.

Future work

Even though it is still in progress, this system is expected to contribute to achieving Sustainable Development Goals, based on the concept of sustainable agriculture through improving land structure and implementing environmentally friendly agricultural practices. Not only that, this method also teaches how to preserve the environment because the cultivation process uses

natural ingredients that are safe for the environment. This system is expected to be able to increase agricultural productivity, maintain soil quality and ecosystem well-being in accordance with goal number 2 from the SDGs. The outcomes will help to end hunger; achieve food security; improve nutrition and promote sustainable agriculture.

Further reading

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17. CORN CHALLENGES IN MADURA

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Abstract
Madura, in East Java, Indonesia, has vast amounts of land under corn production. However, despite this, there is a high poverty level due to low corn yield per hectare. Quantitative data from secondary sources was used to choose locations for conducting qualitative research. Qualitative approaches such as face to face interviews with farmers and households, also focus group discussions, were used to understand the reasons for the challenges and cultural attitudes to corn production in Madura. Results showed that cultural practices in relation to corn handling should be considered by the government or related private sectors if corn cropping or businesses are to be successful in this area. For future work, it is suggested seed or feed companies should do Corporate Social Responsibility (CSR) work to explore seed characteristics required by corn farmers in Madura. This may also provide potential business opportunities for these companies.

Keywords: corn, cultural attitudes, Madura

Abstrak
Madura, yang terletak di Jawa Timur, Indonesia mempunyai lahan produksi jagung yang luas. Namun, ternyata indeks kemiskinan di Madura cukup tinggi dikarenakan renadahnya produktivitas jagung per hektar. Data kuantitatif yang diperoleh dari sumber data sekunder digunakan sebagia acuan untuk menentukan lokasi penelitian kualitatif. Pendekatan kualitatif yang dilakukan adalah wawancara tatap muka langsung dengan petani dan rumah tangga petani serta diskusi kelompok untuk memahami alasan yang mendasari tantangan dan nilai-nilai budaya pada produksi jagung di Madura. Hasil penelitian menunjukkan bahwa praktik budaya yang berkaitan dengan penanganan jagung harus dipertimbangkan oleh pemerintah maupun sektor swasta jika ingin melakukan program pengembangan jagung atau bisnis yang terkait dengan jagung sukses dijalankan di Madura. Berikutnya, perusaahan benih jagung maupun perusahaan pakan di Indonesia melalui kegiatan Tanggungjawab Sosial Perusahaan (CSR) perlu melakukan penelitian untuk mengetahui dan menciptakan karakteristik benih jagung yang diinginkan oleh petani jagung di Madura. Informasi yang diperoleh, bisa menjadi peluang bisnis yang menjanjikan bagi perusahaan.

Introduction
East Java is the biggest Indonesian maize producer, contributing more than 20% to national production[1]. However, although the corn area in East Java is the biggest, productivity is lower than in other Indonesian provinces. West Java, West Sumatra, West Nusa Tenggara, and East Java showed corn productivity of 8.19, 7.376, 6.64 t/ha compared to 5.09 t/ha from East Java. Low corn productivity in Madura island contributes to low productivity in East Java as a whole. Madura island has 4 regencies and one of them, Sumenep, has the largest area (143,215 ha) of corn land in East Java. However, the corn production in Sumenep is smaller than in Lamongan which only has 66,800 ha corn area. The main reason for their low productivity is because the farmers plant retained corn seeds which have low quality. This low productivity contributes to their poverty.

Madura is part of East Java province which is separated from East Java mainland by the sea which is called Selat Madura. Therefore, the living behaviour, including corn farming behaviour, of Madura people is different compared to other East Java citizens. They prefer to eat corn as their main food rather than rice. For them, corn has a value as high as money because they can exchange corn for other household needs, such as palm oil, body wash, coffee, etc. In every house they have ‘lumbung’, a place for keeping food, and they keep corn for all family members, not other crops.

Every year the government delivers a corn hybridization program throughout Indonesia, but it has limited success in Madura where farmers prefer non-hybrid 'Madura corn'. This is grown from farmer-saved seed, kept in the house. Madura corn plants are small, with small cobs, hence, the low harvested yield.

Approach

This study applied quantitative and qualitative methods to understand the reasons for corn problems in Madura. Quantitative data involving corn production, corn area, corn productivity, number of household farmers and farmer groups were collected from secondary sources at regency and district levels. As a result, detailed pictures of corn farming in Madura were achieved. Quantitative data guided us to choose locations for conducting interviews. Interviews were conducted in all regencies in Madura (consisting of Bangkalan, Sampang, Pamekasan, and Sumenep) but it was not possible to visit all districts in these regencies. Interviews were conducted in 3 districts for every regency which had high numbers of male farmers groups (MFG) and female farmers groups (FFG). For example, in Sumenep regency we interviewed in these districts:

- Rubaru which had 208 MFG and 102 FFG,
- Lenteng which had 278 MFG and 75 FFG, and
- Batuputih which had 233 MFG and 70 FFG.

Qualitative data were collected using interviews with a questionnaire. Interviews of households and farmer groups were undertaken to understand cultural attitudes to crop production. The farmers' households were interviewed regarding seed, planting method, selling and market issues, fertilizer problems, and labour for planting corn.

Discussion

The interview results provide interesting facts, previously not exposed, about the corn challenge in Madura.

a) ***Seed issue***. Hybrid seed contains more starch than local varieties, indicated by more white area of the seed. Such seed does not keep as well as Madura corn which contains less starch. Hence, Madura farmers do not sell all their harvested corn. Some is kept for exchange for other household needs, and some for planting the next crop. Farmers prefer corn seed which can keep for at least 4 months.

b) ***Improper planting method***. When they planted hybrid corn, they treated it like traditional corn seed. The hybrid seed did not grow well and, as a result, the farmers assume that hybrid seed is low quality.

c) ***Selling and market issue***. Farmers do not have motivation to increase corn productivity because the market for selling corn in bulk is unfamiliar. They are used to selling little by little when they need other commodities. Moreover, traditional stores give a lower price for hybrid corn compared to traditional corn because of its poor storage characteristics.

d) ***Labour issue***. Male adults and teenagers do not want work as corn farmers, preferring to work in Surabaya as construction laborers, ojek (bicycle taxi driver), or other informal jobs. Therefore, corn farming is conducted by older generation female farmers, including mothers and grandmothers.

e) ***Corn is women's business***. All activities related to corn business are women's responsibility: on farm, off farm, storage, and marketing. Although men sometimes help the family with corn farming, women take the lead and make decisions. On the other hand, tobacco is men's business: men will spend much effort on tobacco planting, because in their history tobacco was an expensive commodity. However, in current years, the tobacco price is more unstable than the corn price, and as a result the men go to Surabaya where they can earn more money than from farming.

Future work

The government and seed companies should consider farmers' preference for seeds which contain less carbohydrate and have a round shape rather than horse-teeth shapes. The Madura farmers assume that a round shape is more compact and gives less space for insect or other small animals living inside the whole corn cob.

In addition, intensive education about proper corn planting methods should be delivered by government, seed companies, fertilizer companies, farmer groups, community groups, and agriculture shops. These entities need to recognise that the farmers are both men and women, because women play such an important role in corn farming and harvesting. Regarding market access, it is good if there are some service providers who have a good relationship with farmers and seed companies and can facilitate corn cropping from seeding to harvest.

There is a possibility for future collaboration with seed companies and feed companies through Corporate Social Responsibility and or international organizations. A seed company which successfully produces seed for Madura farmers may benefit from other potential business opportunities. There are around 18 feed industries in East Java province. These can also gain benefit because their need for corn as a raw material for feed can be fulfilled from local sources. It is to be hoped there will be international organizations that will play a role to evaluate and report that an increase in corn production will promote food security and not affect biodiversity in Madura.

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18. BIO-ORGANIC FERTILIZER FOR SOIL HEALTH AND RICE SECURITY IN INDONESIA

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Abstract
Indonesian people are highly dependent on rice for their food security. To meet this dependency, rice paddy productivity has increased significantly since the 1960s. Chemical fertilizers have been an integral part of paddy-field intensification; however, long-term use of these fertilizers is causing soil degradation. Rice production is decreasing as a result, threatening Indonesia's food security. Bio-organic fertilizers provide a solution because they allow farmers to preserve the soil health required by rice plants. This paper details the use of bio-organic fertilizers on Indonesia's paddy soils, and discusses the challenges and opportunities for their future use.

Abstrak
Masyarakat Indonesia memiliki ketergantungan yang sangat tinggi terhadap beras untuk memenuhi ketercukupan pangan. peningkatan produksi beras telah dilakukan secara besar-besaran sejak tahun 1960 untuk memenuhi kebutuhan pangan nasional. Intensifikasi lahan sawah dilakukan dengan mengintroduksi pupuk kimia dengan pengunaan yang terus meningkat hingga saat ini. Pengunaan pupuk kimia menyebabkan degradasi tanah. Produksi padi yang menurun menjadi dampak, sehingga mengancam ketahanan pangan Indonesia. Bio-organic fertilizers merupakan salah satu solusi karena memungkinkan petani untuk menyeriakan tanah yang sehat untuk padi. Paper ini membahas tentang pengunaan bio fertilizer pada tanag sawah, serta tantangan dan pengembangannya untuk pengunaannya di masa depan.

Introduction
Indonesia is facing crucial challenges to preserve sufficient food for the people because of rice dependency since the Indonesian government introduced rice as a national food product in 1960s. Indonesia also adopted an intensification technology package, including inorganic fertilizer and agrochemical product use, to increase rice production and productivity. This resulted in a significant increase in national rice production by three to five times during 1960–2000s (Figure 1). However, the average growth in rice productivity was decreasing during 2000–2008 and was only 0.95% per year in 2008.

Levelling off of productivity increment may indicate that intensive inorganic fertilizer use has reached a limit. Most of the paddy fields in Indonesia have been degraded and exhausted because of intensive inorganic fertilizer use, heavy cultivation, and over-exploitation. Inorganic fertilizer and other agrochemical products contribute to negative effects such as land degradation and

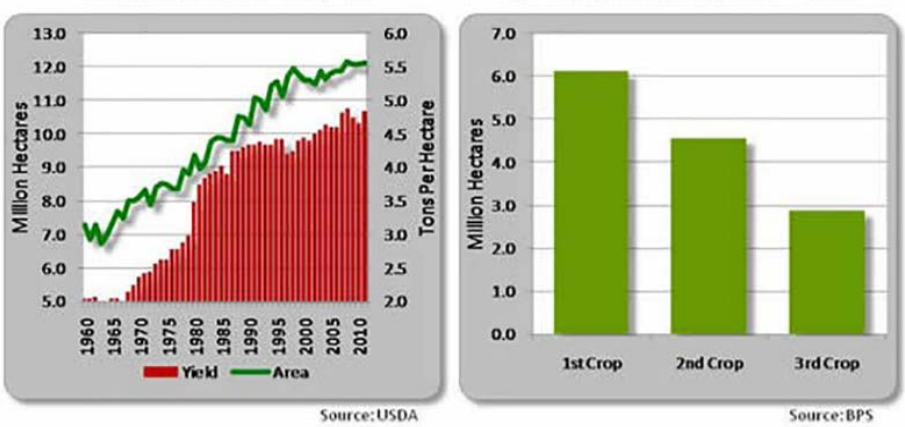

Figure 1. (left) Indonesia rice area and yield, 1960–2010; (right) Indonesia seasonal rice area 2011.

other environmental problems. In 2012, around 70% of paddy soils had low organic carbon and around 90% of dry land had very sick soils with high acidity. The other significant impact is decrease in soil biodiversity which can make the field ecosystem fragile and unhealthy.

The nutrient and soil health management of paddy soils is an important issue in securing rice production sustainability. Organic matter plays a significant role in optimizing soil quality because it can enhance and repair physical soil characteristics and preserve many nutrients in soil. To optimize rice production and productivity in sustainable ways, organic farming has been promoted for the two last decades. Many developments of organic farming systems have been reported including SRI (System of Rice Intensification) and SOBARI (System of Organic Based Aerobic Rice Intensification)[1,2]. All of these systems combine organic fertilizer (organic matter) and biofertilizer (beneficial microbe inoculant) which is named bio-organic fertilizer[1]. While development of bio-organic fertilizer is widely adopted there are some challenging issues with bio-organic fertilizer use. This paper is a critical review about the use of bio-organic fertilizer in paddy fields in Indonesia and some things to consider for the future.

Approach

The paper is based on interview results, government reports, national regulation and an extensive literature research about bio-organic fertilizer use in Indonesian paddy soil. Interviews were conducted with 18 farmers who came from Java, Sumatra and Bali. Government reports were collected from the Central Bureau of Statistics. The critical review term referred to Grant & Andrew's methodology[3].

Discussion

Organic farming has been in use in Indonesia since 1900 and increased sharply to around 200 million hectares in 2008. Scientists have developed an Organic Farming System which is suitable for implementation in the paddy soil. Around 2007, a System of Rice intensification (SRI) was started in Indonesia to preserve a reliable organic farming system for enhancing rice productivity. It is a modifying method of plant, soil, water and nutrient management which could support populations of beneficial soil organisms. The method has been implemented in several regions such as Bogor, Bandung, Sukabumi, Ciawi, Semarang, Salatiga, Kudus, Purbalingga, Ngawi, Banyumas, Kuningan, and Bandar Lampung.

Research on the organic intensification system has been carried out intensively since there was support from the central government. Prioritized topics are biofertilizer (beneficial microbes), advanced organic systems in critical lands, and better quality of organic fertilizer products. Biofertilizers have been used on tidal swamp fields in South Kalimantan and East Sumatra[4]. Other modifying organic farming systems have been reported, such as IPATBO (integrated organic-biofertilizer based on nutrient management and water-saving technology) in 2018 as a new form of organic intensification system[2,5].

Even though there are significant increases in organic farming, reducing the use of chemical agriculture inputs has not been a priority. National government still provides subsidized inorganic fertilizers (Urea) as a main component to increase rice production. Extensive chemical input use and soil over-exploitation have caused soil biodiversity loss which makes the ecosystem very fragile. It makes pest and disease attack easy because of loss of barriers to ecological invasion. Indonesia had lost 63,075 ha of paddy fields because of brown planthopper (*Nilaparvata lugens*) in 2017[6]. It attacked again in 2018, affecting around 70% farmers, and made government increase rice imports in January. Pest management has become a crucial issue, and protecting soil biodiversity is the most important aspect to support it[7].

Agriculture sector stakeholders are facing a dilemma. They are concerned about not only optimizing production and productivity for today, but also maintaining soil to support sustainable production into the future. Implementation of an organic system with bio-organic fertilizer use is a reasonable alternative to accommodate both concerns. Stakeholders should understand that the goal of organic farming systems and bio-organic fertilizer use is about realizing sustainable rice production in healthy soil, and therefore that organic farming system implementation cannot

Registered bio-organic fertilizers in Indonesia

FERTILIZERS	Years					
	2005	2006	2007	2008	2009	Total
Organic fertilizers	9	30	70	72	90	271
Bio-fertilizers	3	4	9	8	12	36
Zeolite	-	7	5	7	5	24
Dolomite	-	13	11	11	18	53
Soil amendments	-	5	2	-	1	8
Agriculture lime	-	1	1	2	3	7
Total	12	60	98	100	129	399

totally depend on market value. For the future, the agriculture sector will have two options: either use a totally organic agriculture system or use a combination with inorganic products as a support system.

The other challenge for organic agriculture development comes from some misleading national regulations about biofertilizer, organic fertilizer and bio-organic fertilizer. Based on some reports, all biofertilizer product which are sold in the market are not qualified as a biofertilizer product based on Indonesian Agriculture Ministry Regulation No. 70/2011. It is caused by a lot of unreasonable requirement such as C-organic, water concentration, and nutrient composition[8,9]. The regulation has no legal standing which makes many people break the rules and sell products below the standard quality of bio-organic fertilizer without penalty.

Future work

To preserve reliable organic intensification, with preservation of soil organic matter, is the most important issue to support rice production. Specific and accurate data at the village level should be collected to determine appropriate villages that can implement organic farming systems. Quality standards of organic agriculture products (especially bio-organic fertilizer) should be more easily controlled to enhance organic farming implementation. Quality indicators and a quality control kit will be useful in maintaining quality control.

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19. EDUCATION, TRAINING AND COMMUNITY AWARENESS: A CASE STUDY OF CAPACITY BUILDING IN BALI'S IRRIGATION SYSTEM

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Abstract

Capacity building is the process by which individuals, groups, organizations, institutions and societies increase their ability to perform core functions, solve problems, understand needs in a broader context and think about sustainability matters. Capacity building embeds personal responsibility and recognition of individual obligations that come from awareness of environmental issues. This is strengthened by interactions with people who have similar interests. Awareness of environmental issues drives activities that help environmental preservation and will also affect the sensitivity of the community to biological security, food security and food sovereignty. This article is related to the goals of the Indonesian Government to reach these objectives, and discusses the role of intergenerational capacity building in the Balinese water irrigation system called 'subak'.

Keywords: food security, food access, food sovereignty

Abstrak

Terminologi 'pengembangan kapasitas' adalah proses dimanaindividu, kelompok,organisasi, lembaga, dan masyarakat meningkatkan kemampuan mereka menjalankan fungsi-fungsi ini, menyelesaikan masalah, memahami kebutuhan dalam konteks yang lebih luas dan memikirkan masalah keberlanjutan. Pengembangan kapasitas tertanam dalam tanggung jawab pribadi dan pengakuan kewajiban individu yang muncul dari kesadaran tentang masalah lingkungan. Ini diperkuat oleh interaksi dengan minat yang sama. Kesadaran akan masalah lingkungan mendorong tindakan pelestarian dan juga akan mempengaruhi sensitivitas masyarakat terhadap keamanan biologis, keamanan pangan, dan kedaulatan pangan. Artikel ini terkait dengan tujuan Pemerintah Indonesia untuk mencapai tujuan ini.

Kata kunci: ketahanan pangan, akses pangan, kedaulatan pangan

Introduction

Over the period 2015–2020 Indonesia will face many complex development challenges, especially in relation to poverty and food security. The national target is to increase food supply and sovereignty. Some basic programs have been envisioned and implemented, starting in 2015, and are expected to be achieved by 2020. The Indonesian Government has increased its focus on organic farming programs by strengthening farmer groups and agricultural organizations. Some of these programs are implemented throughout the provinces in Indonesia. In Bali Province, subak, or traditional water irrigation management, is the focus of this strengthening.

Approach

This study is based on field data and focus group discussions with subak personnel. Questions were posed to subak leaders, other traditional leaders and farmers about the opportunities and challenges in preserving agricultural resources in particular and the environment in general. A key question was how plant management can be carried out in the field so that the concept of environmental preservation based on the traditional philosophy of Tri Hita Karana ('three causes of well-being' or 'three reasons for prosperity') can be promoted. Informants were asked to sign the informed consent form if they agreed to be interviewed in this study. The interview process was started after getting their permission. The process was voice recorded. The data obtained were tabulated and analyzed (thematic analysis according to Creswell[1]). The respondents' themes were then edited, and grouped into themes and concepts.

Discussion

From all the informants interviewed there were seven themes with varying numbers of responses.

- Thirty per cent of informants answered 'strongly agree' that implementing the Tri Hita Karana principles and providing training in biosecurity and food security would improve sustainable management and food security with environment preservation.
- Twenty-five per cent said they 'agreed' and were convinced of the sustainability of food security and environment preservation with the ongoing assistance and empowerment of farmers.
- Seventeen per cent replied 'agreed' but were not sure of the statement about agriculture resources and environmental preservation.
- Fifteen per cent answered 'agreed'.
- Five per cent answered 'not sure' that the traditional philosophy could be implemented in the field.
- Five per cent of informants did not agree about the philosophy of Tri Hita Karana.
- The remaining three per cent did not answer or abstained.

Only the first two themes are discussed now. It can be seen that the largest theme is sustainable management and training. This theme supports the finding that the informants believe that the implementation of Tri Hita Karana is very important in preserving the subak resources and environment. The second most significant theme is the action of assistance and empowerment of farmers in biosecurity and food security management. This is important in the capacity building of human resources of subak.

Overall, the research supports the finding that for preserving subak resources and environment the government and all elements that are related to this action have to support empowering subak through farmers. Assistance and training in implementation of the Tri Hita Karana philosophy are very important to accelerate capacity building of subak's human resources.

The findings support the research of Kaler *et al*.[2] who found that biosecurity management is built into the system of subak in Bali, and that its importance and principles are generalizable to other locations in Indonesia, and might also be appropriate in other locations internationally. The fundamental concepts are that culture is a tool, in the Balinese example, which is used to optimize food production. This involves synchronization of cultural rituals, water irrigation through different rice fields in the subak system and subsequent biosecurity processes of plant pest disease management to reduce losses. This ensures effective management of biosecurity through the practice of sustainable farming, to achieve economic welfare and social inclusion without degrading environmental quality. Disturbance and stress may occur at any time in the agricultural cycle, but informed farmers have resilience to move forward to reach a new equilibrium through developing new science and technologies as well as through adopting new policies.

Subak is a remarkable model for place-centred and inter-generational education and training, and for providing youth the opportunity to develop their competence based on collaboration, experience and community service. Furthermore, it can be explained that in subak organizations the concept of sensitivity and alertness to the environment is closely related to the philosophy of Tri Hita Karana so that it is an obligation for each subak member to carry out environmental training and food sovereignty. Thus, capacity building in subak organizations is strongly influenced by Tri Hita Karana: promoting an harmonious relationship between the natural and spiritual worlds, through an intricate series of rituals, offerings and artistic performances. Subak is a democratic and egalitarian system focused on water temples and the control of irrigation that has shaped the landscape over the past thousand years. Water temple networking ceremonies are associated with the practical management of water, crystallising the precepts of the Tri Hita Karana.

In short, the case of the Balinese subak water management system as a model for place-based intergenerational capacity building provides an important example of how cultural practices can

support and strengthen agricultural and food security outcomes by ensuring that cultural rituals and activities accompany each step in the agricultural cycle. In the Balinese case, these rituals and activities are passed on through place-based capacity building to ensure that sound biosecurity practices occur as part of this integrated process, including weed and pest management.

Future work

To promote community awareness about the need to preserve the environment, a strategy is required which involves the community more fully in biosecurity activities as part of capacity building. Additional capacity building activities will prepare more youth to deal with a diversity of interlinked, complex issues. An example is to develop more specific biosecurity strategies, as posed by Meyerson & Rearser[3]. These strategies would include prevention and early detection of, as well as rapid response to, harmful and potentially harmful organisms.

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20. PEST CONTROL THROUGH MULTIPLE CROPPING SYSTEMS IN GUNUNG KIDUL REGENCY: A QUALITATIVE STUDY

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Abstract

Gunung Kidul Regency in Yogyakarta is dominated by hilly areas. Structurally, much of the Gunung Kidul Regency is a karst area where geographical conditions and dry land contribute to the lack of water availability. This study uses a qualitative approach to observe implementation of multiple cropping systems in Gunung Kidul Regency. Expected findings from this study are a description of multiple cropping systems that are implemented by rural society, especially related to the issue of biosecurity. The expected outcome of this research will provide benefits for development of local knowledge which can also provide a module in schools.

Keywords: cropping systems, local knowledge

Abstrak

Kabupaten Gunung Kidul adalah salah satu wilayah di Yogyakarta yang didominasi oleh daerah bukit dan kondisi struktur lahan yang umumnya tersusun atas tanah kapur. Kondisi geografis dan tanah yang cenderung kering di Kabupaten Gunung Kidul menjadi faktor pembatas terhadap ketersediaan air. Penelitian ini menggunakan pendekatan kualitatif melalui pengamatan terhadap implementasi pola tumpang sari oleh masyarakat lokal Kabupaten Gunung Kidul. Temuan yang diharapkan dalam penelitian ini adalah deskripsi tumpang sari yang diimplementasikan di Kabupaten Gunung Kidul, yang berkaitan dengan ketahanan pangan. Hasil yang diharapkan dalam penelitian ini adalah untuk pengembangan pengetahuan lokal dimana juga dapat menyediakan sarana belajar di sekolah.

Kata kunci: sistem pertanian, pengetahuan lokal

Introduction

Most people involved in agriculture use different cropping patterns depending on the seasons and condition of the area. Cropping patterns are a part of the cultivation process that are often developed to produce various adaptive cropping systems. Cropping patterns are developed in order to utilize resources optimally and increase crop productivity. Indonesia is a tropical country that has agricultural land which depends on rainfall. Therefore, the selection of species and varieties of plants can be based on the rainfall that occurs.

Typically, farmers apply two types of planting patterns, namely monoculture and polyculture. Monoculture is based on a single crop species while polyculture is a pattern of agriculture using several types or varieties of plants in one field. Polyculture farming tends to pay attention to environmental aspects, as biodiversity tends to improve stability of a system. Gunung Kidul Regency is dominated by hilly areas in which there are many natural caves and underground rivers that flow. The condition of the land structure makes a large part of the Gunung Kidul Regency a karst area.

Seasonal conditions include 3 months dry and 7 months wet[1]. The northern part of Gunung Kidul Regency is the highest rainfall area compared to the central and southern regions, while the southern part of the Gunung Kidul region has the earliest time of rain. Geographical conditions and dry land in Gunung Kidul are limiting factors to farming[2]. Intercropping patterns on dry land are a strategy to increase crop productivity and to promote food security.

Tumpangsari (polyculture) as an effort to intensify space and time is mostly carried out in narrow-land agriculture and dry/rainfed environments. As a production system, intercropping is used because it can improve labor efficiency, suppress pest, disease and weed attacks, and still have a

chance to get results if one component of the crop fails to harvest. Intercropping patterns in crop cultivation are selected because a higher total yield can be obtained than can be achieved by a monoculture planted on the same land area and with the same level of management.

Thus, cropping patterns have important meaning in crop production systems through utilizing and integrating the availability of various components, which include: agro-climate, land, plants, pests and diseases, cultivation techniques, and socio-economic conditions. Cropping patterns in the tropics, such as in Indonesia, are usually arranged for 1 year with regard to rainfall (especially in areas/land that are completely dependent on rain). Then the selection of types/varieties to be planted needs to be adjusted to the availability of water or rainfall.

Some cropping patterns that are often applied are as follows:

- Intercropping, planting more than 1 plant (same or different age). Example: intercropping with crops that grow to maturity over similar lengths of time, such as corn and soybeans; intercropping with crops having different times to maturity, such as corn, cassava and upland rice.
- Multiple cropping, carried out in succession throughout the year, takes into account other factors to get maximum profit. For example: young corn, upland rice, peanuts, and cassava[3].

Accuracy in potential analysis regarding local multiple cropping systems can provide knowledge for students according to regional characteristics. Developing student competency by paying attention to the study of local potential is still rarely implemented in middle schools especially in Gunung Kidul Regency.

Approach

This research used a qualitative approach through activities-analysis of multiple cropping systems. Analysis of local potential was done so that a known environment could be studied as a learning resource. Data obtained are then explained through detailed descriptive and analysis results in the form of images about facts. Sampling of insects was carried out with a trap method (pitfall traps), insect nets (sweeping net), and observation (hand collection).

Results and discussion

The insect samples contained 5 Orders and 11 Families.

Number	Order	Number	Family	Ecological role
1	Coleoptera	1	Anthicidae	Eater of organic matter
		2	Coccinellidae	Predator
		3	Elateridae	Eater of organic matter
2	Hemiptera	1	Alydidae	Herbivore
		2	Cercopidae	Herbivore
		3	Cicadellidae	Herbivore
		4	Pentatomidae	Herbivore
3	Hymenoptera	1	Apidae	Predator
		2	Formicidae	Predator
4	Lepidoptera	1	Lymantriidae	Herbivore
5	Orthoptera	1	Acrididae	Herbivore

Insects may play a detrimental or a profitable role. If natural enemies have a role as an optimal predator from the beginning, the pest population can be maintained at a balanced level, or with fluctuations in the population of pests and natural enemies balanced, avoiding a pest explosion

The implementation of multiple cropping systems will have more impact in suppressing pest attacks where plants which can be used as a pest repellent are incorporated. Multiple cropping systems contribute to reduced pest population density compared to monoculture systems, due to the role of volatile chemical compounds and visual disturbances by non-host plants, which

affect behavior and speed of insect colonization in host plants. A number of plants also have the potential to keep away certain diseases[4].

To get optimum results, multiple cropping systems must be chosen in such a way that they can use space and time as efficiently as possible and impose the smallest competitive influence. Thus, it is desirable that plants used in intercropping have different growth patterns, allowing them to complement each other. Patterns can be uniform, for example in lines that intersect alternately, or random. Examples are peanuts intercropped with cassava, soybeans between corn plants, or corn with upland rice, and they can include vegetables such as long beans.

Future work

Projecting ahead, the idea in this preliminary research should be a recommendation for developing a module in senior high school. The importance of integration of local knowledge in the curriculum provides an opportunity for students to understand the context of their living environment.

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Multiple cropping system in Gunung Kidul Regency.

Image courtesy of Risya Pramana Situmorang.

21. EMERGING BIOSECURITY AND BIODIVERSITY IN OIL PALM PLANTATIONS: A CASE STUDY FROM KETAPANG, WEST KALIMANTAN

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Abstract

Oil palm was first introduced to Indonesia in 1848, and since then the country has become the world's leading producer, as well as one of the main consumers. As of 2015, over 11 million hectares is used to grow oil palm, including government-owned, private and smallholder plantations. Oil palm is claimed as a multi purpose oil, for human needs and to leverage rural economic development. On the other hand, the oil palm plantation industry has many critics concerning its impact on the environment, and social issues such as deforestation, human and animal conflicts. This paper will explain Company–community initatives leading to collaborative action as a case study in Ketapang, such as preservation of conservation area, opening new rice fields, mushroom and edamame production initiatives. After observing location, interview and secondary data collection thus the oil palm companies need to pay attention to biodiversity and food scarcity issues through assisting the communities and creating collaborative sustainability action.

Keywords: oil palm, collaborative sustainability action, oil palm biosecurity

Abstrak

Kelapa sawit diintroduksi pertama kali ke Indonesia pada 1848, yang menempatkan Indonesia pada peringkat tertinggi sebagai penghasil dan sekaligus konsumsi minyak sawit. Pada tahun 2015 tercatat lebih dari sebelas juta hektare tertanam kelapa sawit termasuk perkebunan milik pemerintah, perkebunan swasta maupun perkebunan rakyat. Kelapa sawit diklaim sebagai minyak yang mempunyai banyak manfaat bagi manusia serta dapat meningkatkan pembangunan ekonomi perdesaan. Di sisi yang lain kelapa sawit mendapatkan banyak kritik terkait isu sosial dan lingkungan seperti deforestasi, konflik terhadap manusia dan binatang. Makalah ini menjelaskan mengenai aksi kolaborasi perusahaan dan masyarakat melalui studi kasus di Ketapang, seperti pencadangan area konservasi, pembukaan persawahan baru dan inisiasi produksi jamur dan edamame. Setelah melakukan pengamatan di lokasi, wawancara dan pengumpulan data sekunder maka perusahaan kelapa sawit perlu untuk lebih memperhatikan permasalahan ketahanan hayati dan ketahanan pangan melalui pendampingan terhadap masyarakat dan menciptakan kegiatan pelestarian kolaboratif.

Kata kunci: Kelapa sawit, aksi lestari kolaboratif, ketahanan hayati kelapa sawit

Introduction

Since the oil palm was first introduced to Indonesia in 1848, the country has become the world's leading producer, as well as one of the main consumers[1]. As of 2015, over 11 million hectares is used to grow oil palm, including government-owned, private and smallholder plantations[2]. Palm oil is an extremely cheap, versatile product and is the principal food oil of many of the world's poorest. It also has uses in the oleo-chemical industry which processes it into cosmetics, soap and medicines. As a biofuel it has the potential to reduce emissions from the burning of petroleum[3]. Through employing 3.3 million people[2], infrastructure development, and government-mandated smallholder schemes, palm oil has the capacity to be a major tool for rural socio-economic development and poverty reduction[4].

However, oil palm plantations have also caused many social and environmental problems, including land grabbing, illegal working conditions, social conflicts, deforestation, loss of critically endangered habitats, and carbon emissions from the clearing and draining of peat[5,6]. The

existence of oil palm plantations is also a threat to biodiversity and associated ecosystem services used by local communities, due to oil palm plantations' extensive land use. This can be a serious threat to indigenous people and others who depend on subsistence agriculture or surrounding forests for their nutrition. Based on this situation, this paper will examine biosecurity issues in oil palm plantations.

Approach

This paper is based on a case study approach. The first step is collecting secondary data related to oil palm and PT KAL (PT Kayung Agro Lestari), a plantation in Ketapang Regency, West Kalimantan, where the case study was located. The second step is conducting direct observations and informal interviews.

Findings and discussion

PT KAL is a subsidiary of Austindo Nusantara Jaya (ANJ), a national plantation company with a mission to be "a world class agribusiness based food company that elevates the lives of people and nature". PT KAL has a concession area of 17,998 ha, divided between the core plantation (55%), smallholding areas (15%), conservation areas (21%) and offices, housing and mill (8%). Through a survey involving the West Kalimantan Natural Resources Conservation Center and the Indonesian Natural Rehabilitation Initiation Foundation, it is estimated that there are 108 orangutan individuals in the conservation area of 2330 ha. To protect that area, PT KAL has been submitting the conservation area to the Government of West Kalimantan Province to become community forest or city forest[7,8]. In another effort, PT KAL is also protecting areas identified as HCV (High Conservation Value) such as rivers, springs, and sacred/customary areas. This is in line with the Responsible Development principle applied in all ANJ business groups, taking into account the balance between people, planet and profit.

In 2016 there were 1727 employees at PT KAL, of whom 1356 were local people[9]. In addition, at least 2700 families were involved in partnership programs, and some of them could also be employees at PT KAL[7,8]. Thus, the economic benefits are immediately felt by employees and farmers in a partnership program, by increasing their income. Research elsewhere concludes that the expansion of oil palm can enhance food security through better income and expansion of agricultural land[10]. The growth of PT KAL has triggered the development of supporting businesses such as vegetable sellers, groceries and coffee shops, small fuel sellers, workshops and vehicle washing. In addition, there are also opportunities for CV (commanditaire vennootschap) or cooperatives to take contracting work on oil palm plantations, such as construction services, Fresh Fruit Bunch transport services, and upkeep services.

In 2016, in collaboration with the Indonesian Armed Forces (TNI) and local Community, PT KAL supported new rice field development in Laman Satong and Kuala Satong village. Promoting biosecurity, in 2018 PT KAL initiated edamame cultivation in Laman Satong village. Approximately 0.1 ha was used for a pilot project, and this program will increase up to 5 ha in 2020. Another program is mushroom cultivation by housewives with Joint Business Group, in a collaboration of PT KAL with Tropenbos. These activities have the potential to increase people's income as well as provide local food needs. In the long term the program can synergize that Joint Business Group with PT KAL as a key partner in supplying companies' and employees' needs; thus there is interdependence and mutually beneficial cooperation.

Future work

As a note for future, with regard to the potential of palm oil towards increasing food security, especially in remote areas, the seriousness and collaboration of various parties is absolutely necessary. Self-managing smallholders need more assistance so that they can carry out sustainable practices, as will big companies. Besides that, the issue of food security needs to be the concern of oil palm companies at local and national levels, with the objective that oil palm euphoria will not then lead to food scarcity. Palm oil companies need to be more proactive in assisting the local community to develop village spatial plans in the context of food security as a collaborative sustainability action along with other stakeholders.

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