

International Conference on Agro-industry 2014 (IcoA)

Sustainable and Competitive Agro-industry for Human Welfare

**Agriculture and Agricultural Science Procedia
Volume 3**

**Yogyakarta, Indonesia
24 - 25 November 2014**

Editors:

**Adi Djoko Guritno
Elmar Schlich**

Elke Pawelzik

ISBN: 978-1-5108-0070-0

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© by Elsevier B.V.
All rights reserved.

Printed by Curran Associates, Inc. (2015)

For permission requests, please contact Elsevier B.V.
at the address below.

Elsevier B.V.
Radarweg 29
Amsterdam 1043 NX
The Netherlands

Phone: +31 20 485 3911
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

Editorial Preface

Agro-industry development should be managed and supported by its own agriculture-based industrial society. This sector has been regarded as having significant contribution to country's economic growth such as Indonesia. This sector provides plenty of opportunity for transforming its comparative advantages into competitive ones because of its linkages to both upstream and downstream industries. The abundant availability of raw material constitutes agro-industry's comparative advantages that guarantees sustainability.

Sustainable agro-industry is the development of agro-industry which emphasizes on the application of management, technology, and systems engineering. Such applications can benefit the environment through some breakthrough in green supply chains, life cycle assessments and cleaner production approaches, as well as in other aspects. The development of agro-industry in Indonesia shall be directed to become the backbone of the economy that is capable of creating jobs, hence its presence must be guarded. Issues of climate change impacts on productivity of agricultural raw materials, the application of product quality controls, logistics and distribution, and more defined market segmentation are the challenges to the development of agro-industries in Indonesia.

Trying to enrich the synergy development of agro-industry, the Department of Agro-industrial Technology, Universitas Gadjah Mada, Indonesia is herewith initiating a scientific and practical contribution for the development of agro-industry that is capable of meeting market requirements, both nationally and globally. Supported in fund by Universitas Gadjah Mada and Directorate General of Higher Education of Indonesia, we are proudly to hold the International Conference on Agro-industry (ICoA): *Competitive and Sustainable Agro-industry for Human Welfare*, 24-25 November 2014, Eastparc Hotel, Yogyakarta. This event is well joined by our distinguished colleagues from Ehime University, Japan, Osaka Prefecture University, Japan, Ibaraki University Japan, Kasetsart University, Thailand and Universiti Teknologi Malaysia.

ICoA 2014 had invited scholars, academics and professionals around the world to present, share, and discuss their studies on competitive and sustainable agro-industry from various aspects. Fifty two (52) papers consisting of four (4) review papers and forty eight (48) empirical and practical papers had been selected for publication. Upon the full recommendation from the Association of Agro-industrial Technologist Profession (APTA) and Research and Development of Indonesia Supply Chain (Rispeciesia), we believe that ICoA 2014 will bring out benefit to the participants in particular and for agro-industry's sake in general.

Finally, we would like to express our sincere gratitude to the editors, guest editors, program chairs, referees and committee members for their valuable contribution upon the publication of this international proceedings.

Yogyakarta, December 20, 2014
General Chair of ICoA

Dr. Adi Djoko Guritno

Organization

Editor

Dr. Adi Djoko Guritno (Universitas Gadjah Mada, Indonesia)

Guest Editors

Prof. Dr. Elmar Schlich (Justus-Liebig University Giessen, Germany)

Prof. Dr. Elke Pawelzik (Georg-August University Göttingen, Germany)

Program Chairs

Dr. Henry Yuliando (Universitas Gadjah Mada, Indonesia)

Dr. Ravipim Chaveesuk (Kasetsart University, Thailand)

Dr. Tsuyoshi Okayama (Ibaraki University, Japan)

Dr. Chutima Waisarayutt (Kasetsart University, Thailand)

Dr. Pornthipa Ongkunaruk (Kasetsart University, Thailand)

Dr. Tony Hadibarata (Universiti Teknologi Malaysia)

Referees

Prof. Dr. Elmar Schlich (Justus-Liebig University Giessen, Germany)

Prof. Dr. Elke Pawelzik (Georg-August University Göttingen, Germany)

Dr. Adi Djoko Guritno (Universitas Gadjah Mada, Indonesia)

Dr. Mirwan Ushada (Universitas Gadjah Mada, Indonesia)

Dr. Henry Yuliando (Universitas Gadjah Mada, Indonesia)

Dr. Ravipim Chaveesuk (Kasetsart University, Thailand)

Dr. Tsuyoshi Okayama (Ibaraki University, Japan)

Dr. Chutima Waisarayutt (Kasetsart University, Thailand)

Dr. Pornthipa Ongkunaruk (Kasetsart University, Thailand)

Pujo Saroyo, M.Eng. Sc (Universitas Gadjah Mada, Indonesia)

Dr. Tony Hadibarata (Universiti Teknologi Malaysia, Malaysia)

National Committee Member

General chair : Dr. Adi Djoko Guritno

General co-chair : Dr. Wahyu Supartono

Program chair : Dr. Henry Yuliando

Dr. Nafis Khuriyati

Arrangement chair	: Dr. Anggoro Cahyo Sukartiko Darmawan Ari, MP
Program advisory	: Dr. Dyah Ismoyowati Dr. Didik Purwadi Dr. Kuncoro Harto Widodo Dr. Wagiman Dr. Jumeri Dr. Atris Suyantohadi
Conference secretary	: Dr. Mirwan Ushada Pujo Saroyo, M.Eng.Sc Guntarti Tatik Mulyati, MT
Treasury	: Novita Erma Kristanti, MP Arita Dewi Nugrahini, MT
Steering committee	: Prof. Dr. Mochamad Maksum Machfoedz Agustinus Suryandono, M.App.Sc Dr. Endy Suwondo Dr. Makhmudun Ainuri Suharno, M.Eng, M.Eng.Sc.
Logistic & accomodation	: Ibnu Wahid Fakhruddin Aziz, MT Dr. Arief Wijaya Dr. M. Affan Fajar Falah

International Committee Members

Prof. Dr. Elmar Schlich (Justus-Liebig University Giessen, Germany)
 Prof. Dr. Elke Pawelzik (Georg-August University Göttingen, Germany)
 Prof. Dr. Haruhiko Murase (Osaka Prefecture University, Japan)
 Prof. Dr. Hiroshige Nishina (Ehime University, Japan)
 Dr. Ravipim Chaveesuk (Kasetsart University, Thailand)
 Dr. Tsuyoshi Okayama (Ibaraki University, Japan)
 Dr. Chutima Waisarayutt (Kasetsart University, Thailand)
 Dr. Pornthipa Ongkunaruk (Kasetsart University, Thailand)
 Dr. Tony Hadibarata (Universiti Teknologi Malaysia, Malaysia)

University partners

Ehime University (Japan)
 Osaka Prefecture University (Japan)
 Ibaraki University (Japan)
 Katsersat University (Thailand)
 Justus-Liebig University Giessen (Germany)
 University Technology Malaya (Malaysia)

Supporting institutions:

APTA (Asosiasi Profesi Teknologi Agroindustri)
 RISPESCIA (Riset dan Pengembangan Supply Chain Indonesia)
 IILCA (Indonesia Institute Life Cycle Assessment)
 ARMS (Association of Risk Management Society)
 JSABEES (Japanese Society of Agricultural, Biological, Environmental Engineers and Scientists)

TABLE OF CONTENTS

EDITORIAL PREFACE	1
<i>Adi Djoko Guritno</i>	
ORGANIZATION	2
<i>N/A</i>	
THE LATEST DEVELOPMENT OF LASER APPLICATION RESEARCH IN PLANT FACTORY	4
<i>Haruhiko Murase</i>	
DEVELOPMENT OF SPEAKING PLANT APPROACH TECHNIQUE FOR INTELLIGENT GREENHOUSE	9
<i>Hiroshige Nishina</i>	
PREDICTION OF HOT GLUE CONTENT FOR SEALING TOOTHPASTE CARTON	14
<i>Ravipim Chaveesuk, Teeranut Ngoenvivatkul</i>	
STABILIZING AND DECENTRALIZING THE GROWTH THROUGH AGRO-INDUSTRIAL DEVELOPMENT	20
<i>Mochammad Maksun Machfoedz</i>	
POTENTIAL APPLICATION OF A QUALITY COST MODEL FOR FRESH PRODUCE PACKHOUSES	26
<i>Chutima Waisarayutt, Thirawat Wongwiwat</i>	
NEW PARADIGM OF MANAGING RISKS: RISK AND CONTROL SELF-ASSESSMENT	32
<i>Deddy Jacobus</i>	
BUSINESS PROCESS ANALYSIS AND IMPROVEMENT FOR A RAW MILK COLLECTION CENTRE IN THAILAND	35
<i>Pornthipa Ongkunaruk</i>	
MONITORING NEST BUILDING IN MICE AND LEAF MOVEMENT OF KIDNEY BEANS USING AN INFRARED RANGE CAMERA	40
<i>Tsuyoshi Okayama, Tatsuhiko Goto, Takeshi Suzuki, Atsushi Toyoda</i>	
BIOTRANSFORMATION STUDIES ON FLUORANTHENE, A FOUR-RING POLYCYCLIC AROMATIC HYDROCARBON, BY WHITE-ROT FUNGUS ARMILLARIA SP. F022	45
<i>Tony Hadibarata, Risky Ayu Kristanti</i>	
ASSESSMENT OF THE SUPPLY CHAIN FACTORS AND CLASSIFICATION OF INVENTORY MANAGEMENT IN SUPPLIERS' LEVEL OF FRESH VEGETABLES	51
<i>Adi Djoko Guritno, Rika Fujianti, Dinovita Kusumasari</i>	
OPEN INNOVATION MODEL: EMPOWERING ENTREPRENEURIAL ORIENTATION AND UTILIZING NETWORK RESOURCES AS DETERMINANT FOR INTERNATIONALIZATION PERFORMANCE OF SMALL MEDIUM AGROINDUSTRY	56
<i>Ginta Ginting</i>	
POSSIBILITY OF SOME INDIGENOUS SPICES AS FLAVOR AGENT OF GREEN TEA	62
<i>Wahyu Supartono, Anggoro Cahyo Sukartiko, Henry Yuliando, Novita Erma Kristanti</i>	
MARKETING STRATEGY BASED ON MARKETING MIX INFLUENCE ON PURCHASING DECISIONS OF MALANG APPLES CONSUMERS AT GIANT OLYMPIC GARDEN MALL (MOG), MALANG CITY, EAST JAVA PROVINCE, INDONESIA	67
<i>Retno Astuti, Rizky Lutfian Ramadhan Silalahi, Galuh Dian Paramita Wijaya</i>	
ANALYSIS OF PROSPECT OF AGRO-TOURISM ATTRACTIVENESS BASED ON LOCATION CHARACTERISTICS	72
<i>Pujo Saroyo, Guntarti Tatik Mulyati</i>	
THE USE OF COX REGRESSION MODEL TO ANALYZE THE FACTORS THAT INFLUENCE CONSUMER PURCHASE DECISION ON A PRODUCT	78
<i>Azimmatul Ihwah</i>	
DAILY WORKER EVALUATION MODEL FOR SME-SCALE FOOD PRODUCTION SYSTEM USING KANSEI ENGINEERING AND ARTIFICIAL NEURAL NETWORK	84
<i>Mirwan Ushada, Tsuyoshi Okayama, Atris Suyantohadi, Nafis Khuriyati, Haruhiko Murase</i>	
MEDIATING ROLE OF STRATEGIC SUPPLY MANAGEMENT ON PERFORMANCE	89
<i>Meirani Harsasi</i>	
OPTIMIZATION OF HYDRAULIC RETENTION TIME (HRT) AND INOCULUMS ADDITION IN WASTEWATER TREATMENT USING ANAEROBIC DIGESTION SYSTEM	95
<i>Sakunda Anggarini, Nur Hidayat, Nimas Mayang Sabrina Sunyoto, Putri Siska Wulandari</i>	

CLEANER PRODUCTION STRATEGY FOR IMPROVING ENVIRONMENTAL PERFORMANCE OF SMALL SCALE CRACKER INDUSTRY	102
<i>Nafis Khuriyati, Wagiman, Denok Kumalasari</i>	
RISK MEASUREMENT OF SUPPLY CHAIN ORGANIC RICE PRODUCT USING FUZZY FAILURE MODE EFFECT ANALYSIS IN MUTOS SELOLIMAN TRAWAS MOJOKERTO	108
<i>Devi Urianty Miftahul Rohmah, Wike Agustin Prima Dania, Ika Atsari Dewi</i>	
SCALE UP OF PANEL ASSEMBLY FOR MOSS ROOFTOP GREENING MATERIAL (SPHAGNUM SP.) USING DIMENSIONAL ANALYSIS	114
<i>Lathifa Indraningtyas, Mirwan Ushada, Agustinus Suryandono</i>	
INTEGRATION OF KEY PERFORMANCE INDICATOR INTO THE CORPORATE STRATEGIC PLANNING: CASE STUDY AT PT. INTI LUHUR FUJA ABADI, PASURUAN, EAST JAVA, INDONESIA	121
<i>Rheysa Permata Sari</i>	
INFLUENCE OF CO₂ AND C₂H₄ ADSORBENTS TO THE SYMPTOMS OF INTERNAL BROWNING ON THE PACKAGED ‘SILVER BELL’ PEAR (PYRUS COMMUNIS L.)	127
<i>Bayu Nugraha, Nursigit Bintoro, Hideki Murayama</i>	
THE SHALLOT PRICING IN THE VIEW OF IMPORT RESTRICTION AND PRICE REFERENCE	132
<i>Moh. Wahyudin, Moch. Maksam, Henry Yuliando</i>	
CURRENT CONDITION OF AGROINDUSTRIAL SUPPLY CHAIN OF CASSAVA PRODUCTS: A CASE SURVEY OF EAST JAVA, INDONESIA	137
<i>I.B. Suryaningrat, Winda Amilia, Miftahul Choiron</i>	
THE STRENGTHENING FACTORS OF TEA FARMER COOPERATIVE: CASE OF INDONESIAN TEA INDUSTRY	143
<i>Henry Yuliando, K. Novita Erma, S. Anggoro Cahyo, Wahyu Supartono</i>	
HOW RELATIONSHIP QUALITY ON CUSTOMER COMMITMENT INFLUENCES POSITIVE E-WOM	149
<i>Hasti Purnasari, Henry Yuliando</i>	
A SUSTAINABLE PARTNERSHIP MODEL AMONG SUPPLY CHAIN PLAYERS IN WOODEN FURNITURE INDUSTRY USING GOAL PROGRAMMING	154
<i>Muh. Hisjam, Adi Djoko Guritno, Nunuk Supriyatno, Shalihuddin Djalal Tandjung</i>	
FINANCIAL FEASIBILITY ANALYSIS FOR MOSS GREENING MATERIAL PANEL IN YOGYAKARTA	159
<i>Titisari Juwitaningtyas, Mirwan Ushada, Didik Purwadi</i>	
SUPPLY CHAIN PERFORMANCE IDENTIFICATION OF HORTICULTURE PRODUCT AT COOPERATIVE BRENJONK IN TRAWAS, MOJOKERTO	163
<i>Ika Atsari Dewi, Wike Agustin Prima Dania, Bella Rahmawati Kusuma Wardani</i>	
HALAL FOOD MARKETING: A CASE STUDY ON CONSUMER BEHAVIOR OF CHICKEN-BASED PROCESSED FOOD CONSUMPTION IN CENTRAL PART OF JAVA, INDONESIA	169
<i>Dyah Ismoyowati</i>	
MAPPING STUDENT'S PERFORMANCE BASED ON DATA MINING APPROACH (A CASE STUDY)	173
<i>Harwati, Ardita Permata Alfiani, Febriana Ayu Wulandari</i>	
EFFECT OF STORAGE TEMPERATURES ON COLOR OF TOMATO FRUIT (SOLANUM LYCOPERSICUM MILL.) CULTIVATED UNDER MODERATE WATER STRESS TREATMENT	178
<i>A.N. Khairi, M.A.F. Falah, A. Suyantohadi, N. Takahashi, H. Nishina</i>	
DESIGN OF INNOVATIVE ALARM CLOCK MADE FROM BAMBOO WITH KANSEI ENGINEERING APPROACH	184
<i>Achmad Shergian, Taufiq Immawan</i>	
PRODUCTIVITY IMPROVEMENT OF SMALL SCALE MEDIUM ENTERPRISES (SMES) ON FOOD PRODUCTS: CASE AT YOGYAKARTA PROVINCE, INDONESIA	189
<i>Dewi Kurniawati, Henry Yuliando</i>	
WORK POSTURE ANALYSIS OF MANUAL MATERIAL HANDLING USING OWAS METHOD	195
<i>M. Arip Wahyudi, Wike A.P. Dania, Rizky L.R. Silalahi</i>	
THE PRODUCTION OF BIOETHANOL FERMENTATION SUBSTRATE FROM EUCHEUMA COTTONII SEAWEED THROUGH HYDROLYSIS BY CELLULOSE ENZYME	200
<i>Sekar Puspawati, Wagiman, Makhmudun Ainuri, Darmawan Ari Nugraha, Haslianti</i>	
UNPAD – IBU POPON COLLABORATION; A BEST PRACTICE IN SUSTAINABLE ASSISTANCE MODEL FOR SOCIAL ENTREPRENEURSHIP IN AGRO-INDUSTRIAL BASED SME'S	206
<i>Dwi Purnomo, Totok Pujiyanto, Nurfida Efendi</i>	

PRODUCTION SCHEDULING USING MIXED INTEGER PROGRAMMING: CASE OF BREAD SMALL AND MEDIUM ENTERPRISE AT YOGYAKARTA	211
<i>Ratriani Puspita Hastuti, Henry Yuliando, Ibnu Wahid Fakhruddin Aziz</i>	
WASTEWATER TREATMENT IN CAJUPUT OIL INDUSTRY USING ANAEROBIC FILTRATION	216
<i>Rafik Kurniawan, Novita Erma Kristanti, Anggoro Cahyo Sukartiko</i>	
EVALUATION OF POULTRY SUPPLY CHAIN PERFORMANCE IN XYZ SLAUGHTERING HOUSE YOGYAKARTA USING SCOR AND AHP METHOD	221
<i>Ikhsan Bani Bukhori, Kuncoro Harto Widodo, Dyah Ismoyowati</i>	
USFDA IMPORT REFUSAL AND EXPORT COMPETITIVENESS OF INDONESIAN CRAB IN US MARKET	226
<i>A. Suhaeli Fahmi, Moch Maksun, Endy Suwondo</i>	
THE EFFECT OF MALTODEXTRIN CONCENTRATION AND DRYING TEMPERATURE TO ANTIOXIDANT CONTENT OF SINOM BEVERAGE POWDER	231
<i>Amna Hartiati, Sri Mulyani</i>	
SUPPLY CHAIN RISK MANAGEMENT ON TOBACCO COMMODITY IN TEMANGGUNG, CENTRAL JAVA (CASE STUDY AT FARMERS AND MIDDLEMEN LEVEL)	235
<i>Muchamad Muchfirodin, Adi Djoko Guritno, Henry Yuliando</i>	
ADSORPTION POLLUTION LEATHER TANNING INDUSTRY WASTEWATER BY CHITOSAN COATED COCONUT SHELL ACTIVE CHARCOAL	241
<i>M. Lasindrang, H. Suwarno, S.D. Tandjung, H.N. Kamiso</i>	
DIRECTED INTERESTERIFICATION OF COCONUT OIL TO PRODUCE STRUCTURED LIPID	248
<i>Arita Dewi Nugrahini, Tatang Hernas Soerawidjaja</i>	
APPLICATIONS OF QUEUING THEORY IN THE TOBACCO SUPPLY	255
<i>Moh Zainal Arifin, Banun Diyah Probowati, Sri Hastuti</i>	
ANALYSIS OF BIO PELLET PROCESS BASED ON MASS BALANCE	262
<i>Andrew Setiawan Rusdianto, Miftahul Choiron</i>	
POLICY MODEL OF PRODUCTION AND PRICE OF RICE IN KALIMANTAN SELATAN	266
<i>Alan Dwi Wibowo, Armand Omar Moeis, Candra B. Wiguna, T.A.C. Chaulan</i>	
ENGINEERING PROPERTIES OF COFFEE BEANS FROM VARIOUS COLORS OF COFFEE CHERRIES	274
<i>Yuwana, Evanila Silvia, Bosman Sidebang</i>	
CHARACTERIZATION OF NATA DE COCO PRODUCED BY FERMENTATION OF IMMOBILIZED ACETOBACTER XYLINUM	278
<i>Darmawan Ari Nugroho, Pradipta Aji</i>	
SOILLESS CULTURE SYSTEM TO SUPPORT WATER USE EFFICIENCY AND PRODUCT QUALITY: A REVIEW	283
<i>P. Agung Putra, Henry Yuliando</i>	
Author Index	

The 2014 International Conference on Agro-industry (ICoA): Competitive and sustainable Agro-industry for Human Welfare

Current Condition of Agroindustrial Supply Chain of Cassava Products: A Case Survey of East Java, Indonesia

I.B. Suryaningrat*, Winda Amilia, Miftahul Choiron

Study Program of Agroindustrial Technology, Faculty of Agricultural Technology, University of Jember, Indonesia
Jln. Kalimantan 37, Jember, 68121, East Java, Indonesia

Abstract

As an agricultural product, cassava is recognized as a special commodity which has high potential for local and export product. High production cost and low selling price are still become common problem faced by farmers. These common problem leads to low income for the farmers. The opinion to cassava product as unimportance product with low profit has consequence to make low of institution involvement to this product. The objective of this research was to evaluate the current condition of supply chain of cassava products. Direct visit to the farmers and discussion with some industries were implemented to this research. Sampling method was used to reach accurate data from farmers and industries in each research area. It was starting from the industries which use cassava as raw material for production process. The result revealed that strong involvement actors in supply chain of cassava product were farmers, big and small collectors, industries (processors or producer), food store and consumers. The details of flow of material, financial and information were identified in this research. Added value of selected products of cassava also explained in this paper.

© 2015 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of Jurusan Teknologi Industri Pertanian, Fakultas Teknologi Pertanian, Universitas Gadjah Mada

Keywords: cassava; supply chain; industry; added value

* Corresponding author. Tel.: +62 331321784; fax: +62 331321784.
E-mail address: suryaningrat2@yahoo.com

1. Introduction

Cassava is one of commodity which has big potential to be produced as local and export product. As a raw material of some industries, some kind of processed cassava products such as dried chips (namely gaplek), tapioca flour, modified cassava flour (mocaf), and cassava rice. Various products of cassava lead to the farmer to plant cassava as potential product with high profit product. Presently, some traditional products of cassava are made by some home industries or small and medium enterprises.

On the other side, Saragih (2004) explained that agriculture development with production increasing without better income need to be improved through new agriculture development paradigm to realize improved income of farmers. This new paradigm is an agribusiness approach. Daryanto (2009) described that industrial raw material procurement from agricultural sector needs strengthening of agricultural sector to secure raw material supply for continuity of industrial activities and cost efficiency of transport. In term of raw material supply, Indarjit and Pranoto (2002) defined that supply chain is a network of organizations with same objective, which is supply and distribution of materials. Connected points alongside chain with different role are called stakeholders. A clear relationship between stakeholders and farmers would give a clear mechanism of pricing process from farmers to stakeholders.

In term of marketing, Limbong and Sitorus (1987) explained that marketing is the distribution activities of agricultural material from producers to consumers. The product moving with long chain caused quality reduction of product. This also gives strong effect to reduce farmers' income. Wardana(2006) also described that the farmers and small scale industries often in the low bargaining power positions. Regulation and strategy are strongly required to improve agroindustrial cassava product and improve farmers' income.

In raw material market, middlemen have a strong role to drive cassava market. Its mean farmers have weak of bargaining power in the market. Because of long distance location of farmer from industry, farmers prefer sell their product to middleman. This was also due to high cost of transport which could reduce their profit. All of these were strong reasons for low of bargaining power of the farmers in cassava market (Wardana, 2006). Low ability and information around capital investment (time value of money) were also enhancing low selling price of the cassava.

The farmer was still in the weak position among market players. Limited information of market characteristic leads to the farmer to involve in traditional and modern market. The role of stake holder alongside supply chain was also needed to be analyzed to identify role of institution and partnership of cassava product The objective of this research was to evaluate the condition of supply chain of cassava as agroindustrial product.

2. Methodology

This research was conducted in 2 districts with high number of cassava production namely Jember and Bondowoso. Beside production number, these districts were considered by distance of location from industry. Sampling method was implemented by field area and the number of farmers, to reach data based on proportion between farmers and industries in each area.

Stakeholder analysis was used in this research to identify the raw material supply. In term of supply chain institution, direct visit and brief discussion was implemented by purposive sampling, to identify raw material flow from field to industry. Beside material flow, financial flow and information flow were used to evaluate supply chain flow of cassava products. Added value analysis was also implemented to this research to define present condition of selected cassava products.

3. Result and Discussion

3.1 Selected Products of Processed Cassava Industries

This research was conducted in the district of Jember and Bondowoso. Respondent were grouped based on industrial tree. In this research population of small industries were first level industries of industrial tree. The first level industries of industrial tree were fermented cassava (tape), cassava flour (tepung singkong), kerupuk (dried and fried cassava) and cassava chips (keripik). Result showed that small industries used cassava as raw material to produce cassava processed products. In the next processing level, other products made from fermented cassava are

suwar-suwir (fermented cassava fig), prol tape (fermented cassava cake) and pia tape (fermented cassava pie). All of these product were categorized as traditional products as a local products.

Table 1. Selected Products of Processed Cassava Industries in Jember District

Name of Industry (kinds of processed product)	Market (distance)	Raw material come from (distance)	Raw material requirement (kg/year)
Samiler Kemuning (boiled and fried cassava)	Local district (40 km)	DesaArjasa (20 km)	60,000
Tape Reza 99 (fermented cassava)	Local district / province (100 km)	Mayang (15 km)	62,000
Tape Putih 67 (fermented cassava)	Local district (40 km)	Silo (15 km)	45,000
Chips (cassava chips)	Local district (100 km)	Silo (20 km)	90,000

Field survey revealed that raw materials (cassava) were supplied from some places with distance of 15-20 km from processing places (Table 1). High quantity of raw materials was required to supply production of some selected products. Chips product was the highest number of raw material requirement followed by fried products and fermented products. Transportation facilities and road condition were still faced by supplier to send the raw material to production place. These lead to late of supply and decreasing of raw material quality.

In case of marketing activity, these selected products were also marketed (distributed) to other districts in same province with range of 100 km distance (Table 1). Beside packing method of product, roads condition and transportation facilities were also still faced as common problems to the producers. This indicates that the products have a strong potential cause to defected products during distribution process (Austin, 19982). This was relevance to Suryaningrat (2012), a survey result found that in fruit processed product, defected product in distribution processed could reach 10-20% because of transportation facilities and road conditions.

3.2. Stakeholders (Supply Chain Actors) and Roles

All of supply chain actors above have different characteristics and roles to the pricing mechanism on supply chain of cassava. Different characteristic of the stakeholders are mentioned in the Table 2.

Field survey revealed that pricing factor was the importance factor to cassava product as the raw materials flow. All of stakeholders have an involvement in pricing mechanism, but in each stakeholder has different level to decide the price. As a starting point, farmers provide information of raw materials such as price, number and quality of product. But in the reality, its price was decided by wholesalers or next persons. In term of information, wholesalers and retailers has stronger involvement in this raw material flow. Industries has noon formal contract with wholesalers or retailers to maintain information about price, number and quality of product because of high numbers of raw materials requirement.

The institution or organizations which organize activities of cassava farmers could not be found in this research area. Low of attention to cassava farmers was still face by cassava farmers because to the cassava product image as low profit or low prospect business of cassava product.

Table 2.Characterisitics and Roles of Chain Actors

Stakeholders	Characteristics	Roles
Farmers (supplier)	Plantation, supply raw material from field	Provide raw materials (materials and information about price, number and quality)
Wholesalers	Buying, collecting and selling sell to the industries or retailer at market.	Offering price to the farmers (information)
Retailers	Selling cassava to industries or market, sell cassava to consumers at market	Get price from wholesalers and offer price to the industries and market (information)
Industries	Processing cassava as first level products or half products	Got price from wholesalers or retailers

3.3 Supply Chain of Selected Cassava Products

In simple supply chain, farmers supplied raw material to small collectors and big collectors. Big collectors send the raw material to the industries because of the high quantity requirement of cassava. Small collectors supply for non-industrial customers like retailer, traditional market, or other small number requirement. In some case of high supply season, big collectors also shared this fresh cassava with small collectors. Two type of customers were non industrial and industrial customers. The detail of supply chain with kind of cassava product shows in the Fig. 1.

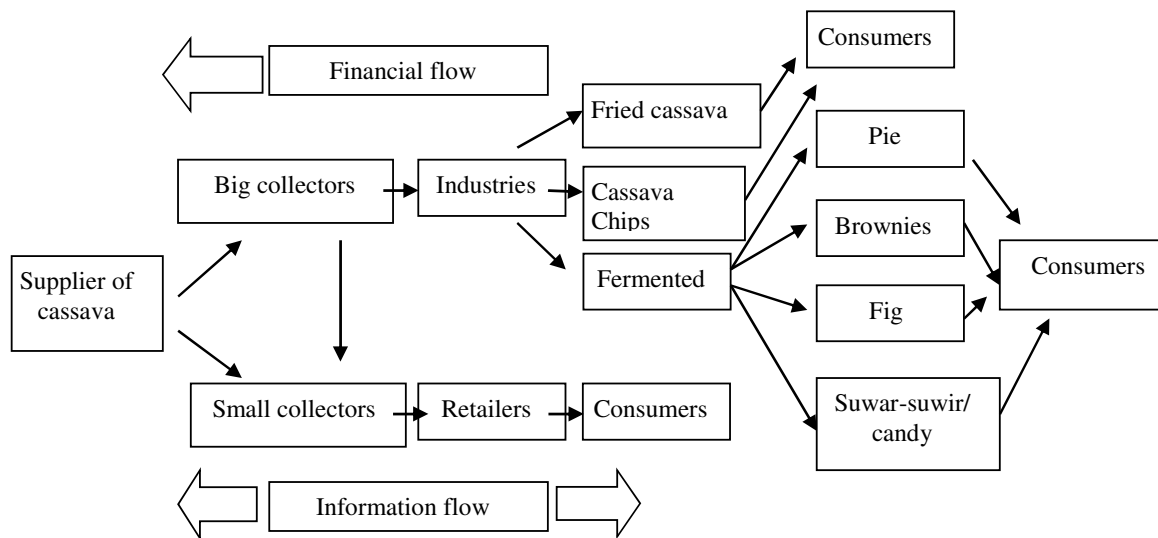


Fig. 1. Supply chain of selected products of Cassava

Pujawan (2005) mentioned that in supply chain mechanism, three aspects should be well managed are material flow from upstream to downstream, financial flow from downstream to upstream, and information stream from both upstream and downstream. In Fig. 1, required raw material (cassava) of selected products such as fried cassava, cassava chip and fermented cassava were supplied by big collectors due to high number of industrial requirement. It was common for the farmers have a contract with big collectors to make sure about number, price and quality of products. Time schedule to send the raw material to the industries including transport facilities were also discussed between farmer and industry. In the research area, the highest requirement of cassava came from fermented cassava industry compare with dried and cassava chips. Beside direct consumption of fermented cassava, this product was also used as a raw material of pie (cake), brownies, fig and suwar-suwir. There were many industries involve in these products. This leads to high requirement of cassava as raw material in second level of product transformation. Related to the requirement of cassava as raw material, availability of cassava including quantity and quality was the most problem faced by these industries. Especially for fermented cassava industries which need yellow cassava. Quality of cassava was defined from freshness, maturity, colour, and size depend on kind of product would be processed. In term of transport facilities, road condition and truck were the most problem happened to these industries. This was also because of plant location of cassava which difficult to be accessed. All of these problem lead to inefficient of cost and time in raw material supply of these industries.

In term of financial flow, it was starting from consumers, producers of food products, retailers, small and big collectors, and farmers. Consumers spend their money to buy final product (cassava processed products) in the market or food store. High number of consumers would result to better performance of agroindustrial including better production capacity and profit. Transaction process in consumer level was conducted in cash payment in food traditional market and other market place. Payment process between store and production (industry) was conducted in cash and credit. It was frequently that the credit payment process between store and industries was conducted after

selling process (sold). Payment from industries to collectors and from big or small collector to farmers was conducted in cash. Only some of them conducted in credit payment or extended payment. All of payment process tends to “trust” concept as a commitment among them.

Information flow in cassava product was started from both side of farmers and customers. Information of requirement was coming from market (industries) and retailer (traditional market). This raw material requirement has a strong relationship with industrial capacity including order status and quantity would be sent to industries. Beside, this was also related to order quantity of processed products which distributed to the market. A strong commitment was needed in this mechanism to support transparent information flow from all supply chain actors. This could be reach from partnership to make a deal among them. The information (data) should be supported in this flow were production capacity to support agroindustries process, agroindustrial activities to produce products, product shipping based on the order, and consumer’ needs to the products. The accurate data of cassava price, quality and availability as information were also required to support supply chain activities. All of this information flow mechanism should be supported by good communication tools as a supporting facility.

3.4 Added Value of Cassava Products

Table 3 shows that in cassava products the ratio of added value has a range from 51% (cassava chips) to 80% (cassava cake). Cassava chips product has a simple making process compare to other products. High quantity of raw materials causes this low of added value ratio. Brownies and cake are the highest added value ratio. These products were made from fermented cassava as main raw material. High production quantity with high product price caused these products (brownies and cake) have highest ratio than others. Crackers and fermented cassava products have similar added value ratio. In research area, most of cassava products industries were using traditional technology, low number of workers, and low education level workers. These factors related to technical factors such as production capacity and using of raw materials. Higher processing technology, better packaging process, supported by higher education level of workers are strongly required to improve cassava products to meet consumers needs.

Table 3. Added Value of Cassava Products

Name of Industry (selected cassava products)	Number of Production (kg/year)	Raw material Requirement (kg/year)	Number of Workers	Product price (Rp/kg)	Raw material price (Rp/kg)	Added value	Ratio of added value (%)
Samiler (crackers)	12,000	60,000	6	25,000	1,500	3,500	70
Tape kuning (fermented cassava)	43,500	62,000	5	10,000	2,000	5,016	71.5
Cassava Chips Singkong	51,480	90,000	8	12,000	1,700	1,160	51
Tape Putih (fermented cassava)	32,000	45,000	4	9,500	2,000	4,755	70.3
Brownies (made from fermented cassava)	15,000	9,000	6	26,000	10,000	33,300	77
Cake (made from fermented cassava)	18,000	10,000	6	24,000	8,000	31,600	80

4. Conclusions

Transportation facilities and road condition were still faced by supplier to send the raw material to production place. These lead to late of order and decreasing of raw material quality. Strong involvement actors in supply chain of cassava product were farmers, big and small collectors, industries (processors or producer), food store and consumers. In financial flow, it was starting from consumers point to farmers using cash and credit method as common payment. Information flow in cassava product was started from both side of farmers and customers, and should be supported with well communication facilities to reach clear and transparent information. High production

quantity with high product price caused products brownies and cake reach the highest added value ratio than other products.

References

- Austin, J.E., 1992. *Agroindustrial Project Analysis. Critical Design Factors*. EDI Series in Economic Development. 2 edition. The Johns Hopkins University Press. USA.
- Daryanto, A., 2009. *Dinamika Daya Saing Industri Peternakan*. Ariefdaryanto.blog.mb.ipb.ac.id. Bogor. (02 Oktober 2012)
- Drilon, J.D., 1971. *Introduction to Agribusiness Management*. Agribusiness Management Resources materials. Vol. 1. Asian Productivity Organization.
- Hayami, Y. et al., 1987. *Agricultural Marketing and Processing in Upland Java: A Perspective from A Sunda Village*. CGPRT Bogor. Ch. 6. pp.40-46.
- Indrajit, R.E.R dan Djoko Pranoto., 2002. *Strategi Manajemen Pembelian dan Supply Chain*. Grasindo. Jakarta
- Iqbal, M., 2007. *Strategi Pengendalian Alih Fungsi Lahan Pertanian Bertumpu pada Partisipasi Masyarakat*. Bogor: Pusat Analisis Sosial Ekonomi dan Kebijakan Pertanian.
- Limbong, W.H. dan P. Sitorus., 1987. *Pengantar Tata Niaga Pertanian*. Jurusan Ilmu-Ilmu Sosial Ekonomi Pertanian Fakultas Pertanian Institut Pertanian Bogor. Bogor.
- Nwokoro, S.O.; Orheruata, A.M.; and Ordiah, P.I., *Replacement of Maize with Cassava Sievates in Cockerel Starter Diets: effect on performance and carcass characteristics*, *Tropical Animal Health and Production*, 2002, Vol. 32 No. 2. Pp 68-74
- Pujawan, I.N., 2005. *Supply Chain Management*. Penerbit Guna Widya, Surabaya
- Saragih., 2004. *Membuat Nata de Coco*. Jakarta : Puspa Swara.
- Suryaningrat, I.B., 2012. *Controlling Factors Of Marketing Activities: A Case Study Of Fruit Processing Industries In East Java, Indonesia*, presented paper at International Conference of Agricultural Marketing. pp 297-307.
- Tonukari, N.J., 2004, *Cassava and The Future of Starch*, *Electronic Journal of Biotechnology*, ISSN: 0717-3458, Vol. 7 No.1 April 15 2004. pp. 72-78
- Wardhana, K.B.F., 2006. *Analisis Strategi Pengembangan Industri tapioca skala kecil di Desa Karang Tengah Kabupaten Bogor*. Institut Pertanian Bogor. Bogor