PROCEEDING

3rd GEN Network and 4th Rispescia International Seminar

Sustainable Bio-resources for Global Welfare

Joinly Organized by:

Universitas Gadjah Mada, INDONESIA

and

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RISPESCIA
Indonesia Supply Chain Research and Development

PROCEEDING

3rd GEN Network and 4th Rispescia International Seminar

Sustainable Bio-resources for Global Welfare

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Preface

Entering its third year, Gadjah Mada – Ehime Universities Network (GEN Network) and collaboration with RISPESCIA held annual seminar entitled BIO-RESOURCES SUSTAINABLE FOR GLOBAL WELFARE in August 2010, Bali, Indonesia. While it was a large task, editing the Proceedings of 3rd GEN and 4th RISPESICA Seminar has been a privilege for us.

Many people have been involved in the production of these Proceedings, started in December 2009 with the launching of GEN Seminar web to provide a portal for paper submission. This was prepared in accordance with some related topics covered as parallel discussion classes which was organized by an eligible moderator who conducted also as a reviewer. Those topics including (1) Forest Carbon Budgeting for REDD; (2) Functinal Food; (3) Molecular Genetic of Topical Rain Forest; (4) Plant Factory; (5) Biodiversity and Natural History Museum; (6) Hydrilogical Issues Under Global Warming; (7) Zeolite Chemistry and Its Industrial Application; (8) Supply Chain in Practices; (9) General Topics.

The seminar theme : BIO-RESOURCES SUSTAINABLE FOR GLOBAL WELFARE has interest and appeal to some people with different fields such as forestry, chemistry, hydrology, operations management, and in collaboration with some industrial practitioners who willing to share in opening season. These participants represent 7 countries form all parts of the world and from a variety of academic backgrounds and interests. We are proud to have been the vehicle for this seminar to run succesfully.

We hope that the papers contained in these Proceedings will prove helpful toward those concerned in relevant topics.

Yogyakarta, Januari 2012

Head of Programme and Proceeding

Content

ABSTRACT

Forest Carbon Budgeting for REDD

Molecular Genetics of Tropical Rain Forest

Plant Factory

General Topics

Supply Chain in Practices

Zeolite Chemistry and Its Industrial Application

THE LIST OF SPECIES OF THE FAMILY HYDROPHILIDAE AND ITS RELATED FAMILIES IN INDONESIA

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ABSTRACT

The species of the family Hydrophilidae and its related families (Hydrochidae, Georissidae and Spherchidae) in Indonesia are listed on the basis of the bibliographical recearch. Up to the present 263 species including subspecies under 4 families, 3 subfamilies, 10 tribes, 48 genera are recorded from Indonesia Archipelago. The highest number of the species lives in both of Sumatra and West Papua.
Keywords: Hydrophilidae, Hydrochidae, Georissidae, Spherchidae, List, Distribution, Indonesia

INTRODUCTION

Hydrophilidae including its related families (= Hydrophiloidea, *sensu* Hansen 1991) are mainly aquatic, except for subfamily Sphaeridiinae which is secondary evoluted to terrestrial (Bernhard *et al*. 2006).

There is no comprehensive study and Indonesian recearcher about Indonesian hydrophilid species, moreover, how many species live in Indonesia Archipelago have no updated today.

In the present paper, we list up the Indonesian hydrophilid species on the basis of the world catalogue (Hansen 1999) and its supplementary lists and recent studies (Short & Hebauer 2006, Short 2007, Hebauer 2007a, b, Komarek & Beutel 2007).

LIST

Family Hydrophilidae Latreille, 1802
Subfamily Horelophopsinae Hansen, 1997
Genus *Horelophopsis* Hansen, 1997

***H. avita* Hansen, 1997**

Distribution: Indonesia (West Papua).

Subfamily Hydrophilinae Latreille, 1802

Tribe Berosini Mulsant, 1844

Genus *Berosus* Leach, 1817

Subgenus *B.* (*Enoplurus*) Hope, 1838

***B.* (*E.*) *elongatulus* Jordan, 1894**

Distribution: Indonesia (Ambon, Bali, Borneo, Java, Lombok, Nias, Siberut, Sulawesi, Sumatra, Timor), Malaysia (Peninsula, Sabah, Sarawak), China (Fujian, Hong Kong), Sri Lanka, Taiwan, Thailand, Vietnam, Afghanistan, Japan , B enin, Chad, Gambia, Ghana, Guinea, Bissau, Senegal.

***B.* (*E.*) *fairmairei* Zaitzev, 1908**

Distribution: Indonesia (Java, Nias, Siberut, Sumatra, Sumba), Andaman Is., Bangladesh, Myanmar, China (Fujian, Guangdong, Hainan, Hong Kong, Yunnan, Henan, Tianjin), India (Delhi, Kerala, Rajasthan), Malaysia (Sabah), Nepal, Philippines, Thailand, Vietnam, Pakistan, Japan.

***B.* (*E.*) *incretus* d'Orchymont, 1937**

Distribution: Indonesia (Sulawesi, Sumatra), Myanmar, China (Hong Kong, Macao, Yunnan), India (Maharashtra, Uttar Pradesh), Laos, Malaysia (Peninsula), Nepal, Philippines, Taiwan, Thailand, Vietnam, Japan.

Subgenus *B.* (s. str.) Leach, 1817

***B.* (s. str.) *nigropictus* Regimbart, 1903**

Distribution: Indonesia (Java), Myanmar, Laos, Malaysia (Peninsula), Vietnam.

***B.* (s. str.) *pulchellus* Macleay, 1825**

Distribution: Indonesia (Bali, Borneo, Java, Lombok, Nias, Seram, Sulawesi, Sumba, Sumbawa, Sumatra), China (Fujian, Guangdong, Hainan, Hong Kong, Yunnan, Zhejiang, Hubei, Jiangsu), Iran, Japan, Saudi Arabia (south), Andaman Is., Bangladesh, Myanmar, India (Haryana, Karnata, Kerala, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal), Laos, Malaysia (Sabah), Nepal, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam, Australia (Queensland).

Genus *Regimbartia* Zaitzev, 1908

***R. attenuata* (Fabricius, 1801)**

Distribution: Indonesia (Java, Sumatra, Sumbawa, Sunda), Myanmar, Cambodia, China (Fujian, Guangdong, Yunnan, Jiangsu), India, Malaysia, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam, Australia (New South Wales, Northern Territory, Queensland, South Australia, Western Australia), New Guinea, Afghanistan, Japan, "Kurdistan", Pakistan, South Korea, Oman, Yemen.

***R. sumatrensis* d'Orchymont, 1941**

Distribution: Indonesia (Sumatra).

Genus *Allocotocerus* Kraatz, 1883

***A. muelleri* (Kirsch, 1875)**

Distribution: Indonesia (Sumatra), Malaysia (Peninsula).

Tribe Chaetarthriini Bedel, 1881

Genus *Chaetarthria* Stephens, 1835

***C. almorana* Knisch, 1924**

Distribution: Indonesia (Sumatra), Myanmar, India (Uttar Pradesh), Malaysia (Peninsula, Sarawak), Thailand, Vietnam.

***C. indica* d'Orchymont, 1920**

Distribution: Indonesia (Borneo, Java, Sumatra), China (Guangxi, Hong Kong), India, Malaysia (Peninsula, Sarawak), Nepal, Philippines, Thailand.

***C. malickyi* Hebauer, 1995**

Distribution: Indonesia (Bali, Sumatra), Malaysia (Peninsula), Thailand.

***C. saundersi* d'Orchymont, 1923**

Distribution: Indonesia (Borneo, Sumatra), Malaysia (Peninsula), Bangladesh, Nepal, Singapore, Thailand, Vietnam.

Genus *Amphiops* Erichson, 1843

***A. coomani* d'Orchymont, 1926**

Distribution: Indonesia (Java, Sumatra), Vietnam.

***A. mater* ssp. *pedestris* Sharp, 1890**

Distribution: Indonesia (Sumatra), China (Guangdong), India (Tamil Nadu), Sri Lanka.

***A. mater* ssp. *sumatrensis* Regimbart, 1903**

Distribution: Indonesia (Sumatra), Malaysia (Peninsula).

***A. mirabilis* Sharp, 1890**

Distribution: Indonesia (Java), Myanmar, Sri Lanka, China (Shandong).

Tribe Anacaenini Hansen, 1991

Genus *Paracymus* Thomson, 1867

***P. blandus* Wooldridge, 1976**

Distribution: Indonesia (West Papua).

***P. generosus* Wooldridge, 1977**

Distribution: Indonesia (Bali).

***P. orientalis* d'Orchymont, 1925**

Distribution: Indonesia (Bali), China (Fujian), Philippines, Vietnam, Japan.

***P. pacatus* Wooldridge, 1976**

Distribution: Indonesia (West Papua).

***P. simulatus* Wooldridge, 1976**

Distribution: Indonesia (Sulawesi), New Guinea.

Genus *Anacaena* Thomson, 1859

***A. balkei* (Gentili, 1993)**

Distribution: Indonesia (West Papua).

***A. colorata* (Gentili, 1996)**

Distribution: Indonesia (West Papua).

***A. conexa* (Gentili, 1996)**

Distribution: Indonesia (West Papua).

***A. lineata* (Gentili, 1996)**

Distribution: Indonesia (West Papua).

***A. lucida* (Gentili, 1996)**

Distribution: Indonesia (West Papua).

***A. mista* d'Orchymont, 1932**

Distribution: Indonesia (Java, Sumatra).

***A. modesta* d'Orchymont, 1932**

Distribution: Indonesia (Java).

***A. obscura* (Gentili, 1996)**

Distribution: Indonesia (West Papua).

***A. personata* (Gentili, 1996)**
Distribution: Indonesia (West Papua).

***A. pilosa* (Gentili, 1996)**
Distribution: Indonesia (West Papua).

***A. striata* (Gentili, 2002)**
Distribution: Indonesia (West Papua).

***A. sucinacia* (Gentili, 2002)**
Distribution: Indonesia (West Papua).

***A. testacea* (Gentili, 1996)**
Distribution: Indonesia (West Papua).

Tribe Laccobiini Bertrand, 1954

Genus *Pelthydrus* d'Orchymont, 1919

Subgenus *P.* (*Globipelthydrus*) Schönmann, 1994

***P.* (*G.*) *acutus* Schönmann, 1994**
Distribution: Indonesia (Sumatra).

***P.* (*G.*) *balinensis* Schönmann, 1994**
Distribution: Indonesia (Bali, Lombok).

***P.* (*G.*) *brouni* d'Orchymont, 1919**
Distribution: Indonesia (Sumatra).

***P.* (*G.*) *corporaali* d'Orchymont, 1923**
Distribution: Indonesia (Borneo, Siberut, Sulawesi, Sumatra).

***P.* (*G.*) *feuerborni* d'Orchymont, 1932**
Distribution: Indonesia (Bali, Lombok).

***P.* (*G.*) *schoedli* Schönmann, 1994**
Distribution: Indonesia (Java, Siberut, Sumatra).

***P.* (*G.*) *thienemanni* d'Orchymont, 1932**
Distribution: Indonesia (Java).

Subgenus *P.* (s. str.) d'Orchymont, 1919

***P.* (s. str.) *iniquus* Schönmann, 1995**
Distribution: Indonesia (Sumatra).

***P.* (s. str.) *minutus* d'Orchymont, 1919**
Distribution: Indonesia (Bali, Java, Sumatra), China (Guangxi, Hong Kong), India (Kerala, Uttar Pradesh), Malaysia (Peninsula), Nepal, Philippines, Taiwan, Thailand, Vietnam.

***P.* (s. str.) *ovalis* d'Orchymont, 1932**
Distribution: Indonesia (Sumatra).

***P.* (s. str.) *truncatus* d'Orchymont, 1932**
Distribution: Indonesia (Sumatra).

Genus *Laccobius* Erichson, 1837

Subgenus *L.* (*Cyclolaccobius*) Gentili, 1991

***L.* (*C.*) *tibialis* d'Orchymont, 1932**
Distribution: Indonesia (Sumatra).

Subgenus *L.* (*Notoberosus*) Blackburn, 1895

***L.* (*N.*) *acceptus* Gentili, 1996**
Distribution: Indonesia (West Papua).

***L.* (*N.*) *alius* Gentili, 1988**
Distribution: Indonesia (West Papua).

***L.* (*N.*) *ambonicus* Gentili, 1991**
Distribution: Indonesia (Ambon, Seram).

***L.* (*N.*) *balkei* Gentili, 1996**
Distribution: Indonesia (West Papua).

***L.* (*N.*) *centralis* Gentili, 1996**
Distribution: Indonesia (West Papua).

***L.* (*N.*) *discitarsus* Gentili, 1997**
Distribution: Indonesia (West Papua).

***L.* (*N.*) *ebeneus* Gentili, 1997**
Distribution: Indonesia (West Papua).

***L.* (*N.*) *fikaceki* Gentili, 2005**
Distribution: Indonesia (West Papua).

***L.* (*N.*) *hollandiae* Gentili, 1980**

Distribution: Indonesia (West Papua), Papua New Guinea.

***L.* (*N.*) *irianicus* Gentili, 1980**

Distribution: Indonesia (West Papua).

***L.* (*N.*) *lucernaris* Gentili, 1980**

Distribution: Indonesia (West Papua), Papua New Guinea.

***L.* (*N.*) *photophilus* Gentili, 1980**

Distribution: Indonesia (West Papua).

***L.* (*N.*) *virens* Gentili, 1981**

Distribution: Indonesia (West Papua).

Subgenus *L.* (*Microlaccobius*) Gentili, 1974

***L.* (*M.*) *roseiceps* Regimbart, 1903**

Distribution: Indonesia (Ambon, Borneo, Sulawesi, West Papua), China (Hong Kong), India (Bihar, Maharashtra, Tamil Nadu, Uttar Pradesh), Malaysia (Sabah), Philippines, Vietnam, Australia (Northern Territory), Papua New Guinea.

***L.* (*M.*) *roseiceps* ssp. *melanesiae* Gentili, 1980**

Distribution: Indonesia (West Papua), New Britain, Papua New Guinea, Solomon Is.

Subgenus *Laccobius* (subg.?)

***L.* (subg.?) *huijbregtsi* Gentili, 1988**

Distribution: Indonesia (Sulawesi).

***L.* (subg.?) *jacobsoni* Knisch, 1925**

Distribution: Indonesia (Sumatra), Thailand, Vietnam.

***L.* (subg.?) *nesiotes* Gentili, 1988**

Distribution: Indonesia (Sulawesi).

***L.* (subg.?) *sulawesicus* Gentili, 1988**

Distribution: Indonesia (Sulawesi).

Genus *Oocyclus* Sharp, 1882 (hygropetric)

***O. sumatrensis* d'Orchymont, 1932**

Distribution: Indonesia (Java, Sulawesi, Sumatra), China (Hainan), Malaysia (Peninsula).

Tribe Hydrophilini Latreille, 1802
Subtribe Acidocerina Zaitzev, 1908
Genus *Agraphydrus* Regimbart, 1903
Subgenus *A.* (s.str.) Regimbart, 1903

***A.* (s.str.) *orientalis* (d'Orchymont, 1932)**

Distribution: Indonesia (Bali, Java, Sumatra), China (Yunnan), Taiwan.

Subgenus *A.* (*Gymnhelochares*) d'Orchymont, 1932

***A.* (*G.*) *geminus* (d'Orchymont, 1932)**

Distribution: Indonesia (Java).

Genus *Helochares* Mulsant, 1844
Subgenus *H.* (s.str.) Mulsant, 1844

***H.* (s.str.) *fuliginosus* d'Orchymont, 1932**

Distribution: Indonesia (Java, Sumatra), Malaysia (Peninsula).

***H.* (s.str.) *pallens* (Macleay, 1825)**

Distribution: Indonesia (Java, Sumatra, Sunda), Benin, Botswana, Chad, Congo, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Namibia, Rwanda, South Africa, Sudan, Tanzania, Yemen, Zambia, China (Hubei, Fujian, Guangdong, Yunnan), Egypt, Israel, Japan, Lebanon, Saudi Arabia (north), Bangladesh, Myanmar, India, Malaysia (Peninsula),

Philippines, Sri Lanka, Thailand, Papua New Guinea, Vanuatu.

***H.* (s.str.) *papuensis* Hebauer, 1995**

Distribution: Indonesia (West Papua).

***H.* (s.str.) *taprobanicus* Sharp, 1890**

Distribution: Indonesia (Borneo, Sumatra), Bangladesh, Cambodia, Malaysia (Peninsula), Sri Lanka, Thailand, Vietnam, New Guinea.

Subgenus *H.* (*Hydrobaticus*) MacLeay, 1871

***H.* (*H.*) *anchoralis* Sharp, 1890**

Distribution: Indonesia (Sumatra), Bangladesh, Cambodia, China (Fujian, Hainan, Yunnan, Hubei), India, Laos, Philippines, Sri Lanka, Taiwan, Thailand, Japan.

***H.* (*H.*) *ancoroides* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***H.* (*H.*) *compactus* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***H.* (*H.*) *denudatus* d'Orchymont, 1943**

Distribution: Indonesia (Sumatra), Malaysia (Peninsula).

***H.* (*H.*) *lamprus* d'Orchymont, 1940**

Distribution: Indonesia (Sumatra).

***H.* (*H.*) *lentus* Sharp, 1890**

Distribution: Indonesia (Borneo, Java, Lombok, Sumatra), Bangladesh, Cambodia, India, Malaysia (Peninsula), Sri Lanka, Thailand, Vietnam, China (Tibet).

***H.* (*H.*) *minusculus* d'Orchymont, 1943**

Distribution: Indonesia (Sumatra), Myanmar.

***H.* (*H.*) *nebridius* d'Orchymont, 1940**

Distribution: Indonesia (Java, Lombok, Sumatra), Singapore.

***H.* (*H.*) *schwendingeri* Hebauer, 1995**

Distribution: Indonesia (Bali), Malaysia (Peninsula), Thailand.

Genus *Chasmogenus* Sharp, 1882

***C. abnormalis* (Sharp, 1890)**

Distribution: Indonesia (Borneo, Java, Sulawesi, Sumatra), Cambodia, Sri Lanka, Taiwan, Thailand, Vietnam, Japan.

***C. irianus* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***C. rubricollis* (Regimbart, 1903)**

Distribution: Indonesia (Borneo, Sumatra).

Genus *Enochrus* Thomson, 1859

Subgenus *E.* (*Methydrus*) Rey, 1885

***E.* (*M.*) *baliemus* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***E.* (*M.*) *balkei* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***E.* (*M.*) *brunnescens* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***E.* (*M.*) *cassidiformis* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***E.* (*M.*) *esuriens* (Walker, 1858)**

Distribution: Indonesia (Borneo, Java, Sumatra, Sunda), Bangladesh, China (Fujian, Guangdong, Hainan, Jiangxi, Hubei, Jiangsu), India, Malaysia (Peninsula), Nicobar Is., Philippines, Sri Lanka, Thailand, Vietnam, Japan, Saudi Arabia (north), South Korea (record from Egypt dubious), Australia (New South Wales,

Northern Territory, Queensland, Western Australia), Fiji, New Caledonia, New Guinea, Solomon Is., Vanuatu, Samoa, Society Is.

***E.* (*M.*) *flavicans* (Regimbart, 1903)**
Distribution: Indonesia (Java).

***E.* (*M.*) *fretus* d'Orchymont, 1932**
Distribution: Indonesia (Java), China (Yunnan).

***E.* (*M.*) *froficuloides* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *gaggermeieri* Hebauer, 1995**
Distribution: Indonesia (Borneo), Malaysia.

***E.* (*M.*) *hendrichi* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *marginalis* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *musculus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *nabiricus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *neglectus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *paniaicus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *ruber* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *rubrocinctus* (Regimbart, 1903)**
Distribution: Indonesia (Buru, Sumatra), Bangladesh, Myanmar, India (Kerala), Philippines, Vietnam.

***E.* (*M.*) *seriellus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***E.* (*M.*) *yamuranus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

Subtribe Hydrophilina Latreille, 1802

Genus *Sternolophus* Solier, 1834

Subgenus *S.* (*Neosternolophus*) Zaitzev, 1909

***S.* (*N.*) *inconspicuous* (Nietner, 1856)**
Distribution: Indonesia (Java, Sumatra), Philippines Myanmar, Cambodia, China (Fujian, Yunnan), India (Bihar), Sri Lanka, Taiwan, Thailand, Vietnam, Japan.

***S.* (*N.*) *marginicollis* (Hope, 1841)**
Distribution: Indonesia (Borneo, Buru, Java, Sulawesi, West Papua), Timor, Australia (Australian Capitol Territory, New South Wales, Northern Territory, Queensland, South Australia, Victoria, Western Australia), Fiji, New Caledonia, Papua New Guinea, Vanuatu, India (Kerala).

Subgenus *S.* (s. str.) Solier, 1834

***S.* (s. str.) *rufipes* (Fabricius, 1792)**
Distribution: Indonesia (Java, Sumatra), China (Beijing, Jiangsu, Tibet, Fujian, Guangdong, Hunan, Yunnan, Zhejiang), India (Tamil Nadu), Philippines, Sri Lanka, Taiwan, Thailand, Vietnam, India (Kashmir), Japan, South Korea.

Genus *Hydrobiomorpha* Blackburn, 1888

Subgenus *H.* (s. str.) Blackburn, 1888

***H.* (s. str.) *cambodiensis* (Regimbart, 1903)**
Distribution: Indonesia (Java), Myanmar, Cambodia, Vietnam.

***H.* (s. str.) *malaisica* Mouchamps, 1959**
Distribution: Indonesia (Sumatra), Cambodia.

***H.* (s. str.) *rufiventris* (Nietner, 1856)**

Distribution: Indonesia (Sumatra), India (Tamil Nadu), Sri Lanka.

***H.* (s. str.) *simplex* Mouchamps, 1959**

Distribution: Indonesia (Borneo).

***H.* (s. str.) *spinicollis* ssp. *oriensis* Mouchamps, 1959**

Distribution: Indonesia (Java), India, Laos, Vietnam.

***H.* (s. str.) *spinicollis* ssp. *andromorpha* Mouchamps, 1959**

Distribution: Indonesia (Sumatra).

Genus *Hydrophilus* Geoffroy, 1762

Subgenus *H.* (s. str.) Geoffroy, 1762

***H.* (s. str.) *acuminatus* Motschulsky, 1854**

Distribution: Indonesia (Sumatra), China (Beijing, Hebei, Nei Mongol, Sichuan, Tibet Guangdong, Hong Kong, Jiangxi, Shanghai, Yunnan, Zhejiang), Japan, Russian Fed. (Far East), South Korea, Myanmar, Taiwan.

***H.* (s. str.) *bilineatus* (MacLeay, 1825)**

Distribution: Indonesia (Ambon, Java, Lombok, Sulawesi), China (Fujian, Hubei, Sichuan), India, Philippines, Australia (Australian Capitol Territory, New South Wales, Northern Territory, Queensland, Western Australia), Fiji.

***H.* (s. str.) *bilineatus* ssp. *caschmirensis* Redtenbacher, 1844**

Distribution: Indonesia (Sumatra), Myanmar, Cambodia, China (Jiangxi, Yunnan, Hubei, Sichuan, "Manchuria"), India ("Bengal"), Malaysia, Sri Lanka, Taiwan, Thailand, Vietnam, India (Kashmir), Japan, South Korea.

***H.* (s. str.) *cavisternum* (Bedel, 1891)**

Distribution: Indonesia (Java), Cambodia, China (Hainan), Laos, Malaysia (Peninsula), Thailand, Vietnam.

***H.* (s. str.) *loriai* (Regimbart, 1901)**

Distribution: Indonesia (West Papua), Papua New Guinea.

Subfamily Sphaeridiinae Latreille, 1802

Tribe Coelostomatini Heyden, 1891

Genus *Coelostoma* Brulle, 1835

Subgenus *C.* (s. str.) Brulle, 1835

***C.* (s. str.) *fabricii* (Montrouzier, 1860)**

Distribution: Indonesia (Borneo, Sumatra, West Papua), China (Fujian), Laos, Vietnam, Australia (Queensland, Southern Australia, Tasmania, Western Australia), New Caledonia, Vanuatu, Hawaiian Is.

***C.* (s. str.) *fallaciosum* d'Orchymont, 1936**

Distribution: Indonesia (Sumatra), China (Fujian), Malaysia (Sabah), Brunei, Vietnam, Japan.

***C.* (s. str.) *subditum* d'Orchymont, 1936**

Distribution: Indonesia (Borneo), Malaysia, Brunei.

***C.* (s. str.) *vitalisi* d'Orchymont, 1923**

Distribution: Indonesia (Borneo, Java, Sumatra), China (Shandong, Yunnan), India (Bihar), Malaysia (Sabah), Brunei, Singapore, Sri Lanka, Vietnam.

***C.* (s.str.) *vividum* d'Orchymont, 1936**

Distribution: Indonesia (Borneo, Java, Sumatra), India (West Bengal).

Subgenus *C.* (*Holocoelostoma*) Mouchamps, 1958

***C.* (*H.*) *stultum* (Walker, 1858)**

Distribution: Indonesia (Borneo, Java, Sumatra, Sumbawa), Andaman Is., Myanmar, China, India (Assam), Malaysia (Peninsula), Nicobar Is., Philippines, Sri Lanka, Taiwan, Thailand, Vietnam, Japan, South Korea, Mascarene Is., Oman, Saudi Arabia (south).

***C.* (*H.*) *thienemanni* d'Orchymont, 1932**

Distribution: Indonesia (Sumatra).

Subgenus *C.* (*Lachnocoelostoma*) Mouchamps, 1958

***C.* (*L.*) *coomani* ssp. *diversum* d'Orchymont, 1932**

Distribution: Indonesia (Sumatra).

***C.* (*L.*) *coomani* ssp. *javanicum* Mouchamps, 1958**

Distribution: Indonesia (Java).

***C.* (*L.*) *cooptatum* d'Orchymont, 1932**

Distribution: Indonesia (Bali, Java, Sumatra).

***C.* (*L.*) *coortum* d'Orchymont, 1932**

Distribution: Indonesia (Sumatra).

***C.* (*L.*) *horni* (Regimbart, 1902)**

Distribution: Indonesia (Sumatra, Sunda), Andaman Is., Bhutan, China (Hong Kong), India, Nicobar Is., Sri Lanka, Vietnam, Mascarene Is., Oman, Saudi Arabia (south), South Africa, Yemen.

***C.* (*L.*) *irregular* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***C.* (*L.*) *lazarense* d'Orchymont, 1925**

Distribution: Indonesia (Sumatra), Malaysia (Peninsula), Philippines.

***C.* (*L.*) *phallicum* d'Orchymont, 1940**

Distribution: Indonesia (Borneo, Sulawesi), Cambodia, China (Xinjiang), Malaysia (Peninsula), Laos, Vietnam.

***C. (L.) vagum* d'Orchymont, 1940**

Distribution: Indonesia (Borneo, Java, Sumatra), Cambodia, China (south), Malaysia, Laos, Vietnam.

Genus *Dactylostethus* d'Orchymont, 1919

***D. impunctatus* d'Orchymont, 1919**

Distribution: Indonesia (Sumatra).

Remarks. This genus is endemic to Sumatra (Hebauer, 2007a, b).

Genus *Dactylosternum* Wollaston, 1854

***D. abdominal* (Fabricius, 1792)**

Distribution: Indonesia (Java, Sumatra), Benin, Cape Verde Is., Comoros, Guinea, Ivory Coast, Madagascar, Mascarene Is., Nigeria, Senegal, Seychelles (incl. Aldabra), South Africa, Togo, Yemen, Zaire, Algeria, Azores, Canary Is., Croatia, Cyprus, Egypt, France, Germany, Greece, Italy, Japan, Madeira, Spain, Syria, Tunisia, Andaman Is., Christmas Is., India, Malaysia (Peninsula), Philippines, Singapore, Sri Lanka, Australia (Australia Capitol Territory, Queensland, South Australia, Victoria, Western Australia), Fiji, New Caledonia, New

Guinea, New Zealand, Gambier Is., Hawaiian Is., Marquesas Is., Samoa, Society Is., Argentina, Brazil, Cuba, Jamaica (purposely intr.), Lesser Antilles, Mexico, U.S.A. (Alabama, California, Florida, North Carolina, Texas).

***D. bormeanum* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***D. corporaali* d'Orchymont, 1923**

Distribution: Indonesia (Sumatra), Malaysia (Peninsula).

***D. cycloides* Knisch, 1921**

Distribution: Indonesia (Sipura, Sumatra), Malaysia (Peninsula).

***D. detersum* Hebauer, 2001**

Distribution: Indonesia (West Papua), Papua New Guinea.

***D. doherty* Balfour-Browne, 1942**

Distribution: Indonesia (Java), Thailand.

***D. dytiscoides* (Fabricius, 1775)**

Distribution: Indonesia (Borneo, Buru, Enggano, Java, Mentawei, Morotai, Nias, Sulawesi, Sumatra), Malaysia (Peninsula), Philippines, Singapore, Sri Lanka, Australia (Queensland), New Britain, Papua New Guinea, Vanuatu, Hawaiian Is.

***D. hydrophiloides* (MacLeay, 1825)**

Distribution: Indonesia (Borneo, Buru, Java, Sulawesi), Andaman Is., Bhutan, China (Fujian), India (West Bengal), Malaysia (Peninsula), Singapore, Taiwan, Thailand, Vietnam, South Africa, Australia, Palau Is., Hawaiian Is., Jamaica.

***D. ilaganum* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***D. illutum* Hebauer, 2001**

Distribution: Indonesia (West Papua), Papua New Guinea.

***D. inaequale* Knisch, 1921**

Distribution: Indonesia (Sumatra).

***D. proxime* d'Orchymont, 1923**

Distribution: Indonesia (Sumatra).

***D. seriatum* Knisch, 1921**

Distribution: Indonesia (Enggano, Java, Mentawei, Sumatra), Vietnam.

***D. subquadratum* (Fairmaire, 1849)**

Distribution: Indonesia (Kep. Tanimbar), Fiji, Papua New Guinea, Vanuatu, Gambier Is., Hawaiian Is., Samoa, Society Is., Tubuai Is.

***D. trilobatum* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***D. waigeuense* Balfour-Browne, 1942**

Distribution: Indonesia (West Papua).

Tribe Protosternini Hansen, 1991

Genus *Rhombosternum* Balfour-Browne, 1942

***R. bameuli* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***R. consobrinum* Bameul, 1997**

Distribution: Indonesia (Java), Philippines.

***R. wagneri* (Knisch, 1921)**

Distribution: Indonesia (Java, Sipura, Sumatra), Malaysia (Sabah).

Genus *Protosternum* Sharp, 1890

***P. abnormal* (d'Orchymont, 1913)**

Distribution: Indonesia (Mentawei, Sumatra), Taiwan.

***P. longicarinatum* Bameul, 1997**

Distribution: Indonesia (Sulawesi).

Tribe Omicrini Smetana, 1975

Genus *Paromicrus* Scott, 1913

***P. bicarinatus* Bameul, 1993**

Distribution: Indonesia (Sulawesi)

***P. carolinae* d'Orchymont, 1919**

Distribution: Indonesia (Enggano).

***P. flexus* Bameul, 1993**

Distribution: Indonesia (Sulawesi).

***P. punctulatus* Bameul, 1993**

Distribution: Indonesia (Sulawesi).

***P. scotti* d'Orchymont, 1919**

Distribution: Indonesia (Sumatra, Enggano, Sulawesi)

***P. scotti* ssp. *denseseriatum* d'Orchymont, 1925**

Distribution: Indonesia (Borneo).

***P. scutulatus* Bameul, 1993**

Distribution: Indonesia (Sulawesi).

***P. wallacei* Bameul, 1993**

Distribution: Indonesia (Sulawesi).

Genus *Aculomicrus* Smetana, 1990

***A. brendelli* Bameul, 1993**

Distribution: Indonesia (Sulawesi).

Genus *Psalitrus* d'Orchymont, 1919

***A. fungifer* Bameul, 1993**

Distribution: Indonesia (Sumatra).

***A. nigrorufus* d'Orchymont, 1932**

Distribution: Indonesia (Bali).

***A. vandenbosscheae* d'Orchymont, 1919**

Distribution: Indonesia (Sumatra).

Genus *Stanmalcolmia* Bameul, 1993

***S. sulawesiensi* Bameul, 1993**

Distribution: Indonesia (Sulawesi).

Remarks. This genus is endemic to Sulawesi (Hebauer, 2007a, b).

Genus *Omicrogiton* d'Orchymont, 1919

***O. insularis* d'Orchymont, 1919**

Distribution: Indonesia (Borneo, Buru, Enggano, Sulawesi, Sumatra), Malaysia (Sarawak), Philippines (Luzon), Sri Lanka, Mascarene Is.

Genus *Mircogioton* d'Orchymont, 1937

***M. irregularis* Hebauer, 2006**

Distribution: Indonesia (West Papua).

***M. seriatus* Hebauer, 2006**

Distribution: Indonesia (West Papua).

Genus *Peratogonus* Sharp, 1884

***P. corporaali* d'Orchymont, 1926**

Distribution: Indonesia (Java).

Genus *Noteropagus* d'Orchymont, 1919

***N. obliquus* d'Orchymont, 1925**

Distribution: Indoensia (Sulawesi), Malaysia (Pinang Is.), Hawaiian Is.

***N. obscurus* d'Orchymont, 1919**

Distribution: Indonesia (Timor), Fiji.

***N. occlusus* d'Orchymont, 1932**

Distribution: Indonesia (Sumatra), Madagascar, Mascarene Is.

***N. politus* d'Orchymont, 1919**

Distribution: Indonesia (Bali, Java, Mentawei, Sumatra), India, Philippines, Samoa.

***N. politus* ssp. *punctatus* d'Orchymont, 1925**

Distribution: Indonesia (Sumatra), Vietnam.

Tribe Megasternini Mulsant, 1844

Genus *Cycreon* d'Orchymont, 1919

***C. sculpturatus* d'Orchymont, 1919**

Distribution: Indonesia (Sumatra).

Genus *Armostus* Sharp, 1890

***A. arcuatus* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***A. crenulatus* (Regimbart, 1903)**

Distribution: Indonesia (Java), India (Kerala, Uttar Pradesh), Malaysia (Pinang Is.), Singapore, Japan.

***A. fleutiauxi* (d'Orchymont, 1925)**

Distribution: Indonesia (Java), Vietnam.

***A. optatus* Sharp, 1890**

Distribution: Indonesia (Java), India (Uttar Pradesh), Sri Lanka, Vietnam.

***A. schenklingi* (d'Orchymont, 1914)**

Distribution: Indonesia (Borneo, Java, Sumatra, Sumbawa, Sulawesi), Taiwan.

***A. taeniatus* Hebauer, 2001**

Distribution: Indonesia (West Papua).

Genus *Australocyon* Hansen, 1990

***A. antennatus* Hansen, 2003**

Distribution: Indonesia (Sulawesi).

***A. loebli* Hansen, 2003**

Distribution: Indonesia (Sumatra).

***A. nigrorufus* Hansen, 2003**

Distribution: Indonesia (Sulawesi).

***A. puncticollis* Hansen, 2003**

Distribution: Indonesia (Mentawei), Malaysia (Sabah).

Genus *Cetiocyon* Hansen, 1990

***C. goliathus* (Huijbregts, 1984)**

Distribution: Indonesia (West Papua).

Genus *Platycyon* Hansen, 1999

***P. bicolor* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***P. bisignatus* Hebauer, 2000**

Distribution: Indonesia (West Papua).

***P. collaris* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***P. confusus* Hansen, 1999**

Distribution: Indonesia (West Papua).

***P. guttalis* Hebauer, 2000**

Distribution: Indonesia (West Papua), Papua New Guinea.

***P. latior* Hebauer, 2000**

Distribution: Indonesia (West Papua).

***P. minimus* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***P. minor* Hebauer, 2000**

Distribution: Indonesia (West Papua).

***P. nabirensis* Hebauer, 2000**

Distribution: Indonesia (West Papua).

***P. nigrifrons* Hebauer, 2000**

Distribution: Indonesia (West Papua).

***P. reticulatus* Hansen, 1999**

Distribution: Indonesia (West Papua), Papua New Guinea.

***P. sulcatus* Hebauer, 2000**

Distribution: Indonesia (West Papua).

Genus *Peltocercyon* d'Orchymont, 1925

***P. coomani* d'Orchymont, 1925**

Distribution: Indonesia (Sumatra), Vietnam.

***P. lunulatus* (Gemminger & Harold, 1868)**

Distribution: Indonesia (Sumatra), Singapore, Sri Lanka, Vietnam.

Genus *Cercyon* Leach, 1817

Subgenus *C.* (*Acycreon*) d'Orchymont, 1942

***C.* (*A.*) *punctiger* Knisch, 1921**
Distribution: Indonesia (Enggano, Sumatra), India (Tamil Nadu), Singapore, Sri Lanka, Vietnam.

Subgenus *C.* (*Paracycreon*) d'Orchymont, 1942

***C.* (*P.*) *morosus* Knisch, 1925**
Distribution: Indonesia (Sumatra).

***C.* (*P.*) *subsolanus* Balfour-Browne, 1939**
Distribution: Indonesia (Sumatra, Sunda), India, Malaysia (Peninsula), Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam (as "vicinalis"), Saudi Arabia (north).

Subgenus *C.* (s. str.) Leach, 1817

***C.* (s. str.) *corporaali* d'Orchymont, 1925**
Distribution: Indonesia (Batu).

***C.* (s. str.) *iquinatus* Wollaston, 1854**
Distribution: Indonesia (Java), Azores, Canary Is., Croatia, Italy, Japan, Madeira, U.S.A. (Illinos), Brazil, Mascarene Is., New Caledonia.

***C.* (s. str.) *madidus* d'Orchymont, 1932**
Distribution: Indonesia (Java).

***C.* (s. str.) *toxopeusi* d'Orchymont, 1925**
Distribution: Indonesia (Buru).

***C.* (s. str.) *tropicus* d'Orchymont, 1925**
Distribution: Indonesia (Buru).

***C.* (s. str.) *trossulus* d'Orchymont, 1932**
Distribution: Indonesia (Sumatra).

***C.* (s. str.) *udus* d'Orchymont, 1932**
Distribution: Indonesia (Bali, Java).

***C.* (s.str.) *vaneeckei* Knisch, 1926**
Distribution: Indonesia (Java, Sumatra).

Subgenus *C.* (*Paracercyon*) Seidlitz, 1888

***C.* (*P.*) *fulvus* Knisch, 1921**
Distribution: Indonesia (Mentawei, Sumatra).

***C.* (*P.*) *vitalis* Knisch, 1921**
Distribution: Indonesia (Sumatra).

Subgenus *C.* (*Clinocercyon*) d'Orchymont, 1942

***C.* (*C.*) *asperatus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***C.* (*C.*) *conjiciens* (Walker, 1858)**
Distribution: Indonesia (Sumatra), India (Tamil Nadu), Seychelles, Sri Lanka.

***C.* (*C.*) *flaviventris* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***C.* (*C.*) *humeronotus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***C.* (*C.*) *humeropictus* Hebauer, 2001**
Distribution: Indonesia (West Papua).

***C.* (*C.*) *javanus* d'Orchymont, 1932**
Distribution: Indonesia (Java).

***C.* (*C.*) *lineolatus* (Motschulsky, 1863)**
Distribution: Indonesia (Sumatra), India (Bihar), Philippines, Sri Lanka, Vietnam, Mascarene Is.

***C.* (*C.*) *xanthaspis* Hebauer, 2001**
Distribution: Indonesia (West Papua).

Genus *Pelosoma* Mulsant, 1844

***P. orientale* d'Orchymont, 1925**
Distribution: Indonesia (Buru).

***P. sumatrense* d'Orchymont, 1932**

Distribution: Indonesia (Sumatra).

Genus *Paroosternum* Scött, 1913

***P. alternans* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***P. jayanum* Hebauer, 2006**

Distribution: Indonesia (West Papua).

***P. melanesinum* Hebauer, 2006**

Distribution: Indonesia (West Papua), Papua New Guine.

***P. saundersi* (d'Orchymont, 1925)**

Distribution: Indonesia (Java), Singapore, Vietnam, Papua New Guinea.

Genus *Bolbonotum* Hansen, 1999

***B. myophallus* Hansen, 1999**

Distribution: Indonesia (Batu Is., Nias Is.), Malaysia (Sarawak).

Genus *Pachysternum* Motschulsky, 1863

***P. apicatum* Motschulsky, 1863**

Distribution: Indonesia (Java, Lombok, Sipura, Sumatra), India, Malaysia (Peninsula), Vietnam.

***P. sulawesicum* Fikáćek, 2006**

Distribution: Indonesia (Sulawesi).

Genus *Cryptopleurum* Mulsant, 1844

***C. bilinguipenis* Hebauer, 2001**

Distribution: Indonesia (West Papua).

***C. corporaali* d'Orchymont, 1926**

Distribution: Indonesia (Java).

***C. ferrugineum* Motschulsky, 1863**

Distribution: Indonesia (Sumatra), India ("Bengal"), Singapore, Sri Lanka, Vietnam, Saudi Arabia (north).

***C. flaviapex* Hebauer, 2001**

Distribution: Indonesia (West Papua).

Genus *Pilocnema* Hansen, 1990

***P. bicolor* Hebauer, 2004**

Distribution: Indonesia (West Papua).

***P. brevisternum* Hansen, 2003**

Distribution: Indonesia (West Papua).

***P. clypealis* Hansen, 2003**

Distribution: Indonesia (West Papua).

***P. confuse* Hansen, 2003**

Distribution: Indonesia (West Papua).

***P. crassipes* Hansen, 2003**

Distribution: Indonesia (West Papua).

***P. fusipalpis* Hebauer, 2004**

Distribution: Indonesia (West Papua).

***P. gracilipes* Hebauer, 2004**

Distribution: Indonesia (West Papua).

***P. grandis* Hansen, 2003**

Distribution: Indonesia (West Papua).

***P. obsoleta* Hansen, 2003**

Distribution: Indonesia (West Papua).

Tribe Sphaeridiini Latreille, 1802

Genus *Sphaeridium* Fabricius, 1775

***S. dimidiatum* Gory, 1834**

Distribution: Indonesia (Java), India (Bihar, Kerala, Tamil Nadu, Uttar Pradesh, West Bengal), Sri Lanka, Thailand, Japan.

***S. flavomaculatum* d'Orchymont, 1924**

Distribution: Indonesia (West Papua).

***S. huijbregtsi* Berge Henegouwen, 1986**

Distribution: Indonesia (Maluku, West Papua), Papua New Guinea, Solomon Is.

***S. quinquemaculatum* Fabricius, 1798**

Distribution: Indonesia (Java, Sumatra), India, Philippines, Sri

Lanka, Taiwan, China (Jiangsu), Japan, Saudi Arabia (north).

***S. seriatum* d'Orchymont, 1913**

Distribution: Indonesia (Batu Is., Borneo, Java, Sumatra), India, Philippines, Vietnam.

***S. severini* d'Orchymont, 1919**

Distribution: Indonesia (Sumatra), Cambodia, China (Hong Kong, Yunnan), India (Kerala, Tamil Nadu, West Bengal), Laos, Singapore, Vietnam.

Family Georissidae Castelnau, 1840

Genus *Georissus* Latreille, 1809

Subgenus *G.* (*Neogeorissus*) Satô, 1972

***G.* (*N.*) *batavianus* Delève, 1969**

Distribution: Indonesia (Java).

***G.* (*N.*) *calculus* Delève, 1969**

Distribution: Indonesia (Sumatra).

***G.* (*N.*) *emdeni* Delève, 1969**

Distribution: Indonesia (Sumatra).

***G.* (*N.*) *overbecki* Emden, 1934**

Distribution: Indonesia (Java, Sumatra).

Family Hydrochidae Thomson, 18595

Genus *Hydrochus* Leach, 1817

***H. chitaniei* Makhan, 1994**

Distribution: Indonesia (West Papua).

***H. gitaraiae* Makhan, 1994**

Distribution: Indonesia (West Papua)

***H. inornatus* d'Orchymont, 1927**

Distribution: Indonesia (Java).

***H. kiranae* Makhan, 1994**

Distribution: Indonesia (Sulawesi).

***H. satishanandi* Makhan, 1995**

Distribution: Indonesia (Java).

Family Spercheidae Erichson, 1837

Genus *Spercheus* Kugelann, 1798

***S. platycephalus* Macleay, 1825**

Distribution: Indonesia (Bali, Borneo, Java, Lombok, Sulawesi, Sumatra, Sumbawa), Australia (Queensland), Papua New Guinea, Tonga Is.

***S. siamensis* Hebauer, 1990**

Distribution: Indonesia (Sumatra), Thailand.

Discussion

In the present paper, 263 species including subspecies under 4 f amilies, 3 subfamilies, 10 tribes, 48 genera are listed from Indonesia archipelago, and this number is 8.76 % of the world Hydrophilidae species. According to Hansen (1991), of these 26 genera are terrestrial, and remaining genera are aquatic/semiaquatic.

Two families related Hydrophilidae, i.e. Helophoridae and Epimetopidae, have not been recorded from Indonesia archipelago, but as Hebauer (2007b) suggested we suppose the family Epimetopidae which distributed in tropical region will be discovered from Indonesia.

The highest number of the species lives in both of Sumatra and West Papua. Hebauer (2007a) reported two genera as island endemics in Indonesia, there are *Dactylostethus* d'Orchymont recorded from Sumatra and *Stanmalcolmia* Bameul from Sulawesi.

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EL NINO AND LA NINA CLIMATE ANOMALY IMPACT ON MAIZE PRODUCTION AND SUPPLY IN JAVA

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ABSTRACT

Maize was the second important food crop in Indonesia, after paddy, and Java Island became one of its production centers, besides Sumatera and Sulawesi. The more frequent occurrence of El Nino and La Nina climate anomaly after the global warming was hypothesized has influenced the production, and also the supply, of maize. This paper described and analyzed the impact of El Nino and La Nina on maize production and supply in Java.

Panel data was used, that was combining between cross sectional data from four provinces in Java island, i.e. West Java, Central Java, East Java, and DI Yogyakarta, with time series data from 1987-2006 of those provinces. The table analysis was used to describe the impact of El Nino and La Nina on rainfall and maize production. The autoregressive regression model, which were include the dummy variable of El Nino and La Nina occurrence and Southern Oscillation Index value, was run to estimate the maize supply.

The table analysis showed that the El Nino occurrence decreased rainfall by 22.74%, while La Nina increased it by 38.41% from normal. The maize production decreased, both on El Nino and La Nina occurrence, consecutively 30.24% and 33.10%. Meanwhile, the regression analysis showed that El Nino didn't influence the maize supply, but La Nina did. Maize supply function showed that the supply of maize in Java island increasing when La Nina occurred.

Keywords: El Nino, La Nina, production, supply

INTRODUCTION

The 2006-2009 General Policy of Food Security from Indonesian Agency of Food Security stated that maize was the second most important food crop in Indonesia, after paddy. Besides used as staple food in several regions, such as Madura and East Nusa Tenggara, the demand and using of maize also increase significantly after the fast growing of animal husbandary (Erwidodo *et al*., 2003 cit. Ariyanti, 2007). Maize production is concentrated in Java Island, which is more than 50% of its production yielded in East Java and Central Java provinces in this island (Agency of Food Security, 2006). Thus, Java Island became an important area for food production, especially paddy and maize as strategic food crops.

Maize was seasonal crop with short planting period. This made the maize will be easily influenced by climate anomaly. Two climate anomalies usually attack Indonesia were El Nino and La Nina, which recently deviated from its normal cycle. The both climate anomalies became more frequent and have longer duration since 1990's. The El Nino occurance was usually followed by rainfall decreasing, while the La Nina stimulated the rainfall increasing above normal. Those both incidents harmed the agricultural production by its impact on water supply. In El Nino period, there was shortage in water supply, causing the decreasing of agricultural yield because of the drought. Otherwise, La Nina stimulated excessive water supply which sometimes causing flood and failure in crop harvest.

Water was dominant factor for plant growth, yield, and production stability. The water need for maize was 45-145 millimetres per month (Directoral General of Higher Education, Department of Education and Culture, 1991). The El Nino can cause the rainfall decrease below normal, i.e. less that 50 millimetres per month, while La Nina opposites. Many plant activities using water, such as photosynthesis, which were important for the plant to produce seed and fruit. Thus, El Nino and La Nina climate anomaly was clearly impacted on maize, seasonal food crop with short planting period.

The fluctuating maize production because of the climate anomaly will also impact on its supply, which was the quantity produced and supplied by the farmers. Thereby, this paper aimed to analyze the impact of El Nino and La Nina climate anomaly on maize production and supply in Java.

DATA

Data used was secondary data, which was collected from several related institutions, such as Central Bureau of Statistics, Ministry of Agriculture, Bureau of Meteorology, Climatology, and Geophisics, website of Australian Bureau of Meteorology, website of National Weather Service of United States of America, etc. The data panel was used, which was combining between cross section data from four provinces in Java Island, i.e. West Java, Central Java, Daerah Istimewa Yogyakarta, and East Java, with quarterly time series data from 1987 to 2006.

ANALYSIS

The table analysis was employed to describe the impact of El Nino and La Nina on rainfall and maize production. The histogram was also formed to show the comparison of maize production in normal climate, El Nino, and La Nina.

The Ordinary Least Square regression function was run to analyze the El Nino and La Nina impact on maize supply. The maize supply function was developed using autoregressive model, which analyze in two kinds of model. Firstly, the dummy variable of El Nino and La

Nina occurance was included in the model to analyze its impact on maize supply. Secondly, the value of Southern Oscillation Index (SOI), as the El Nino and La Nina indicator, was included to analyze the elasticity or changing value of maize supply because of the both climate

anomalies. Autoregressive model was econometric model which included the time lag value of its dependent variable (Widarjono, 2005). The maize supply models were as followed:

$$lnQjg = \square_0 + \square_1 lnPjg_{t-4} + \square_2 lnPka_{t-1} + \square_3 lnLPjg + \square_4 lnUr + \square_5 lnUc + \square_6 Den + \square_7 Dln + \square_8 Qjg_{t-1} + e$$

$$lnQjg = \square_0 + \square_1 lnPjg_{t-4} + \square_2 lnPka_{t-1} + \square_3 lnLPjg + \square_4 lnUr + \square_5 lnUc + \square_6 IOS + \square_7 Qjg_{t-1} + e$$

Note:
Qjg = supply quantity of maize in farmer stage (ton)
Pjg_{t-4} = price of dried maize in farmer stage 4 quarters ago
(Rp/quintal) Pka_{t-1} = price of dried groundnut in farmer stage 1 quarter ago (Rp/quintal)
LPjg = harvested area of maize (hectare)

Ur = retail price of urea fertilizer in rural area
(Rp/kilogram) Uc = agricultural wage labor for
ploughing (Rp/day/person) SOI = value of Southern
Oscillation Index
D_{en} = dummy variable for El Nino occurance,
value 1 for El Nino climate condition and 0 for others
D_{ln} = dummy variable for La Nina occurance,
value 1 for La Nina climate condition and 0 for others
Qjg_{t-1} = supply quantity of maize in farmer stage 1 quarter ago (ton)
$\square_0$ = intercept
$\square_{1-8}$ = function coefficient
e = disturbance factor

The both models were tested using goodness of fit, F test, t test, and test for deviation classical asumption, i.e. multicolinearity, autocorrelation, and heteroscedasticity.

RESULTS AND DISCUSSION

El Nino and La Nina Impact on Rainfall and Maize Production

The occurance of El Nino and La Nina was related with the air pressure on equator zone of Pasific Ocean. These climate anomalies were observed by observing the air pressure between Darwin, Australia and Tahiti, French Polinesia. The air pressure diffence between those places was standardized and became indicator for El Nino and La Nina occureance, i.e. Southern Oscillation Index (SOI). The SOI value used in this paper was SOI which was published by National Weather Service of United States of America and ranging between -10 and +10. The SOI value less than -1 in 3 months consecutively indicated El Nino occurance, while SOI value more than +1 in 3 months consecutively indicated La Nina. Table 1 be low described the time and period of El Nino and La Nina climate anomaly in the period of 1987-2006.

Table 1. Time and Duration of El Nino and La Nina Occurance, 1987-2006

Climate Condition Incident	Month of	Duration (month)	Average Monthly Rainfall (mm)	Average of SOI Value
Normal 0,200	Average	10	137,8	-
El Nino 1,246	January 1987-January 1988	13	194,2	-
	March 1991-June 1992 1,394	16	146,4	-
	March 1993-October 1993 1,200	8	31,6	-
	April 1994-April 1995 1,154	13	101,1	-
	April 1997-April 1998 1,946	13	145,4	-
	May 2002-June 2003 0,879	14	116,1	-
	July 2004-February 2005 1,000	8	72,4	-
	August 2006-December 2006 0,880	5	44,5	-
	Average	**11**	**106,5**	-
		1,200 (decrease 22,74% below normal)		
La Nina	May 1988 - July 1989 1,153	15	181,3	
	July 1998 - April 2000	22 0,936	166,7	
	October 2000 - March 2001	6 1,133	224,2	
	Average	**14**	**190,7**	
			1,100 (increase 38,41% above normal)	

Source: Analysis of Secondary Data, 2008

Table 1 showed that there were 8 times of El Nino and 3 times of La Nina in the 20 years period of 1987-2006. The El Nino and La Nina duration were longer, that were 11 months for El Nino and 14 months for La Nina. The table also showed that rainfall in El Nino period was lower than normal and it was higher in La Nina period. The rainfall decreased 22.74% in El Nino period, but indrease 38.41% in La Nina period. According to the month of incident, the El Nino mostly occurred in rainy season, i.e. in the year 1987/1988, 1991/1992, 1994/1995, 1997/1998, 2002/2003, 2004/2005, and 2006, while La Nina in dry season.

Table 2 be low described the comparison of average maize production in normal, El Nino, and La Nina climate condition. Averagely, the El Nino and La Nina bothly decrease the maize productions,

which were 30.24% in El Nino period and 33.10% in La Nina period. Compared with paddy, maize production was more sensitive with climate anomaly (Utami et. al., 2008)

Table 2. Average Maize Production in Normal, El Nino, and La Nina Condition, 1987-2006

	Production average (ton) in climate condition:				
Period	**Normal**	**El Nino**	**Percentage Changing (%)**	**La Nina**	**Percentage Changing (%)**
Jan-Apr	3.062.185	2.530.631	-17,36	2.275.019	-25,71
May-Agt	1.648.519	1.136.534	-31,06	968.678	-41,24
Sep-Des	1.690.068	975.187	-42,30	1.143.251	-32,35
	Average		**-30,24**		**-33,10**

Source: Analysis of Secondary Data, 2008

The decreasing maize production in El Nino and La Nina related with the rainfall condition (Table 1). In 1987-2006, rainfall in El Nino period in November-December increased above normal. Besides, in the period of 1987-2006, there were two La Nina occured in dry season. The excessive water supply in dry season, which usually become maize planting season, caused the decreasing maize production.

Regression Analysis of Maize Supply Function

Results of regression analysis of the maize supply function was shown in Table 3 be low. The both model have high adjusted R^2, i.e 0.87. The F-test significance on □= 1% and the maize supply function free from multicolinearity, auticorrelation, and heteroscedasticity. The both model showed that maize supply was influenced by climate anomaly occurance.

Table 3. Regression Analyses of Maize Supply Function

	With dummy variable			**With SOI value**		
Independent Variable	**Coefficient**	**t-statistic**	**t-table**	**Coefficient**	**t-statistic**	**t-table**
Constant	2,24	0,83	1,28	3,95	1,37	1,28
Ln maize price (t-4)	0,71**	2,04	1,64	0,68*	1,90	1,28
Ln groundnut price (t-1)	-0,87***	-2,75	2,32	-0,88**	-2,58	1,64
Ln maize harvested area	0,79***	17,10	2,32	0,82***	19,61	2,32
Ln urea price	-0,45	-1,31	1,28	-0,35	-1,00	1,28
Ln ploughing wage	1,05***	2,86	2,32	0,70**	2,19	1,64
Maize supply (t-1)	0,35**	2,32	1,64	0,38**	2,29	1,64
Dummy El Nino	0,10	0,75	1,28			
Dummy La Nina	0,51***	2,85	2,32			
Southern Oscillation Index				0,06*	1,81	1,28
Adjusted R^2	0,87			0,87		
F statistic	209,97***			232,52***		
F table	2,41			2,51		

Source: Analysis of Secondary Data, 2008

Note: *) significance on □= 10%; **) significance on □= 5%; ***) significance on □= 1%

The t-test for independent variables showed that maize price 4 quarters ago, groundnut price 1 quarter ago, harvested area of maize, agricultural wage for ploughing, and maize supply 1 quarter ago influenced significantly on maize supply in Java Island. Dummy variable for La Nina occurance influenced significantly on maize supply, and so did the SOI value. Retail price of urea fertilizer and dummy variable of El Nino occurance didn't influenced the maize supply.

The maize price 4 quarters ago influenced positively on maize supply, that 1% increase on maize price 4 quarters (1.33 years) ago would increase maize supply 0.68%, vice versa. The higher maize price more than 1 year ago made the farmers decide to plant maize. This made the maize production increase, and so did its supply.

In the case of planting area, groundnut was considered as maize substitute plant because the both plants can be planted on the dry land. The groundnut price 1 quarter ago influenced negatively on maize supply, which was 1% increase in groundnut price would decrease the maize supply 0.87%, vice versa. The increasing groundnut price would attract farmers, so that they would more interested to plant groundnut. Thus, the maize production would decrease, and so did the maize supply.

The harvested area of maize influenced positively on maize supply in Java Island. The 1% more on harvested area of maize would increase maize supply 0.79%, vice versa. The wider harvested area usually followed with higher production quantity. Thus, the maize supply would also increase.

Agricultural wage for ploughing influenced positively on maize supply. Every 1% increasing on ploughing wage would increase the maize supply 0.70%, vice versa. The increasing in agricultural wage, especially ploughing, would make the farmers manage the maize farming in better way to get more yield. The higher production was expected would give higher income as the compensation for increasing in input cost. The better farming management after the increasing on ploughing wage would increase the maize production, and so did the maize supply.

The maize supply was influenced significantly by La Nina occurance, as shown by significant influence on dummy variable of La Nina occurance and SOI value. The positive sign of dummy variable meant that the La Nina occurance can increase the maize supply. Based on the elasticity value of SOI variable, the maize supply would increase 0.06 ton or 60 kilogram for every 1 point increasing on SOI value. The maize farming in Java Island usually planted on dry land area with insufficient water. The increasing rainfall in La Nina period can increase the water supply in maize planting area. Thus, the maize production increased and so did its supply, although only in slightly amount.

The maize supply 1 quarter ago influenced positively on maize supply, in which 1% decreasing on maize supply 1 quarter ago would decrease maize supply 0.35%, vice versa. This meant that the farmers decision to plant maize not only influenced by maize price, substitute plant price, input cost, harvested area, and climate condition, but also by maize supply 1 quarter ago.

CONCLUSIONS

El Nino and La Nina climate anomaly decreased the maize production quantity in Java Island in the period of 1987-2006. Production quantity determined supply quantity of maize in farmer stage. El Nino did not impacted on maize supply, while La Nina did. The maize supply in Java Island increased

when La Nina occured, i.e. maize supply will increase 60 ki lograms for every 1 point increasing in SOI value.

It was needed to improve the irrigation or drainage system in agricultural land, especially in dry land area for maize cultivation. This is because maize have more important role this recent year and La Nina climate anomaly positively impacted its supply. By better irrigation and drainage system in maize farming, it is expected that the La Nina will be usefull for maize production.

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THE CAPABILITIES OF *Fusarium* sp. F092 ON CHRYSENE AND CRUDE OIL DEGRADATION UNDER SALINE CONDITION

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ABSTRACT

Chrysene is low aqueous solubility and promote its accumulation in non-aqueous phase, as consequence become difficult for microbial degrader. As a polycyclic aromatic hydrocarbon (PAH), it is also an important compound consisting in crude oil. In this study, we focused on e valuating on chrysene and crude oil degradation by *Fusarium* sp. F092 under saline condition. *Fusarium* sp. F092, a fungus screened from nature, has abilities to growth on agar medium contaminated with chrysene and crude oil. In liquid medium, sea water salinity ($35^{o}/_{oo}$) has not significant effect on the ability of *Fusarium* sp. F092 in chrysene degradation. The degradation of chrysene was increased 0.03 and 2.1 fold high at agitated culture (80 rpm) and surfactant (1%), respectively. Furthermore, *Fusarium* sp. F092 degraded 77% total saturated and aromatic of crude oil at 60 days incubation. *Fusarium* sp. F092 also converts chrysene to became chrysene 1,2-oxide and chrysene *trans*-1,2-dihydrodiol. Chrysene *trans*-1,2-dihydrodiol be further converted to 1-hydroxy 2-naphtoic acid and next step to cathecol via salicylic acid.

Key words: Chrysene, Crude oil, Degradation, *Fusarium* sp. F092, synthetic sea water

1. INTRODUCTION

Petroleum and crude oil represent the single most common environmental contaminant. The spillage of crude oil can damage to the environment and the ecosystem. They contaminate from several accident such as offshore platform and drilling rigs and well accident, transportation accident, seepage and ruptured pipelines, and routine washings of the storage tanker (Chaineau et al., 2005; Tehrani et al., 2006; Elshafie et al., 2007; Hasanuzzaman et al., 2007) . Oil spill was estimated over of 42-100 million US gallons (Pidd, 2010) . These conditions will make serious damage to ecosystem. Crude oil contained saturated, aromatic, NSO and Asphaltene that potent to have carcinogenic and immunotoxic effect.

Polycyclic aromatic hydrocarbons (PAH) are one of the crude oil components and also formed by incomplete combustion of fossil fuels, coal gasification and liquefaction, incineration of industrial waste, wood treatment and preserve processes, accidental spillage of petroleum hydrocarbon, tobacco smoke, forest fire and farm debris fires (Johnsen et al., 2005; Wang et al., 1999). The environmental fate of PAHs mainly depends on the number of rings in the molecule and environmental factors such as pH, temperature and salinity (Kanaly and Harayama, 2000). PAHs are biodegraded by microorganisms present in soil, sewage and water. They have been found to have a variety of toxic, mutagenic, teratogenic, and carcinogenic on microorganisms. Chrysene is low aqueous solubility and promote its accumulation in non-aqueous phase, as consequence become difficult for microbial degrader.

The ability of microorganisms on degradation of PAHs has been reported

and also their biochemical pathway of biodegradation (Johnsen et al., 2005; Shuttleworth and Cerniglia, 1995). Several studies reported the mechanism of ring oxidation and also co-metabolism of PAHs (Juhasz et al., 1997; Gibson et al., 1975) and other studies reported that isolated microorganisms such as fungi and bacteria could use some PAHs as the sole carbon source (Kastner et al., 1994; Walter et al., 1991). PAHs and crude oil should be treated because of very harmful or toxic compounds. In this study, we will use biodegradation method to purify pollutant in the environment using fungus screened from nature. It has been shown to be a viable, relatively low cost, low-technology technique and widespread use (Bogan and Lamar, 1996; Kang and Oulman, 1996; Vidali, 2001). In this study, we focused on evaluating the ability of *Fusarium* sp. F092 in chrysene degradation under saline condition; to investigate the several treatments such as agitated culture, and addition of surfactant to enhance degradation rate; and to evaluate the ability of *Fussarium* sp. F092 in C heavy oil degradation also under saline condition.

2. Material and methods

2.1 Chemical. 2,4,8 TCDF (tetrafuran), 4-CB (chlorobiphenyl) were purchased from TCI. Co. Ltd (Osaka, Japan). Chrysene, agar, glucose, wakogel S-1 silica gel and other chemical were purchased from Wako. Co. Ltd (Osaka, Japan). Thin layer chromatography (TLC) aluminium sheet (silica gel 60 F254, 20x20 cm) were obtained from Merck (Darmstadt, Germany). Synthetic of sea water was obtained from Delphis (Osaka, Japan). C heavy oil was obtained from Taiyo Petroleum Co. Ltd (Japan).

2.2 Fungus strain and inoculum preparation. *Fusarium* sp. F092, isolated from soil, was used as fungus degrader in our studies. For preparation of the inoculums, fungus was grown on malt extract agar medium (malt extract 20 gl^{-1}, glucose 20 gl^{-1}, agar 20 gl^{-1}, polypeptone 1 gl^{-1}) at 25 $^{\circ}$C for several days and maintained at low temperature 4 $^{\circ}$C.

2.3 Culture preparation. Chrysene degradation: Liquid culture experiments were conducted in Erlenmeyer flasks containing of malt extract (ME) liquid medium. ME liquid medium was supplemented with 35 gl^{-1} of synthetic sea water. Medium was sterilized for 20 min at 121 $^{\circ}$C and then three 5 mm disk obtained by punching out from an actively growing fungus. After pre-incubating, each inoculated flasks were supplemented with 1 mM of chrysene and then incubated in the dark condition at 25 $^{\circ}$C. Control experiments have been performed on Erlenmeyer flasks only containing 20 ml of malt extract (ME) liquid medium containing 1 mM of chrysene without inoculated fungus. **Crude oil degradation:** The liquid culture experiments were conducted in Erlenmeyer flasks containing of potato glucose medium (PGM) with composition potato 500 g l^{-1}, glucose 20 g l^{-1}, yeast extract 5 g l^{-1} and added by sea water (35 g l^{-1} of synthetic sea powder in distilled water). The fixed concentration of C heavy oil dissolved with *n*-hexane was added in the culture. After the solvent evaporated and over night stand in a clean bench, three 5 mm disk actively growing fungus F092 in agar plate were inoculated into the Erlenmeyer culture. The culture was incubated for 15, 30 and 60 days in the dark condition at 25 $^{\circ}$C.

2.4 Analytical methods. Chrysene residues were quantified after fixed time (15 and 30 days). The culture flask was acidified with 5 ml 1 N HCl and added with 2,4,8 TCDF. The initial extraction was conducted by adding the culture with 50 ml of acetone and homogenized at 10000 rpm for 10 minutes. Samples were evaporated prior to extraction using ethyl acetate by funnel separation. Chrysene adsorbed in the mycelium was extracted with 300 ml ethyl acetate by using a soxhlet apparatus for 16 hours. Each extract were mixed and evaporated to

obtain concentrate extraction. It was added with 4-CB and purified on a chromatography column and then anthracene was added as internal standard followed with analyzed by gas chromatography coupled with mass spectrometer (GG-MS Shimadzu QP-5000). Percent recovery was calculated for chrysene, 2,4,8 TCDF and 4-CB by using standard curve. Total petroleum hydrocarbon concentration was determined by extraction and purification process using several solvent. The culture was extracted with *n*-hexane, dichloromethane (CH_2Cl_2) and chloroform ($CHCl_3$), respectively. The soluble combined and then separated into *n*-hexane insoluble and soluble fractions. The *n*-hexane insoluble fraction calls as asphaltenes and some organic compounds. The *n*-hexane soluble fraction was further separated to obtain aliphatic, aromatic and NSO fraction by purification process with *n*-hexane, toluene and combination $CHCl_3$ and methanol at ratio 1 : 1 (v/v). The aliphatic and aromatic fractions were analyzed by gas chromatography (GC Shimazdzu G-3000). Aliphatic compound of C heavy oil was analyzed by kovats retention index system (Jennings and Shibamoto, 1980). Pentadecane ($C_{15}H_{32}$) and hexadecane ($C_{16}H_{34}$) were subjected in the gas chromatography analysis. The kovats rentention index formulated was compared with reference in order to know a prediction of aliphatic structure.

3 Results

Fusarium sp. F092 was collected and isolated based on its abilities to grow on chrysene agar medium. The ability of *Fusarium* sp. F092 increased 20% on chrysene agar medium under saline condition (Fig 1). Furthermore, this fungus was also quantified to degrade chrysene in saline liquid medium. Fig. 2 showed that chrysene degradation was obtained at level 28% and 40% on 15 and 30 days, respectively. As the effect of sea water

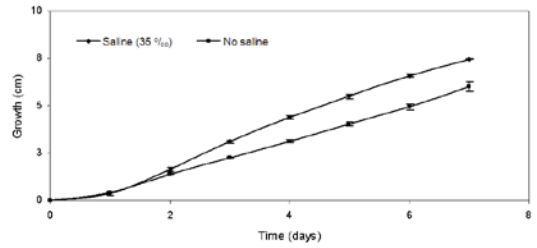

Fig. 1 The radial growth of *Fusarium* sp. F092 on agar medium containing chrysene (*n*=3)

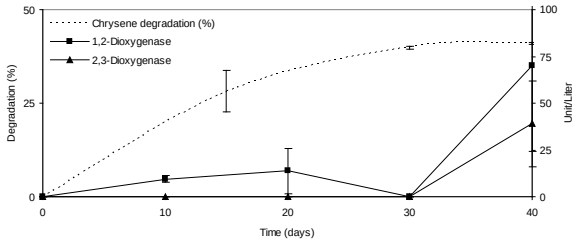

Fig. 2 Chrysene degradation, 1,2-dioxygenase, 2,3 dioxygenase activity (Ul^{-1}) in a liquid medium under saline condition

salinity ($35^{o}/_{oo}$), the ability of *Fusarium sp.* F092 on chrysene degradation was no significant decrease ($p < 0.05$) on 30 days if compared when this fungus incubated without addition of synthetic sea water (data no shown).

3.1 Effect of Tween80 on chrysene degradation

To investigate the influence of surfactant concentration on chrysene degradation, *Fusarium* sp. F092 was incubated in a liquid culture containing 1 mM chrysene and in the four surfactant concentration (Fig. 3). It showed sequentially increased significantly on chrysene degradation with increasing concentration of surfactant ($p < 0.05$). Furthermore, the chrysene degradation and the degradation throughout process were significant different ($p < 0.05$) among of all surfactants concentration tested. *Fusarium* sp. F092 degraded chrysene 22%, 40%, 59%, and 70% with surfactant concentration 0%, 0.25%, 0.5% and 1% for 30 days, respectively.

3.2 Effect of agitation on chrysene degradation

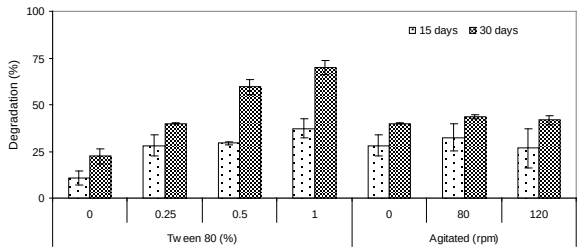

Fig. 3 Effect of Tween80 and agitation culture on chrysene degradation by *Fusarium* sp. F092

Chrysene degradation was measured during incubation of *Fusarium* sp. F092 on difference agitation rate at 0, 80 and 120 rpm. Chrysene degradation increased slightly and then decreased for all agitation rate tested (Fig. 3). Therefore, the chrysene degradation and the degradation throughout process were not significant different ($p > 0.05$) among the three agitation rate. The lowest rate degradation was obtained in non agitated culture and the highest rate degradation was observed in 80 r /min. The degradation decreased while the agitation rate was increased to 120 r/min.

3.3 Evaluation of C heavy oil degradation in liquid medium

The C heavy oil used in this research was composed of 44% aliphatic, 31% aromatic, 8% NSO and 17% of a hexane insoluble including asphaltene and organic compound. Aliphatic fraction was composed of liner aliphatic hydrocarbons (C_{13}-C_{27}), branch and cyclic aliphatic hydrocarbons. The degradation of total petroleum hydrocarbon (TPH), with initial concentration at 1000 ppm was observed 56 % and 77 % of aliphatic and aromatic degradation for 60 days incubation. Furthermore, NSO and asphaltene fraction were slightly degraded by *Fusarium* sp. F092.

Table 1 Degradation of aliphatic, aromatic, and total petroleum hydrocarbon (TPH) of C heavy oil by *Fusarium* sp. F092

Incubation time (days)	Degradation (%)			
	Aliphatic (I)	Aromatic (II)	Total (I + II)	TPH
15	66 ± 4	54 ± 1	60 ± 2	45 ± 1
30	61 ± 5	62 ± 2	61 ± 2	45 ± 2
60	72 ± 3	82 ± 1	77 ± 1	56 ± 1

4. Discussion

The effectiveness of bioremediation is dependent on the ability of the natural microflora to tolerate the level of salinity in the environment. Almost in biodegradation processes by microorganisms in saline condition was generally lacking or slow and large impact on cell growth, because disrupt cell membrane, denature some proteins, change osmotic force which any of these situation could be lethal (Woolard and Irvine, 1994; Kargi and Dincer, 2000). Both on 2 type medium, agar and liquid, showed that chrysene degradation rate was not influenced significantly ($p > 0.05$) by *Fusarium* sp. F092. These results had implicated that *Fusarium* sp. F092 resisted growth under saline condition and also capable to degrade chrysene (Fig. 1 and 2).

Chrysene is four fused benzene ring, low aqueous solubility (0.002 mg l^{-1}) and promote its accumulation in non-aqueous phase on environmental, as consequence, so difficult for microbial degrader (Juhasz and Naidu, 2000; Johnsen et al., 2005; Mulligan, 2005). The addition of 1% surfactant to the culture resulted in the best degradation rate, with increased 2.1 fold higher than those obtained without addition of surfactant. Tween80 are used for bioremediation application based on their abilities to decrease surface and interfacial tension and increase solubility (Christofi et al., 2002; Paria, 2008; Yoa et al., 2009). The solubility of chrysene increased and micellized chrysene increased bioavailability to microorganisms.

Agitation increased contacting area between cell, oxygen and substrate and facilitated interphase mass transfer of PAHs into aqueous phase. With the surfactant present, the iceberg structure is broken up or weakened during agitation process, as result it is easier for PAHs to be transported to the hydrophobic core (Yao et al., 2009). The decreasing of surface and interfacial tension and increasing solubility were thought to be main reason for facilitating the transport and degradation of hydrocarbon, as proven in our result showed in Fig. 3. The suitable agitated culture is important for ensuring good mixing, among nutrients supply required growth of microorganisms and facilitating mass transfer without shear stress on mycelia, as consequence degradation rate increased.

A proposed pathway that includes the ethyl acetate-extractable metabolites produced from chrysene by culture of *Fusarium* sp. F092 was investigated previously. Chrysene have converted by *Fusarium* sp. F092 to be formed chrysene 1,2-oxide and chrysene trans-1,2dihydrodiol. Furthermore, *Fusarium* sp. F092 attacked chrysene trans-1,2-dihydrodiol became 1-hydroxy 2-napthoic acid. Salicylic acid was further produced via the formation of cathecol after the aldose and hydroxylase reaction, tran-o-hydroxybenzylidenepyruvate (tHBPA) which next mineralized to carbon dioxide and water.

The degradation rate of aliphatic and aromatic fraction was observed on 77%. Other hand NSO and asphaltene fractions were slightly degraded by *Fusarium sp.* F092. The hexane insoluble fraction contained asphaltene and polar molecules have been shown to be partially or completely resistant to microbial assimilation and maximum degradation in optimal culture about 15-20% (Chaineau et al., 2005).

Microbial degradation of crude oil often occur by attack on alkanes or light aromatic fraction, while the high molecular weight aromatic, resin and asphaltene are considered recalcitrant (Lal and Khanna, 1996). It is often difficult to find organisms that will individually degrade all the faction of crude oil (Obayori et al., 2009). In nature, biodegradation of crude oil typically involves a succession of species within the consortia of microbes present (Venosa and Xueqing, 2003; Obayori et al., 2009). The biodegradation of alkanes was usually in the order linier>branched>cyclic indicated a preferential order in the assimilation of carbon sources (Chaineau et al., 2005). Alkanes in the C_{10}-C_{26} range are considered the most rapidly degradable components. The predominant mechanism of *n*-alkane degradation involves terminal oxidation to corresponding alcohol, aldehydes, or fatty acid functional groups. Branches alkanes are less rapidly degraded in comparison to *n*-alkanes (Venosa and Xueqing, 2003).

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SILVICULTURE OF COMMUNITY FOREST FOR ADAPTATION OF GLOBAL-ENVIRONMENT ISSUES: BETWEEN PRODUCTIVITY, CONSERVATION AND PEOPLE PROSPERITY

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ABSTRACT

The rate of forest degradation and number of people depend on forest resources in Indonesia will affect global livelihood. Java island has the biggest livelihood problem due to 69% of people are living in 6% of total Indonesia land area, where state forest only covers about 20%. This paper reviews technical options of community forest (CF, forest developed and owned by communities) for alleviating environmental issues. Development of CF in Java (constitute 50% of CF area in Indonesia) is promising for complementing the role of state forests. Javanese CF covered 651,204 ha in 2007, compared to degraded-state forest 1,767,304 ha; produced greater timber (e.g. teak 2-3 times greater, although with low quality) than state-forests, contributed up to 60% to farmers' income. However, CF management has changed plantation pattern with less number of tree species (i.e. teak, mahogany, albizia or *Acacia auriculiformis*), resulting tree domination to crops and threatening food production. Traditional *tebang butuh* selective cutting is questioned to sustain timber production because stand structure is dominated by medium-big tree size, and less seedling and soil-seed bank for regeneration source. Selective cutting at optimum age and dynamic tree-crop combination should be applied to replace *tebang butuh* system. Spatial arrangement, thinning (for productivity), pruning (for timber quality), and promotion of natural regeneration should be practiced to develop multi-strata CF ecosystems. Nevertheless, current observed carbon accounting data will be valuable if incentive scheme for carbon conservation is adopted for CF farmers.

Keywords: population growth, forest degradation, community forest, productivity, silvicultural solution, Java, Indonesia

BACKGROUND

Tropical forests of Indonesia are not only an important part for local livelihood, but also for regional and global interests especially in mitigating global warming in the near future. However, their significant role is experiencing serious problems. Though huge areas, counted for 120,35 million ha (Ministry of Forestry, 2009), their current status is so degraded due to deforestation, uncontrolled illegal logging, illegal mining, land occupation, and forest fire. Its deforestation rate is about 1 – 1,9 million ha per year during 2000 – 2005 (Ministry of Forestry, 2009). Moreover, the number of forest dependent people who live in forest areas is accounted for 40 – 65 million people, but if we calculate people that directly and indirectly depending on forest products and services the number will double (Fisher et al, 1997). Obviously, it is a huge number to potentially harm and threaten the forests more severely and in the end of the day environmental problem is still becoming problematic issues for the next decades.

Comparing to the other part of Indonesia archipelago, Java is the most threatened island especially regarding environmental and quality of life for people live in (Ref). The majority of Indonesian people (69%) live in only 6% of Indonesia areas (Statistic Bureau of Indonesia, 2009). Consequently, forest areas in Java are less than 30% after long exploitation since colonial era and developing plantation estate for agricultural products in mid nineteen century (Simon, 2000). This small area is not the real number because many part of the areas has already degraded, plantation forest failure has occurred repeatedly (Simon, 2000).

On the other hand, forests cultivated in the private land have grown considerably and managed individually as tree farming in the hilly and dry land due to government policy, market, and infrastructure development (Fillius, 1997). The role of community forests to fuelwood consumption has recognized since 1976 (Simon, 2010) as well as other function such as to support life system and environmental sustainability. Despite their significant roles, some technical and managerial problems require solutions, such as how to improve the productivity or traditional management system of community forests. This paper aims to analyze the development of community forests in Java and their role to complement and support forest functions, and the opportunity to induce community forests more sustainable by interfering with silviculture technique.

Population growth and forest degradation in Indonesia

Forest degradation in Indonesia cannot be separated with the development of population growth rate that is 2% per year causing decrease in land carrying capacity to support quality of life (Simon, 2000). Unequal distribution of Indonesian people, concentrated only in Java Island (Figure 1), has also brought about environmental degradation more severe especially in the very densely populated areas. With the population density reaching up to 1000/km^2 and the high population growth rate (1,58% per year), Java island is becoming vulnerable areas due to human needs. It is a relevant issue to conclude that discussing environmental problems should take into account the forest degradation and the population increase in the context of Java Island.

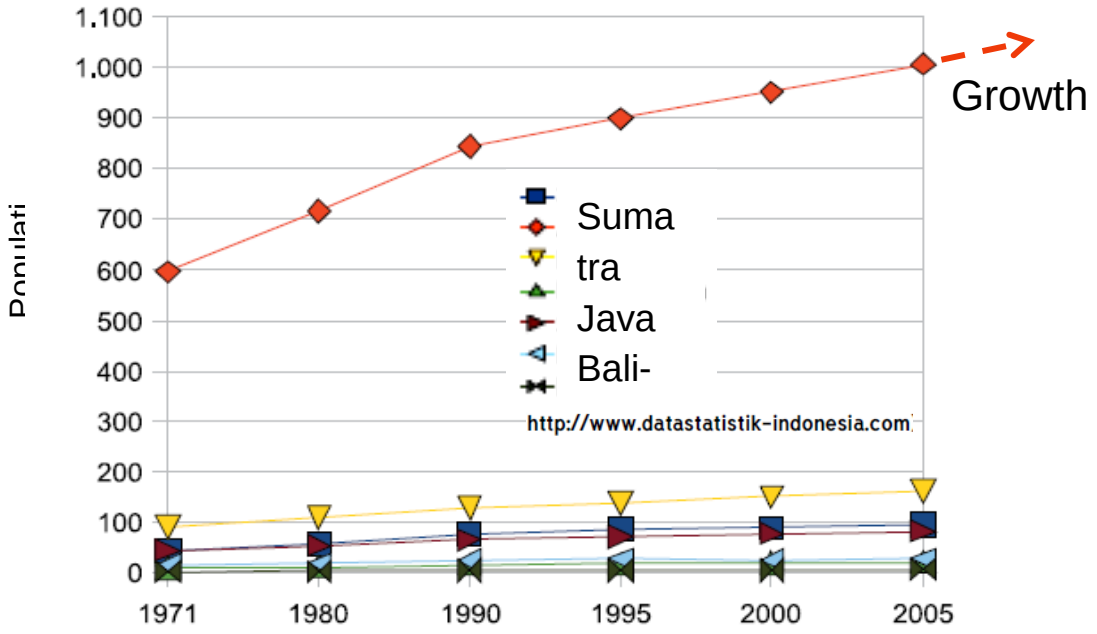

Figure 1. Population distribution and growth rate in main islands in Indonesia, with distinguishable condition number of people per unit area in Java Island (Statistical Bureau of Indonesia, 2009)

Beside, vegetation covers in the big islands of Indonesia have decreased especially when forest concessionaries had been introduced since 1970s. In Java, vegetation covers decreased under the national average rate compared to year 1950s. The awareness to recover land degradation occurred in 1970s with the regreening program induced by government policy in the new order regime. Gradually, the program has evolved outside degraded state forest land including in private land. Nowadays, this forested land is called community forests (Figure 2) (MoF, 2009).

According to Ministry of Environmental (MoE, 2009) state forest in Java covers only 7% of total Java island. The remaining areas of state forests are still degraded, bare, and without trees. It totally differs from other island outside Java, so that this problem requires different approach to handle, as well as how to deal with social economic problems. Different data of forest cover are shown by Ministry of Forestry. It is stated that forest areas in Java still 19,4% of total island (MoF, 2009). Both data are not contradictory since MoF data refers to legal status of forest area, while MoE bases on vegetation cover of state forests. Therefore, based on the practical use, vegetation cover is more relevant and important information in which the actual un-forested areas are known, than only legal status of forest areas.

Community forest development in Java

Regarding with the importance of community forests in high populated island of Java, ecologist and social scientists strongly emphasized the development of community forest for complementing function of state forest. On Ministry of Forestry (MoF) data (2008) 50% of community forests area in Indonesia has established in Java. Most of Javanese farmers take optimizing small land area with woody trees establishing such a forest-like ecosystem into account, like dry land and home garden (Budiadi, 2008).

Various data showed the high rate of adoptability of community forest to Javanese farmers in the two decades, increasing from 1.67 Million ha (1995), to 1.87 million ha (1997) and reaching 2.52 million ha (2008) (Poffenberger 2006; MoF, 2008). In productivity point of view, Javanese community forest contributed to significant amount of farmer's income (Cahyono et al. 2002; Riva 1997; Darusman and Harjanto 2006; Sitanggang 2009; Hardjanto 2001). Community forest in Java produced significant volume of timber higher than state forest, e.g. in Central Java timber production was recorded more than 15 million m3 in 2008, where more than 90% produced from community forest (MoF, 2009).

Regarding with vast adoptability of community forest and land cover, to solve the environmental and people prosperity problems in Java will be strongly relied on community forest. In the view of land cover, forested area both in state- and community-forest in 2007 has been approached more than 30% of total Java island (data analyzed from Poffenberger 2006; MoF 2008) (Figure 3). It is, therefore, community forest in Java which plays important role for environment stability, timber supply and people prosperity, needs special concern and management.

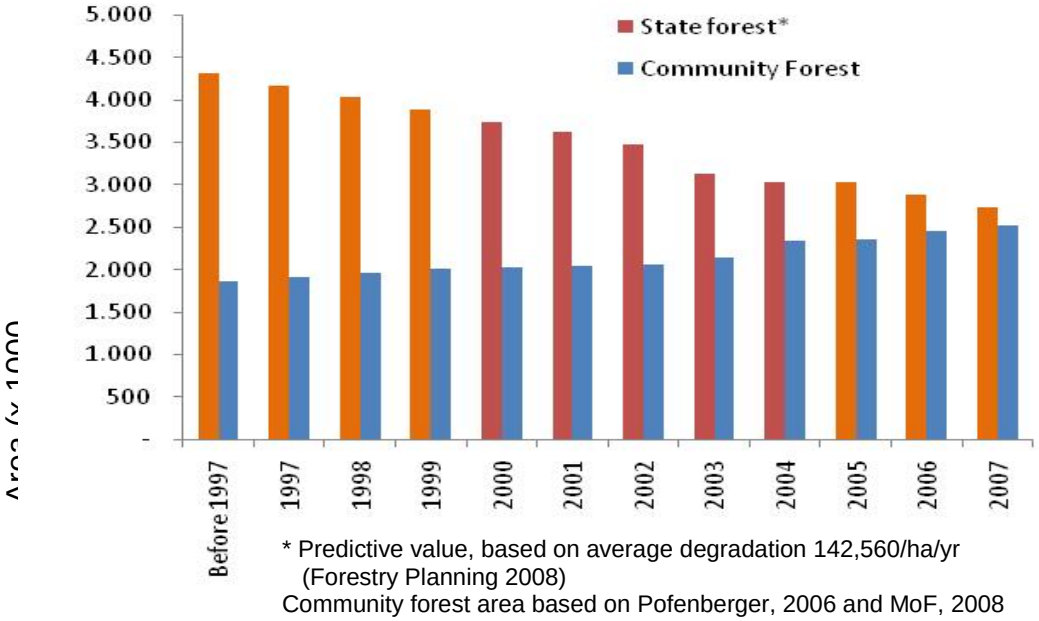

Figure 3. Development of community-forest area for complementing state-forest area in Indonesia

Several researches on community forests have been established by various scholar and stakeholders. Paying attention on the research related to the potential role of community forests has commenced since the late 1970s, just after 1 – 2 decades of regreening program by government. It was stated that based on the fueldwood consumption report in Java and Bali regions, the potential role of community forest providing fuelwood accounted for 63%. The remaining came from state forests (Simon and Fanani, 1978). The research had continued to understanding the typology of community forests that can be determined to be three classifications based on type of tree plantation: fully planted trees, tree borders, and alley cropping. Based on t he land accessibility, community forests can be classified to be homegarden (*kitren*), tree farming in the dry land (*tegalan*) and forests (wana, located outside the settlement and tree farming) (Simon, 2010).

In the next two decades, research and development of community forests has more scientific influences especially as an alternative strategy of forest management than state forest management by professional foresters (Fisher et al, 1997). One important of the sustainable forest management is how secure community forests in term of land tenure recognition by multi stakeholder. Then the development of community forest management units becomes important issues in the establishment of community forests compare to the failure of state forest management, beside social economic and marketing aspect of community forest products (Awang, et al, 2002). It is also oriented to being more communal action than individual management when CF management unit has been established, for example by introducing institutional cooperatives (Awang et al, 2007).

In 2005 onward, the development of community forests has been recognized by international market through forest certification of small scale forest management scheme using LEI and FSC criteria and indicator of SFM. It has aimed to improve livelihood forest farmers and the sustainability of CF. Research in CF then is more to know the impact of forest certification on livelihood improvement and sustainability of forest resources

(Rohman, 2010). Furthermore, the research has also been orientated to solve some technical problems encountered by traditional community forests farmers and the role of global climate change problems especially related to community carbon accounting.

Regardless high adoptability of community forest in Java, the development of community forest in Java has several weaknesses that scientifically should be taken into account. Traditional and individual management, and less scientific intervention, especially silvicultural improvement, are of the most weaknesses in Javanese community forest management that affecting low productivity and timber quality. Possible impose of traditional community forest management are (Figure 4):

1. Farmers are affected by timber market, that stably increase, resulting domination of wood on seasonal crops. Farmers converted seasonal crop farm to woodlots, affecting less food production and food severity. Most of woodlots are planted in monoculture system with less ecological function.
2. Low competency in wood silvics and physiology affecting less concern on tree to tree competition. Farmer concerns on agronomy but less educated on silviculture, and producing less timber productivity.
3. Seasonal cropping season is changed to long-term farming system, and therefore, short-term income will be affected, although timber end-value will be potentially higher.

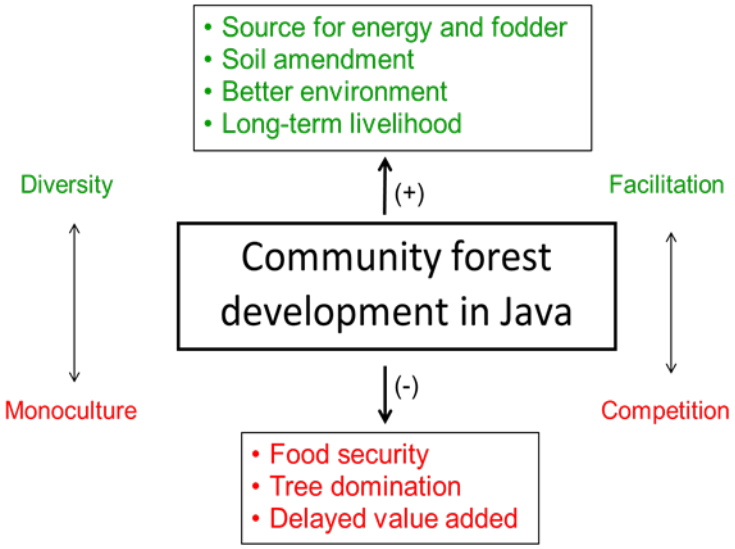

Figure 4. Positive and negative impacts of community-forest development in Java

Problems on Traditional Community Forest Management

1. Traditional tebang butuh system in community forest management is a cutting system applied to individual tree of under or over optimum ages (Figure 5). The system produced low quality timber, less value added to farmer and unsecure to environment.

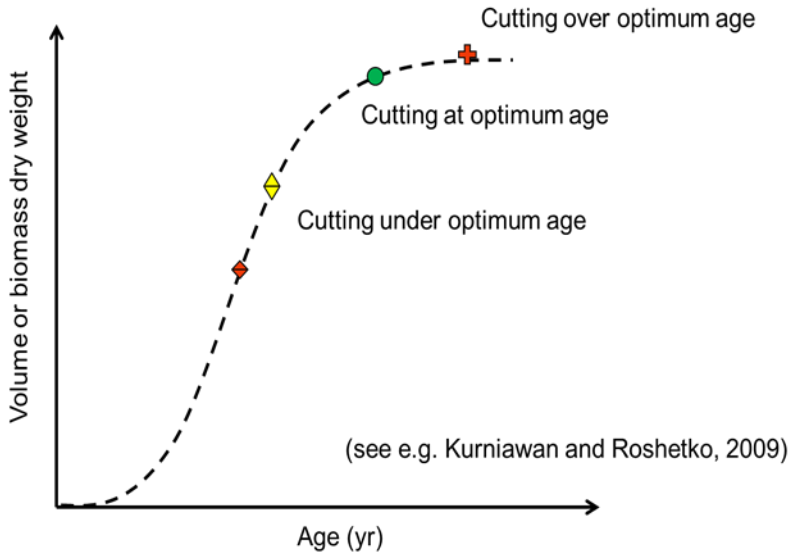

Figure 5. Curve of tree growth and tebang butuh selective cutting in community forests in Java

2. Patchiness is a special characteristics of community forest or agroforest management (Nair 1993), which each farmer practices different low standardized tradition and technique. Community forests are practiced in diverse area and varies plantation pattern namely pekarangan/home garden, tegalan/dry land and alas/forest.
3. Traditional silvicultural technique affecting:
   a. Abnormal stand structure (reflecting J type), no management on regeneration and improvement (Budiadi 2008)
   b. Low productivity due to no thinning practiced and spatial arrangement
   c. Low quality timber due to no individual tree treatment such as pruning
   d. Low sustainability, that affected by no biomass and nutrition management (Utomo, 2008; Hartanto 2008; Budiadi 2010)

Solution and Silvicultural Recommendation in Community Forest Management

Possible silvicultural techniques in community forest should be lead to 5 (five) recommended areas:

1. Improvement of stand structure, for converting J type to L type, which the stands are dominated by young trees and less dominated by old trees
2. Improvement of high quality regeneration will secure future stand production
3. Dynamic plantation pattern, changing from irregular trees-along border and random mixture to alternate rows with regular initial spacing (Budiadi 2008)
4. Application of selective cutting system to mature trees, to ensure regeneration and spatial arrangement, resulting high diversity and multi-stratum stands
5. Biomass and nutrition management, through pruning-lopping and improve resources sharing

Silvicultural application will be ensure production sustainability in future stands, and improve environmental services if the community forests are integrally managed by group of communities. Integrated community forest management has been initiated in the last few years to alleviate the weaknesses of traditional community forest management (Bao Huy 2006) with special interest to establish micro-economy institution in

Gunung Kidul district to reduce negative impacts of tebang butuh cutting system (Rohadi…). Nevertheless, economic and ecological value can be increased if incentive mechanism for farmers on water catch and carbon sequestration is implemented in future community forest management in Java.

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DESIGN OF A SUSTAINABLE GREENHOUSE STRUCTURE FOR THE TROPICAL REGIONS: APPLYING COMPUTATIONAL FLUID DYNAMICS METHODS

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ABSTRACT

In the future, greenhouses in Indonesia will be used not only in vegetable and ornamental crop production but also in the production of plant seedlings, either from seed or through tissue culture procedures. Specific structure should be designed according to its humid tropical climate. The purpose of this project is to simulate the existing greenhouse at Bogor Agricultural University using Computational Fluid Dynamics (CFD) methods in order to investigate the greenhouse environment and identify necessary design considerations for an environmentally and economically sustainable greenhouse for the humid tropics. The CFD model predicted temperature and airflow distributions of the greenhouse. The visual representations of the airflow distributions in the greenhouse were created via contours and presented.

Keywords: airflow, CFD, design, greenhouse, simulation, temperature, tropics

INTRODUCTION

The growing of plants in greenhouses is essentially subtropics phenomenon. It is not, however, a new phenomenon in the tropics. Greenhouses have in recent years become widely used for crop production in tropical countries such as Indonesia whether for vegetables, fruit or ornamentals. In the future, greenhouses in Indonesia will be used not only in vegetable and ornamental crop production but also in the production of plant seedlings, either from seed or through tissue culture procedures.

For that reason, adapted structures for Indonesia are needed. The temperate greenhouses i.e. quonset or tunnel type structure and glass-covered greenhouse are not suitable for the region since they resulted in high in-house temperature causing plant stress that eventually reduced the crop yield. Otherwise, active control like exhaust fans and fogging system had to be used to maintain the desired temperature and humidity which resulted in high operational cost (Suhardiyanto and Romdhonah, 2007).

Several tropical greenhouse structures have been proposed (Campen, 2005; Kamaruddin *et al*., 2006; Harmanto *et al*., 2006; Impron *et al*., 2007). There is always space for improvement to provide the optimum environment for the plants inside the greenhouse. This effort can be best done using computational fluid dynamics (CFD). CFD is an advanced technique for design in engineering. CFD has been used for closed greenhouses (Boulard et al 1999) and for greenhouses with natural ventilation (Mistriotis *et al*., 1997, Karcia *et al* 1998; Lee and Short,

2000; Lee *at al*., 2000; Barzanas *et al*, 2001; Pontikakos *et al* 2006). With CFD simulation, it is possible to predict the inside air temperature and to see the air flow before the greenhouses are built (Reichratch *et al*., 2002; Pontikakos *et al*., 2005).

The aim of this study was to simulate the existing greenhouse at Bogor Agricultural University using Computational Fluid Dynamics (CFD) methods in order to investigate the greenhouse environment and analyze the components necessary to create a sustainable greenhouse, in terms of optimum greenhouse environmental condition at a low operational cost, for the humid tropical regions like Indonesia. The commercially available CFD code Solidworks® was used for the simulation of a standard peak greenhouse design. The simulation will give understanding on the mechanism of greenhouses structures reacts to the surrounding environment.

MATERIAL AND METHODS

Experimental Field

The measurements were conducted in February 2010 in an empty standard peak type greenhouse with roof and sidewall ventilation covered with wire screen (porosity 0.64) located at IPB university farm, Indonesia. The E-W oriented greenhouse was a 150 m^2 single-span greenhouse (width, 8 m; length, 18.75 m; ridge height, 7 m; eaves height, 4.130 m), covered with a 0.8-mm thick polycarbonate Solar Tuff®. Parameters measured were macro and micro climate of the greenhouse. Air temperature, relative humidity, wind speed and its direction, solar radiation, and precipitation were measured using weather station and its console, while roof temperature, inside air temperature, side wall temperature, floor temperature, relative humidity of the greenhouse were measured with thermocouples and a data logger. These experimental data were used not only to provide input data for the model, but also for its validation.

Greenhouse Simulation Model

The geometry of the greenhouse was built in Solidworks® Office Premium 2010 x64 edition (Serial No. 9000 0078 3094 0176 64N 9 XP9B) and the greenhouse environment was simulated in its Flow Simulation 2010 SP4.0 Build: 1299. The program uses the finite volume method to numerically solve the Navier–Stokes equations, i.e., the mass, energy and momentum balances, permitting the calculation of air velocity and temperature fields.

A three dimension simulation model was created for the experimental greenhouse. The computational domain for the greenhouse model was created with the following dimensions: five times the length of the greenhouse in the windward and leeward directions, and also five times the height of the ridge, ensuring that the domain boundaries had a negligible effect on the flow in the vicinity of the greenhouse (Richards P J; Hoxey R P., 1992).

The size of the model was significantly limited by the available computer memory and processor speed. In this research the computer used was a PC with Intel ® Core ™ i7 CPU; 8GB RAM; and 64-bit Operating system. In the simulations, two common net porosity cases were investigated. For the boundary conditions, floor and the roof were set as real wall with temperatures as in Table 1. The simulations were conducted only for low wind speed as to investigate the effect of thermal and wind forces ventilation on the greenhouse microclimate. Internal analysis was chosen for the flow simulation. Table 1 gives all input data for the simulations.

Table 1. Input data for the simulations

CASE	Input Data		
	Initial Conditions	**Boundary Conditions**	**Porous Medium**
1	Wind speed 0.4 m/s Outside air temperature 32.4°C Relative Humidity 68 % Solar Radiation 1002 W/m^2	Floor temperature 42.5°C South Roof temperature 34.82°C North roof temperature 38.36°C	Wall and roof ventilation as porous medium covered with wire screen (porosity 0.64)
2	Wind speed 0.4 m/s Outside air temperature 32.4°C Relative Humidity 68 % Solar Radiation 1002 W/m^2	Floor temperature 42.5°C South Roof temperature 34.82°C North roof temperature 38.36°C	Wall and roof ventilation as porous medium covered anti greenhouse whitefly (mesh 58; porosity 0.44)

RESULTS AND DISCUSSIONS

The Existing Greenhouse Environment

The experimental greenhouse was a typical tropical greenhouse with roof and side walls ventilations covered with wire screen with 0.64 porosity. Figure 1 shows the geometry and computational domain of the greenhouse model. Distribution of inside air temperature and the airflow were given in Figure 2 and Figure 3.

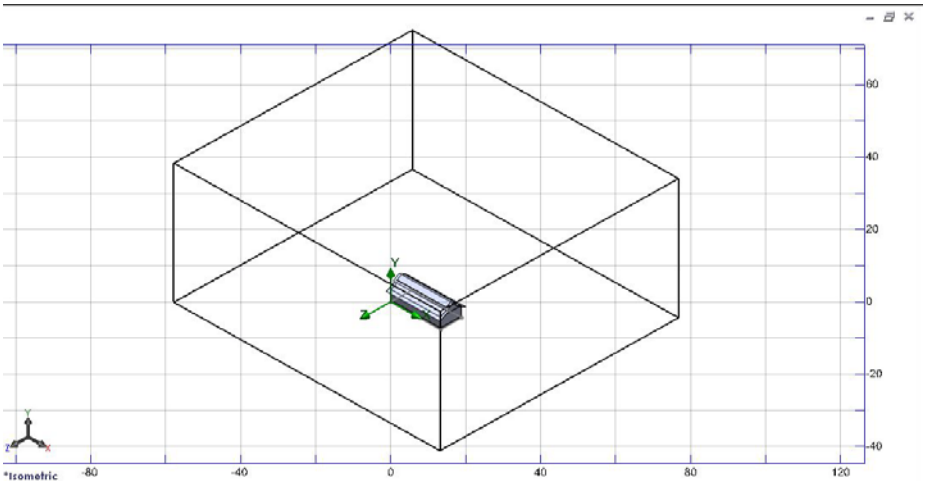

Figure 1. Greenhouse geometry and computational domain for the flow simulation.

Figure 2 shows that there was no significant distribution of temperature inside the greenhouse when external wind speed was low (0.4 m/s). However, according to experimental measurements, air temperature inside the greenhouse had maximum values of 36.95°C near the roof openings (*x=3 m*, *y*=5 m, z=-4 m) and near the floor, whereas at y=1 m, the temperature was 33.00°C. The greenhouse temperature was lower near the wall openings and almost no differences with the outside at the windward. This was because fresh air from outside entered the

greenhouse through wall and ridge openings at windward (Figure 3) and out from leeward openings. The air entered the greenhouse (x=0m) with a t emperature similar to the outside one and left (x=-8 m) 2 °C warmer.

The combined openings i.e wall and ridge openings, had significant effect to the greenhouse climate when external wind speed was low.

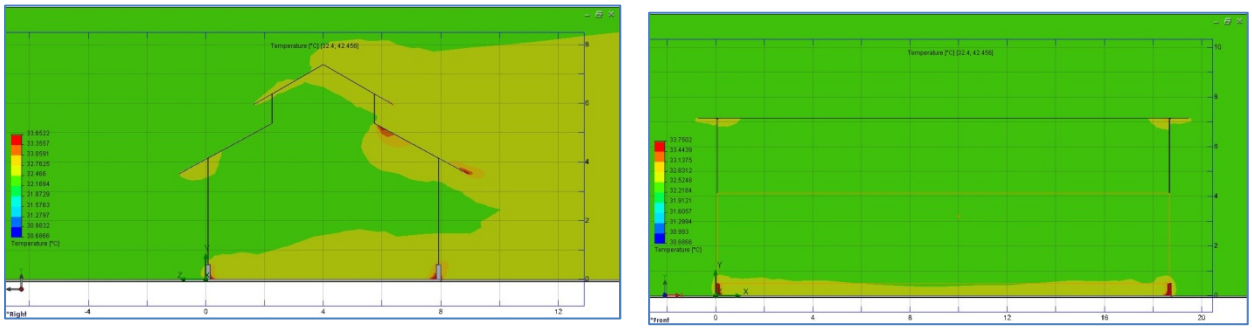

Figure 2. Temperature distribution of the experimental greenhouse at low wind speed.

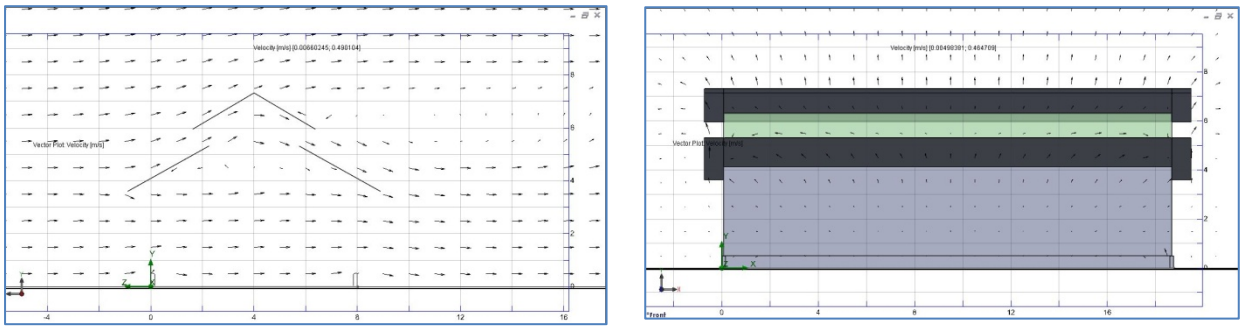

Figure 3. Airflow of the experimental greenhouse at low wind speed

Validation of the CFD Model

Validation of the CFD model was conducted by comparing the simulated temperature and the measure ones (Table 2). Validation was made to 8 point goals located inside the greenhouse. Maximum error of 12.25% was achieved. It showed that the simulated values of inside air temperature had a fine agreement with the experimental data. Therefore, this model can be used for temperature prediction of the greenhouse using different screen porosity.

Predicted Greenhouse Environment at Low Wind Speed

The validated CFD model was used to predict the inside air temperature of the greenhouse with less porous screen (0.44). This screen was chosen since it is usually used as anti greenhouse whitefly screen. For this case, air temperature was predicted higher 1 (Figure 4). The air temperature in the middle of the greenhouse was much higher than any other places in the greenhouse. The air flow vectors inside the greenhouse was presented in Figure 5. Where there was no screen in the openings the inside air temperature was almost equal to the outside (Figure 4).

Table 2. Simulated and measured air temperature difference.

Case	Point			Temperature		
	x [m]	y [m]	z [m]	Simulated [°C]	Measured [°C]	Error (%)
WS=0.4	3	1	0	32.41	31.60	-2.55
porosity 0.64	3	1	-4	32.50	33.00	1.51
	3	1	-8	32.65	34.76	6.09
	3	5	-4	32.43	36.95	12.25
	15.75	1	0	32.41	32.10	-0.96
	15.75	1	-4	32.50	32.30	-0.63
	15.75	1	-8	32.66	32.70	0.11
	15.75	5	-4	32.43	33.60	3.49

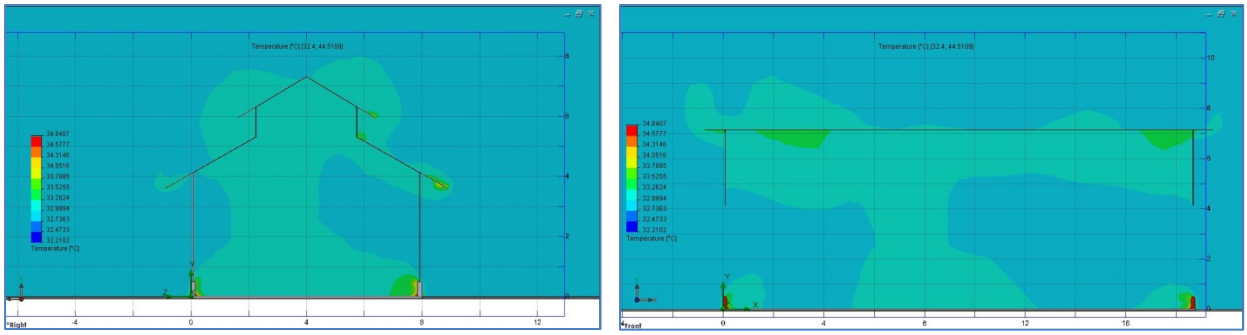

Figure 4. Temperature distribution of the experimental greenhouse at low wind speed with less porous screen.

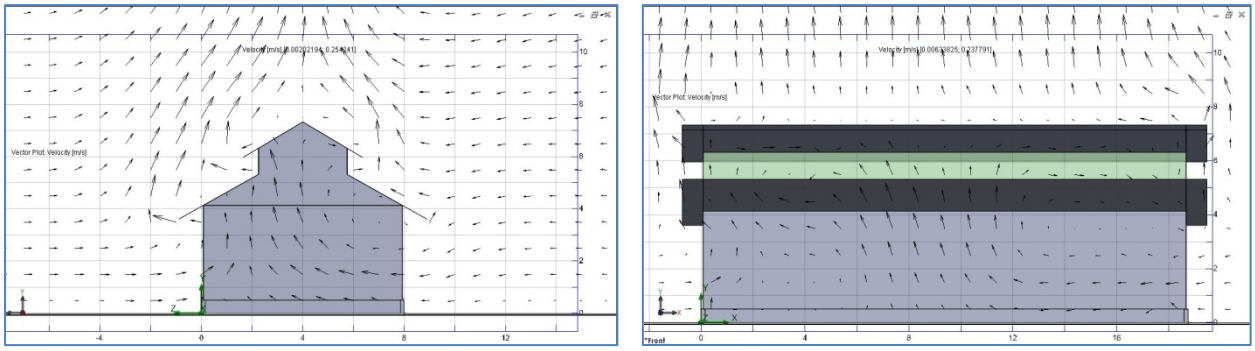

Figure 5. Airflow of the experimental greenhouse at low wind speed with less porous creen.

CONCLUSIONS

The CFD simulation was able to predict the greenhouse temperature and show temperature distribution inside. Simulations with the less (0.44) porosity anti-insect screen showed that it reduced ventilation airflows and raised air temperature. Screen porosity should be made into consideration when designing a greenhouse that applying natural ventilation.

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THERMAL DECOMPOSITION OF VOCs CATALYZED BY OXIDES-ZEOLITES NANOCOMPOSITES SYNTHESIZED FROM INDUSTRIAL BY-PRODUCTS

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ABSTRACT

Volatile organic compounds (VOCs) such as toluene, xylene, formaldehyde and acetaldehyde are toxic, and cause degradation of housing environment and building syndrome for human beings. Acetaldehyde and formaldehyde are effectively adsorbed by faujasite, zeolite-A and so on. However, VOCs with benzene ring in their structure such as toluene are hardly adsorbed onto these zeolites with high cation exchange capacity and low Si/Al ratio. The purpose of this study was to find effective materials for adsorption and decomposition of VOCs, especially those with benzene ring structure.

We have succeeded to synthesize ZSM-11, zeolite with high Si/Al ratio, from by- product of optical fiber as a raw material. CeO_2–ZSM-11 nanocomposite was also synthesized by adding CeO_2 during the synthesis process of ZSM-11. The synthesis products were applied for adsorption and thermal decomposition of toluene. Both ZSM-11 zeolite and the CeO_2-ZSM-11 nanocomposites had high capacity for toluene adsorption. The simple reason is that both the adsorbent (ZSM-11) and the adsorbate (toluene) are hydrophobic in nature. Furthermore, the nanocomposites decreased combustion temperature of toluene from 342 °C for ZSM-11 to 298 °C for CeO_2-ZSM11 nanocomposite. The decrease in the decomposition temperature of toluene was due to CeO_2 which acted as thermal catalysis during combustion process. By this manner, adsorbed toluene can be effectively removed by thermal decomposition, and be reused again for toluene adsorption.

Key words: VOCs, ZSM-11, thermal decomposition

BACKGROUND

Recently pollution of VOCs (volatile organic compounds) in housing environment becomes serious problem around the world. VOCs are defined as chemical organic compounds that have enough vapor pressure under normal condition to significantly vaporize and enter the atmosphere. VOCs are toxic compound for human bodies which cause symptoms called sick house syndrome. Some examples of VOCs are formaldehyde, acetaldehyde, ethyl and propyl alcohols, and toluene. Toluene is one of the dangerous VOCs, that is discharged from painting and printing industries in high concentration.

Some study concerning adsorption and decomposition of acetaldehyde and formaldehyde by adsorption and TiO_2-phocatalytic decomposition have been done (Johan et al., 2006, Ichiura et. al, 2002). Acetaldehyde and formaldehyde are easily adsorbed on common zeolites, such as zeolite-A or Na-X. However, toluene and xylene, VOCs with benzene ring in their structure, are hardly adsorbed on these zeolites with low Si/Al ratio. Our preliminary study indicated that ZSM-11, a high silica zeolite had high capacity for toluene adsorption.

On the other hand, many industries discharge by-products difficult to burry. For example fiber glass industry discharge by-product with high silica content. Fiber glass is made from quartz glass, and during manufacturing of the quartz glass, about 40% of SiO_2 is flied on the air and remains as by-product. For simplicity, the by-product is called soot, and the soot contains more than 98% of SiO_2. In the present study we synthesized ZSM-11 zeolite from soot, with and without the addition of cerium oxide (CeO_2). The oxide was chosen because it has catalytic combustion property. The synthesized products were characterized by XRD, SEM and FTIR, and were subjected for adsorption and thermal combustion experiments of toluene. Here, Toluene gas represents one of VOCs containing benzene ring with hydrophobic in nature, that is hardly adsorbed onto common zeolites such as phillipsite, zeolite-A, or natural zeolite.

MATERIALS AND METHODS

ZSM-11 was synthesized from soot with and without the addition of CeO_2. Soot was firstly ground and sieved with 20 meshes. Molar ratio of starting materials for ZSM-11 was described as follow: SiO_2: Al_2O_3: NaOH: TBABr (tetra n-propyl ammonium bromide) : H_2O = 1: 0.008: 0.04: 0.1: 40. Sodium aluminate ($NaAlO_2$) was purchased from Nacalay tesque and was used as an aluminum source. NaOH was purchased from Nacalay tesque, and TBaBr was purchased from Kanto Chemical Co., Inc. Six grams of soot as a silicon source was mixed with other reagents and was stirred for 15 minutes. The mixture was then

transferred into stainless steel autoclave, followed by heating reaction in an oven at 170 °C for 72 h. Reaction product was washed with pure water and was dried at 100 °C, followed by calcination at 450 °C for 3h to remove the organic template (TBABr). Similar experiments were done in the synthesis of CeO_2-ZSM11 nanocomposite, but 0.3 g of CeO_2 was added during the synthesis process. The obtained products were subjected for characterization by powder XRD with Cu-KH radiation (Rigaku Ultima IV X-ray Diffractometer), SEM (Hitachi High Technology S-8000), and FTIR (Jasco FT/IR-4100).

Adsorption and thermal decomposition of toluene was done on three samples, namely ZSM-11 (blank), CeO_2-ZSM-11 nanocomposite, and mixture of CeO_2 and ZSM-11. About 0.1 gram of sample was mounted on a glass slide, and put in a 200 mL reaction chamber. Toluene gas was introduced into reaction chamber so as to give initial toluene concentration of 180 ppm. Decrease in toluene concentration was monitored every 20 minutes for 90 minutes, by using gas chromatography (Shimadzu Gas Chromatograph GC-14A with FID detector). Thermal decomposition experiment was carried out by putting 0.1 g of samples on a watch glass, and then two drops of toluene was added, and stand for 30 minutes to allow evaporation of excess of toluene. The samples were then subjected for TG-DTA measurement from 20 °C - 800 °C with heating rate of 20 °C/minute. Appearance of exothermic peaks was considered as thermal combustion of toluene.

RESULTS AND DISCUSSION

Chemical composition of soot is shown in Table 1. The high SiO_2 content of soot is favorable to synthesize high-silica ZSM-11. Figure 1 shows X-ray diffraction patterns of soot, and synthesized products. Raw material (soot) showed broad peak only at d space of 3.98Å, indicating that the material is amorphous. The synthesized products (a, b, c) showed strong peaks at 11.18 Å, 10.06 Å, 3.84 Å, 3.72 Å, 2.98 Å and 2.01 Å, indicating the presence of ZSM-11. The CeO_2-ZSM-11 nanocomposite and mixture of CeO_2 and ZSM-11 also showed peaks of CeO2, in addition to those of ZSM-11. These data proved that ZSM-11 is successfully synthesized from soot, an industrial by-product.

Figure 2 show SEM (scanning electron microscopy) of soot, ZSM-11 and CeO2-ZSM-11 nanocomposite. The figures show that soot has small particle of 0.07μm that is combined into aggregate with diameter from 18μm to 27μm. On the other hand, ZSM-11 has spherical shape of 1.9μm in size. This feature is similar with the observations of Gonzalez et al. (2009). Furthermore, by adding CeO_2 during synthesis, the particle size became larger (14.5 μm in diameter) with CeO_2 particle on its

surface (Figure 3), this may be due to the effect of nanocomposition, where the presence of CeO2 o xide increased the particle size of ZSM-11.

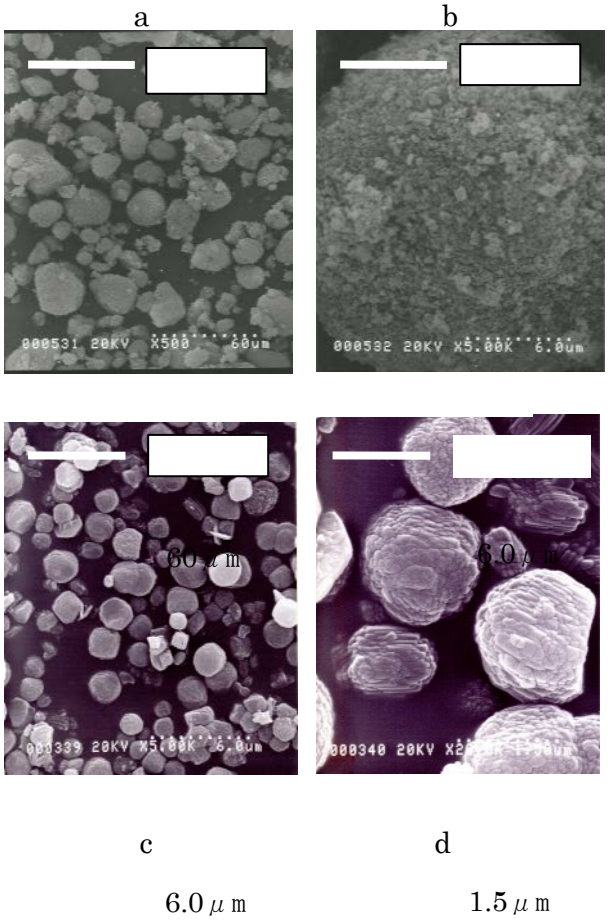

Fig. 2 SEM imagines of raw material and synthesized

Table 1. Chemical composition of soot

	Mass (%)
SiO_2	98.00
Fe_2O_3	0.11
P_2O_5	0.59
CaO	0.17
MgO	0.01

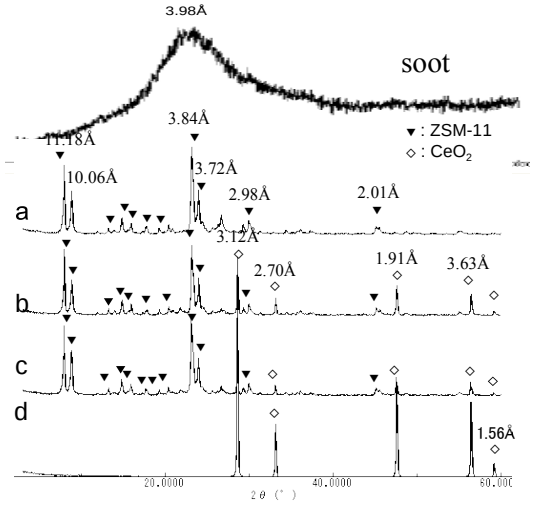

Fig. 1 XRD patterns of soot and synthesized product:

a: ZSM-11, b: CeO2-ZSM-11 nanocomposite, c: CeO2-ZSM-11 mixture, d: CeO2

Figure 4 pr esents adsorption of toluene on the synthesis products (decrease in toluene concentration with time). Toluene concentration decreased drastically f rom 180 p pm to 3 0 p pm during first 10 minutes, then gradually decreased up to 0 ppm for ZSM-11 and 5 ppm for CeO2-ZSM-11 nanocomposite. This indicates that ZSM-11 and its nanocomposite have high capacity for toluene a dsorption. T he adsorption capacity was even greater than ZSM-5, another family of high silica zeolite (laboratory data).

Figure 5 shows FTIR spectra of the samples and CeO_2. Generally the appearance of the peaks is common for high silica zeolites. However, CeO_2-ZSM-11 nanocomposite sample showed a shoulder at 998 cm^{-1}, which was not found in the spectra

of ZSM-11 sample, mixture of CeO2 and ZSM-11, and CeO2. The appearance of this shoulder, together with the depression of a peak at around 1100 cm-1 (Figure 5b), indicated the formation of nanocomposite, where CeO2 and ZSM-11 particles are approached and located closely each other.

Figure 6 shows DTA curves of the samples after treated with toluene. Both samples showed endothermic peak at around 80 °C, indicating evaporation of water adsorbed on the samples. Another endothermic peak at 160 °C of ZSM-11 sample (Figure 6a) maybe due to evaporation of toluene weakly adsorbed on the sample. Exothermic peaks occurred due to combustion of adsorbed toluene on the samples. Combustion reaction of toluene adsorbed on ZSM-11 occurred at 342 °C, lower than autoignition temperature of toluene (480 °C). This means that ZSM-11 has thermal catalyst properties. Combustion temperature of toluene further decreased to 298 °C, when it is adsorbed on CeO2-ZSM-11 nanocomposite (Figure 6b). The difference in combustion temperature of toluene adsorbed on ZSM-11 (342 °C) and on

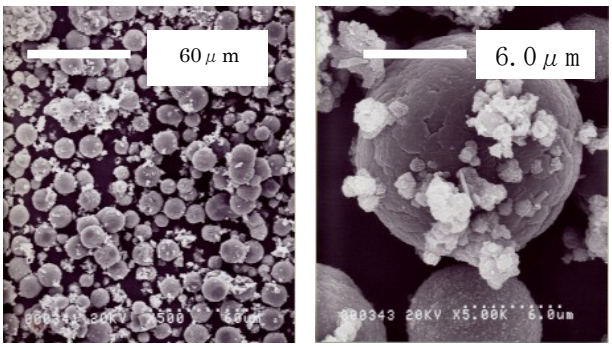

Fig. 3 SEM images of CeO_2-ZSM-11 nanocomposite

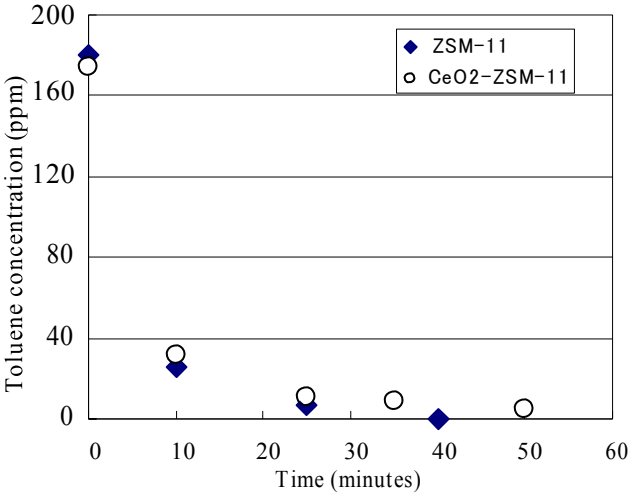

Fig. 4 Decrease in toluene concentration with time

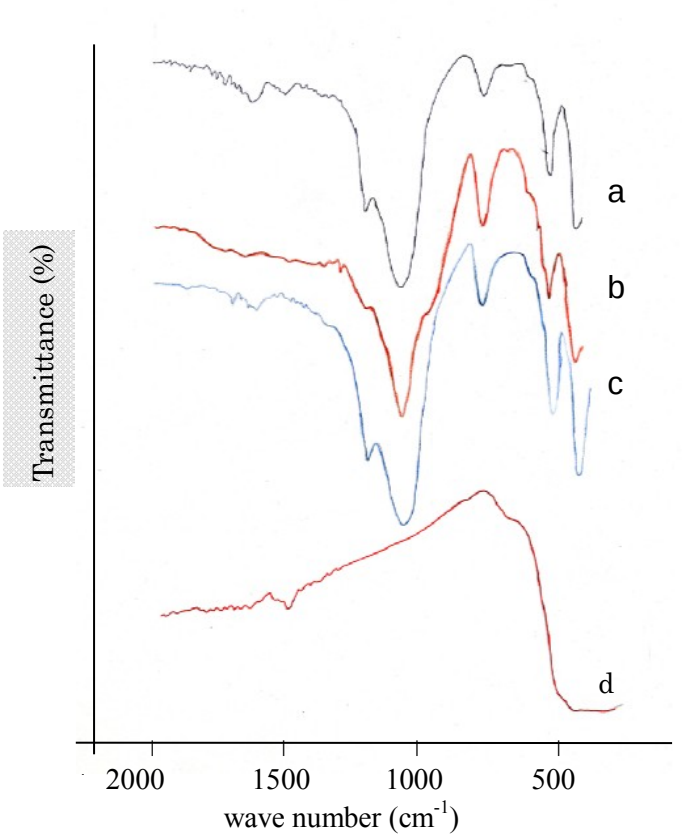

Fig. 5 FTIR spectra of the samples: a, ZSM-11, b: CeO_2-ZSM-11 nanocomposite, c: mixture of CeO_2 and ZSM-11, d: CeO_2

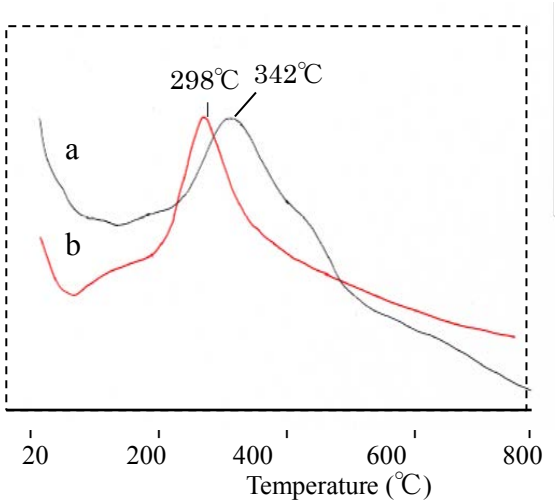

Fig. 6. DTA patterns of the samples after toluene treatment: a. ZSM-11; b. CeO_2-ZSM-11 nanocomposite

CeO_2-ZSM-11 nanocomposite (298 °C) is due to the presence of CeO_2 in the nanocomposite acted as a thermal catalyst the combustion temperature of adsorbed toluene was observed at 333 °C (data not shown). This suggested that thermal catalytic property of CeO_2 was more effectively exerted in the nanocomposite than in the physical mixture. In this manner, toluene can be adsorbed then be combusted by such kind of nanocomposite, and the nanocomposite can be reused again as an adsorbent. This kind of thermal catalyst process is also applicable for other kind of VOCs.

that oxidatively combusted adsorbed toluene. In case of the mixture of CeO_2 and ZSM-11,

Conclusion

1. ZSM-11 and CeO_2-ZSM-11 nanocomposite are successfully synthesized from industrial by-product of glass fiber.
2. CeO_2-ZSM-11 nanocomposite is an effective material for removing VOCs, by adsorption and thermal catalyst.

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MOLECULAR VARIATION OF SOME ENDANGERED SPECIES IN INDONESIA

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ABSTRACT

Taxus sumatrana is an endangered species distributed in Himal region, China and South East Asia. In Indonesia, *T. sumatrana* found to have a scattered distribution at. 1700-2200 masl. *Shorea javanica, Shorea selanica*, and *Shorea montigena* are known as Indonesian endemic Shorea species. *S. javanica* is common in Southern tips of Sumatra island and and Central Java while *S. selanica* and *S. montigena* is endemic to Moluccas. The objective of this study are : 1) to investigate the genetic diversity of *T. sumatrana* in Indonesia by RAPD marker. ; 2) to examine nucleotide variation of three nuclear gene and two cpDNA regions in *S. javanica, S. selanica* and *S. montigena*; 3) to investigate the genetic diversity and differentiation of *S. javanica, S. selanica* and *S. montigena* using microsatellite. The overall result is hoped to contribute in providing baseline information for conservation of the species. Of the 28 un iversal primers screened for *T.sumatrana*, 6 produced reproducible and clear RAPD band. U sing these primers, 48 di scernible DNA fragment were generated, of which 47 (97.92%) were polymorphic. The result also showed that percentage of polymorphic band, PPB, ranging from 46% – 83% with an average 69% and Nei's genetic diversity index (H_e) of 0.23, and genetic differentiation among population,G_{ST} = 0.29. Research on *S. javanica* is still in progress but preliminary result show the tendency that *S. javanica* has very low genetic diversity, while research on *S. selanica* and *S. montigena* will be carried out soon.

A. Study on *Taxus sumatrana* Miq de Laubenfel

Introduction

Taxus sumatrana (Miq) de Laub. (Taxaceae) ia an endangered evergreen nonresinous conifer with its geographic range covered Afghanistan, Tibet, Nepal, India, Bhutan, Burma and China, Vietnam; Sumatra, Philippines and also Taiwan (Anonymous, 2007). In Indonesia, where Mt.Kerinci known as the only site for its natural habitat, *Taxus sumatrana* found to

have a scattered distribution. During the field survey, this highly valuable tree is usually distributed in shady valley and slopes at high altitudes of 1700-2200 masl.

Taxus sumatrana those grown in Indonesia has not been studied intensively. Nothing is known except for the study of endophytic fungi (Syukur *et al*., 2003). The present study is an important step toward investigating the genetic diversity and population structure of *Taxus sumatrana* in Indonesia.

Materials and Method

Leaves of 30 individuals were collected from 3 reproductive populations. Population of natural parents tree and natural seedling were taken from Mt. Kerinci, Jambi Province – Indonesia. The population of cultivated tree originated from twigs cutting were taken from Cibodas Botanical Garden. In each of three reproductive populations, random sample of 10 plants were analyzed using RAPD.

Genomic DNA was extracted from dried leaves using a modified CTAB method (Milligan, 1989). DNA checked by electrophoresis on 1% agarose gel. 28 primers (Operon Technology) were screened for their ability to amplify polymorphic bands among the populations. 6 primers produce strong, clear, and reproducible bands. These primers were selected for further study of the 30 individuals. 13.5µl PCR reaction were carried out in a MJ Research PTC-100 and run for: 1 cycle pre-denaturation at 95^{o}C for 2 min, 45 cycles of 1 min denaturation at 95^{o}C, 2 min annealing at 37^{o}C, 2 m in extension at 72^{o}C and 1 cycle final extension at 72^{o}C in 10 min.

A matrix of different RAPD phenotype was established and used for statistical analysis. Data analysed using the program POPGENE version 1.31 (Yeh et al., 1999), parameter observed are percentage of polymorphic band (PPB), the effective number of allele per locus (Ae), and Nei's genetic diversity (He). The diversity among population was measured by Nei's genetic distance (D) and genetic differentiation (G_{ST}).

Result

The 6 selected RAPD primers generated a total of 48 bands (loci) that ranged in size from 100-1500 base pairs. The primers yielded 5-11 bands, with an average of 8 bands per primer. Among the 48 bands, 47 (97.92%) were polymorphic. The percentage of polymorphic bands (PPB) at the population level was 69% on average, ranging from 46%-83%. The average effective number of alleles per locus (Ae) was 1.40 and 1.57 at the population and species level respectively. Assuming Hardy-Weinberg equilibrium, the average gene diversity (H_e) was estimated to be 0.23 within population and 0.33 at the species level. Among the three reproductive population, the natural parent trees population (H_e = 0.26) and cultivated population (H_e = 0.30) exhibit high levels of variability

Genetic differentiation among population (G_{ST}) of *Taxus sumatrana* was estimated as 0.29 , indicating that 29% of the genetic variability was distributed

among population, or most of the total genetic diversity was distributed within population. Nei's genetic distance (D) was varied from 0.13 – 0. 26 with the average of 0.20. This means that around 80% of the genetic variability exists within population and only 20% exist among population.

Discussion

Data showed that genetic diversity within population of *Taxus sumatrana* from Indonesia is relatively high (mean of H_e = 0.23). These results comply with Hamrick *et al.* (1992) that stated genetic variation in long-lived Gymnospermae should theoretically be relative high within population and relatively low between populations. Generally, conifer will have high genetic variability due to its low genetic differentiation among population.

In the Genus of Taxus, genetic diversity within population of *Taxus sumatrana* is higher compared to anothers Taxus species such as *Taxus fuana* from Pakistan (H_e=0.12), *Taxus wallichiana* from south east India, *Taxus canadensis* (H_e=0.10), and *Taxus brevifolia* (H_e= 0.17). While, *Taxus baccata* has higher genetic diversity (H_e= 0.28). The percentage of polymorphic bands for *Taxus sumatrana* (PPB) (69%) is also higher than *Taxus fuana* (38%), *Taxus wallichiana* (45%), *Taxus canadensis* (26%), *Taxus cuspidata* (31%), and *Taxus brevifolia* (42%), but slightly lower than *Taxus baccata* (71%) (Shah *et al*., 2008; Saikia *et al*., 2000; Senneville *et al*., 2001; Kassaby & Yanchuk, 1998; Lewandowski *et al*, 1995; Hilfiker et al., 2004).

The genetic diversity of seedling population from *Taxus sumatrana* was lower than natural parent trees population and cultivated population. The same result obtained in *Taxus baccata* (Lewandowski *et al.*,1995), where slight excess of homozygote (F = 0,049) was observed from progeny trees while the homozygote for parental population was very low (F = -0,104). This will be understood for a dioecy tree where any observed inbreeding must be the result of mating between relatives or close neighbours. The genetic diversity within population of cultivated population was higher than natural parent tree population. The high genetic diversity within cultivated population was also found in cultivated *Taxus cuspidata var. nana* (Li *et al*., 2005), where the cultivated population generated from very few mother trees by stem cutting showed a high genetic diversity within population. S uch variability may result from two factors, those: 1) The original mutant has already harbored a large amount of pre-existing somatic variation, or 2) There has been genetic instability such as rapid occurrence and accumulation of somatic mutation.

Compared to others Taxus, the genetic differentiation among population of *Taxus sumatrana* was classified into moderate because its value is still lower than *Taxus fuana* (G_{ST} = 0.58) and higher than *Taxus brevifolia* (G_{st} = 0.08), and *Taxus canadensis* (G_{ST} = 0.10).

Conclusion

Knowledge of genetic variation of population of rare and endangered species

plays an important role in the formulation of appropriate conservation strategies both *in-situ* and *ex-situ*. In *ex–situ* conservation strategy, the information of genetic variation is needed to determine the number of collected population or individual for maintaining the genetic diversity value. In *in-situ* conservation strategy, it is important to determine the location number, width area and number of individual.

From the study result, it is known that the level of genetic variation of *Taxus sumatrana* from Indonesia is high. Due to the fact that natural growing habitat of *Taxus sumatrana* from Indonesia is only found in Mt. Kerinci and the genetic variation of the seedling population is low, for exploration activity and *ex-situ* conservation program will require big number of individual to be collected. The high variability in vegetatively cultivated population and low seedling existence, that is very rare in its natural habitat, will allow cuttings to be planted for *ex-situ* conservation program.

B. Study on Indonesian endemic Shorea species

Introduction

Shorea javanica Koord & Valeton is an indigenous species to Indonesia where it is common in Southern tips of Sumatra and found scattered in Central Java. Locally it is known as *dammar mata kucing* (cat eye resin) and it produces non t imber forest product (high quality, clear resin – known as dammar). Nowadays, Indonesia is the only dammar-producing country in the world. (Anonymous 1995).

Shorea selanica Blume is grouped into red meranti. Locally known as dammar selan, kayu bapa, sehu, boba, luma, bahut, biahgawa. *S. selanica* is also endemic to Indonesian and only found naturally in Moluccas islands (Newman et al., 1998). This species could reach 50 cm in diameter at breast height in less than 30 years (Subiakto et al. 2001; Anonim 1987). Measurement on mean annual increment (MAI) by Mindawati et al (2004) showed *S. selanica* as a potential for proposed species in plantation forest with MAI could reach 2.0 cm/year.

Shorea montigena Slooten is grouped into white meranti. Locally known as bahut, kayu bapa, gawa, babat, umale. This species is also endemic to Moluccas with narrower distribution compared to *S. selanica*. *S. montigena* is also said possibly found in North Sulawesi but so far this possibility support only by sterile collection (Newman et al., 1998).

Several studies have been conducted on the genetic variation of the Shorea species using RAPD, allozyme, SSR, and DNA sequences. However, the genetic variation within and among population and also population lineage by using DNA-based marker to *S. javanica*, *S. selanica*, and *S. montigena* has not been reported.

Materials and Method

Leaves sample of *S. javanica* collected both from Sumatra and Java population. For Sumatra population, leaves sample collected both from natural habitat

in Bukit Barisan Selatan National Park and also planted trees from dammar agroforest in Southern tips of Sumatra (Krui area of Lampung). Java population represented by individual that grows naturally in Sancang Nature Reserve in Garut, West Java and also planted trees in Bogor Botanical Garden. There are still two proposed location for *Shorea javanica* sample collection, those are: South Sumatra (Sumatra population) and Subah, Central Java (Java population). While leaves sample of *Shorea selanica* and *Shorea montigena* will be taken from their natural habitat in Moluccas islands.

Genomic DNA extracted using a modified CTAB method. PCR optimalization due to the primers used when molecular variation will be generate from two cpDNA region, three nuclear gene, and at least 10 microsatellite markers.

Preliminary results

Research on *S. javanica* is still in progress but preliminary result shows the tendency that *S. javanica* has no variation in trnL – trnF region and posses very low genetic diversity in GapC region. Study on some others cpDNA and nuclear gene region to whole individual in each population is still in progress. Research on *S. selanica* and *S. montigena* will be carried out soon.

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THE ROLE OF KENYA FORESTRY RESEARCH INSTITUTE IN REDD+ PROJECTS

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ABSTRACT

Since reducing carbon emissions from deforestations and forest degradation (REDD+) projects require sound scientific principles and findings prior to implementation, forestry research have a big role to play. KEFRI's past research in rehabilitation of degraded forests, monitoring land cover changes, forest inventory and silvicultural practices in different ecological zones of Kenya will form important baseline of information and implementation strategies. The other task will be developing methodologies for carbon accounting and reference emission scenario in different forest types toward carbon markets. Monitoring performance of REDD+ strategy in terms of reducing carbon emissions, forests productivity and improvement of livelihoods will be undertaken as per international standards of monitoring, reporting and verification. Inadequate forest resource database, inconsistent methodologies, and unclear benefit sharing arrangements are the key challenges. The paper reviews status of forests in Kenya, national progress of REDD+ projects and highlights achievements of KEFRI

Key words: REDD, KEFRI, R-PP, climate change, carbon credits

INTRODUCTION

With wide acceptance of human-induced climate change, there is a growing recognition that deforestation and forest degradation play a significant role in carbon emission. Kenya's forest cover is currently about 5 per cent (3.47 million ha) of total land area and a projected 12,000 hectares are lost every year, primarily through conversion to farmlands (FAO, 2009). The remaining forests are degraded due to unsustainable utilization, illegal logging, uncontrolled grazing and exploitation for charcoal. It's estimated over 50 per cent of urban energy requirements and 80 pe rcent of rural cooking and heating requirements are from forests (KEFRI, 2009). Deliberate efforts are made by government, private sector, development partners and local communities to restore degraded forest areas throughout the country. Water catchment areas have received close attention due to their significance in soil, water and biodiversity conservation in addition to amelioration of regional climatic conditions. Furthermore, the forests in water catchments have been flagged out as important in supporting Kenya's long term development agenda "vision 2030".

As a follow-up of Bali action plan (UNFCCC, 2008), Forest Carbon Partnership Facility (FCPF) under World Bank and UN-REDD were formed aiming to assist developing nations in formulating a roadmap in terms of awareness and preparedness towards international REDD+ mechanism. Kenya is among 37 developing countries participating in FCPF

through formulation of Readiness Preparation Proposal (R-PP) and its implementation. Furthermore, the National Climate Change Response Strategy (NCCRS) has prioritized increasing forest cover and planed REDD+ initiatives in its action plan (GOK, 2010)

KEFRI is a public research institution mandated to undertake forestry research and development for improved livelihoods and healthy environment. The institute's Research and Development (R&D) agenda is organized into five key programmes: farm forestry; natural forests; dryland forestry; industrial forest plantations; and technology dissemination. In 2009 a Climate Change Working Group was formed to address climate change issues including national preparedness in REDD+ mechanism. Key collaborators include Kenya Forestry Service (KFS) and National Environment Management Authority (NEMA).

MATERIALS AND METHODS

This paper was developed through a review of existing literature, discussions with representatives of Climate Change Working Group in KEFRI and other institutions represented in the on-going R-PP activities during the month of May and June 2010. Partial data obtained was analyzed by MS Excel.

RESULTS AND DISCUSSION

Preparedness and awareness of REDD+ projects

Submission of REDD Readiness Plan Idea Note (R-PIN) in 2008 and grant agreement in November 2009 initiated the R-PP activities. The initial activity has been creating awareness and formulation of national and regional committees. Implementation of R-PP is expected to commence in 2011 to establish technical, legal and monitoring arrangements. The key pillars of REDD+ projects which include carbon accounting methods, establishment of baselines scenario, emission reduction strategies, monitoring and modalities of carbon-credit sales will be addressed at this stage.

Having six research centres and ten sub-centres distributed in all regions of Kenya, KEFRI have played a key role in propagating knowledge of REDD+ mechanisms, as well as opportunities and challenges that are anticipated during implementation. Since the year 2009, a total of ten workshops have been held across Kenya, targeting stakeholders drawn from community forest associations, indigenous groups, public institutions, community-based organizations and private sector. Development of dissemination materials such as brochures and pamphlets has also been undertaken to reach more stakeholders with diverse interest in REDD+ process. To implement REDD+ projects effectively, various committee have been formed which will be involved not only in R-PP formulation but also during implementation of REDD+ projects. These include national coordination, steering committee and technical working group in which KEFRI have been instrumental in advisory and providing technical information. This is expected to continue during R-PP implementation.

Establishment of REDD+ baselines in Kenya

Efforts to quantify historic carbon emissions/removals from deforestation and degradation will be the next agenda, after the expected approval of R-PP. Development of expected trajectories of carbon emissions/removals in the absence of REDD+ incentives will also be undertaken to set the baseline scenario.

At present, Kenya reports its forest area using a minimum crown cover of 10 per cent, minimum height of 5 meters, and minimum area of 0.5 ha. The last estimate of the net emissions of Green

House Gas (GHG) from the forest sector was in the First National Communication to the United Nation Framework on Convention on Climate Change (UNFCCC) submitted in 2002 but it was based mostly on data from the last national inventory carried out in 1994 (GOK, 2002). Furthermore, good practice guidance for land use, land use change and forestry were still under discussion.

In the REDD projects, modalities to establish carbon crediting baseline are yet to be set since policy decisions are still ongoing under the UNFCCC. It's anticipated that most of the activities under REDD+ could be implemented using Inter governmental Panel on C limate change (IPCC) framework under agriculture, forestry and other land use (AFOLU). The historical emission is earmarked from the year 2000 t o 2010. To facilitate the estimation of land cover and land use change, satellite image for the target period will be sourced and changes synthesized. Approaches used by Akotsi et. al. (2006) in assessing forest changes using satellite remote sensing technologies in five key water catchment areas (water towers) in Kenya could be utilized with modification in addition to other modern techniques. Massive destruction of forest from 2000 t o 2005 w as observed in Mau complex forest with 16,563 ha deforested and only 334 ha showing signs of recovery over the period. The other four water towers showed signs of recovery with insignificant deforestation.

Forest degradation and stock enhancement are difficult to detect using satellite imagery hence methods shall be developed during the implementation stage of the R-PP. As a starting point, members of REDD technical working group and other experts will meet to plan a strategy for estimating emissions/removals during the historic time period. Methodologies for forest inventory, volume/biomass equations for carbon stock estimation and modeling forest carbon future trajectory will be the definite output. The IPCC recognizes five forest carbon pools: aboveground biomass, belowground biomass, soil, litter and dead wood. K enya proposes to use aboveground and belowground carbon stock in trees as the main pools in all land cover changes related to REDD+ activities. Currently national carbon stock estimate based on IPCC Tier 1 and other models varies from 163 t o 618 M t C, this shows inadequate sampling and inconsistent methods across the country (Gibbs et. al., 2007).

National Forest Inventory carried out in 1989-1993 by two projects, namely Kenya Forestry Master Plan on plantation forests and Kenya Indigenous Forest Conservation Project jointly covering some 900,000 ha of possible 1.22 M illion ha, provides important basis for designing REDD+ protocols. Other existing key inventories are regionally based such as mangrove forests, Mt. Kenya ecosystem and Mau ecosystem among others. There is an on-going national forest inventory being carried out, Figure 1 shows results of main plantation species namely *Cupressus lusitanica* (cypress) and *Pinus patula* (pine). Most of the growing stock is between 25 to 35 years with cypress occupying larger areas as compared to pine. The target rotation age for both species toward saw logs is about 25 years. This shows most of the plantations are over mature mainly due to national timber harvesting ban which is already in place.

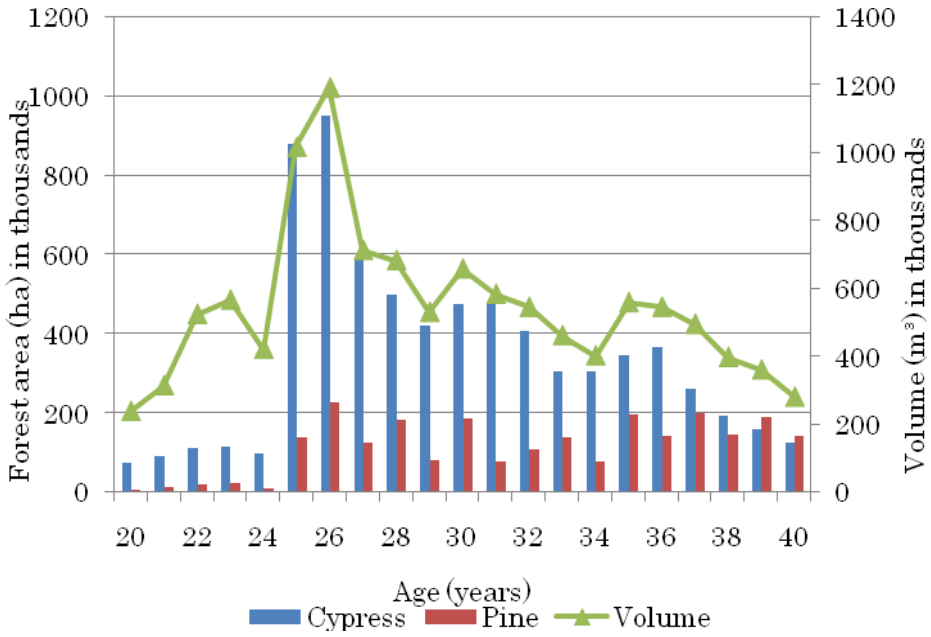

Figure 1: Plantation forest inventory of main species in Kenya

Lessons learnt and technologies developed during implementation of Participatory Forest Management (PFM) and Social Forest Extension Model (SOFEM) projects would be crucial in the REDD+ framework. The initiative of PFM and SOFEM was, and still is promoting joint ownership of indigenous forest resources and enhancement of growing of trees in degraded forest areas and farmlands. Moreover, the government is in a process of decentralization of forest management to community forest associations (GOK, 2005). Guidelines for high conversion efficiency methods of charcoal burning, pruning and thinning regimes of common plantation species and cost effective rehabilitation techniques have been developed. These technologies will be crucial in carbon stock enhancement and forest management.

Fire has also been a threat to natural forest as shown in Figure 2. However quantification of the amount of carbon emitted after destruction has not been undertaken.

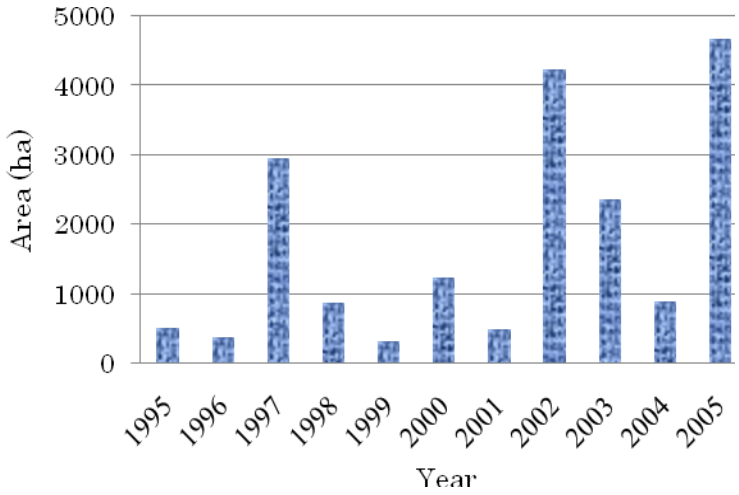

Figure 2: Estimated forest areas destroyed by fire (Source; KFS annual reports)

Monitoring of REDD+ Projects

The main aim is to develop a monitoring, verification and reporting system that will allow for transparent accounting of emission and removals of carbon dioxide against projected reference scenario. Robust methods to determine changes in carbon stock and improvement of livelihoods will be undertaken as per the required international standards.

CONCLUSIONS AND WAY FORWARD

Progress in R-PP is on track with a lot of enthusiasm on the ground by the local community and policy makers. Although no agreement was reached on REDD mechanism in 15th Conference of the Parties (COP 15) held in Copenhagen, December 2009, it's hoped an agreement will be reached in the forthcoming COP 16. Dissemination of research outputs to target beneficiaries will be crucial in addressing drivers of deforestation to alleviate further carbon emission and consequently enhance the carbon sink. Inadequate forest resource database, inconsistent methodologies and unclear benefit sharing arrangements are the key challenges.

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THE INFLUENCE OF IMPLEMENTING TOTAL QUALITY MANAGEMENT TOWARDS INNOVATION PERFORMANCE

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ABSTRACT

Total Quality Management (TQM) is a topic that is often linked to company performance, including innovation performance. Some studies showed that TQM has influence on pe rformance, while some others showed contrary results. This study examined the effect of TQM on innovation performance of manufacturing companies in West Java - Indonesia. The method of data collection was conducted through mailed questionnaires, which consist of 155 r espondents using purposive sampling method. The hypotheses were tested by using multiple regression analysis. The results indicated that all TQM variables had significant influence on i nnovation performance. Another finding was that strategic planning was the only independent variable that had negative impact on innovation performance.

Keywords: TQM, innovation performance, manufacturing companies

INTRODUCTION

Indonesia's business world is faced with some tough challenge. Companies have to compete on regional, national and even international arena as well. Therefore, competing globally is a requirement for companies to survive. To obtain competitive advantages, companies must be able to provide a high quality of products or services with reasonable and competitive prices. Moreover, companies should realize the importance of quality and quality management as major factors of success to enhance the ability to compete. In other word, the main key to improve competitiveness is quality. Hence, companies need to focus on quality or Total Quality Management (TQM).

Dimensional concept of quality management has often been mentioned by many experts. Dean and Bowen, 1994; Hackman and Wageman, 1995; Powell, 1995 state that the elements of TQM include: the involvement of top management team, the adoption of quality philosophy, the emphasis on T QM-oriented training, customer focus, continuous process improvement, management by facts, and the use of TQM methods. Thus for the organization to improve all aspects of products and services to consumers, TQM can be used as management application for the whole organization (Heizer and Render, 2005).

The implementation of quality management is not always successfully implemented within company. In a research conducted by Buran (1994) in Ettlie (1997) about quality programs of companies in the United States, it s hows

that more than 50% of surveyed companies reported that their quality program does not produce improvements in business performance. Only third of surveyed companies believe that quality program affects its competitiveness significantly. Taylor (1997) also shows a similar result. Taylor's research on the role of leadership in TQM in small firms shows that the respondent answers regarding the application of quality management in company is inconsistent, for example, small firms that have positive results of TQM are actually not really understand about TQM. In addition, smaller companies also lack the motivation to achieve TQM but claim that quality management is a strategic issue in organizations. These failures happen due to the implementation of TQM partially.

Research on quality management is often associated with company performance. Murphy, Trailer, and Hill (1996) states that the measures of performance in business enterprise can be determined from the efficiency, growth rate, profit, size, liquidity, failure or success and leverage. Research by Madu, Kuei, and Jacob (1996) states that the measures of organizational performance shown by the short-term and long term performance, productivity, cost performance, profitability, competitiveness, sales growth, revenue growth and market share. Other performance measurement that can be used to determine the company performance is innovation performance. Therefore in order to obtain all aspects of innovation, the measurement of product and process innovation were conducted (Prajogo dan Sohal, 2006). The criterias that were developed to measure the innovation is determined based on previous studies that include the speed of innovation, degree of innovation and market share.

Many studies have focused on the impact of quality management on business performance and still show contradictory results. Some research shows the result of the relationship between quality management on performance. But other studies also show the opposite result as quality management and performance do not have any correlation. Research by Flynn, Schroeder, dan Sakakibara (1995) which examines the effect of quality management practices on quality performance and competitive advantage, is one of the researches that support the existence of the relationship between quality management with performance. The results show that the infrastructure has an influence on the implementation of quality management. This result also supported by Ahire, Golhar, and Waller's (1996) research which confirm the positive influence between the quality management strategies and the quality of the company's products. Moreover, Madu, Kuei, and Jacob (1996) also reveal a similar result stating that there is a relationship between quality dimension and organizational performance.

On the other hand, several other studies on this subject show contradictory results that quality management has no effect on performance. Powell (1995) conducted research on TQM and shows that not all TQM practices influence corporate performance. Out of 12 elements of TQM, only three elements that affect the performance e.g executive commitment, open organization and employee empowerment. And other elements, such as benchmarking, training, flexibility, process improvement and the repairement of measuring instruments, show no significant effect on the performance of TQM. The result of Powell's research is supported by research conducted by Dow, Samson, and Ford (1999) explaining that there is no direct positive relationship between quality management practices with quality performance. This research also reveals different results from the previous research by Flynn, Schroeder, and Sakakibara (1995) which shows the

results of any significant effect between quality management with quality performance. Furthermore, Flynn, Schroeder, and Sakakibara's (1995) research then was replicated by Kumalaningrum (2000). Kumalaningrum research shows that not all of TQM's practices have a positive effect on performance. There is even only one practice of TQM that affect the performance quality i.e statistical control/feedback.

Based on research results that show the differences in influence of TQM implementation on performance, this research is conducted to determine how the application of TQM affects the performance of manufacturing companies in Indonesia.

RESEARCH HYPOTHESES AND DEVELOPMENT MODEL

Hypothesis Development

TQM implementation can be done from various aspects, including leadership, strategic planning, customer focus, information and analysis, workforce management, and process management (Prajogo & Sohal, 2006). The study also shows a correlation between TQM implementation with performance innovation.

Therefore based on the theoretical framework, the hypothesis proposed in this study are:

1. H1: leadership has an influence on innovation performance.
2. H2: strategic planning has an influence on innovation performance
3. H3: focus on customer has an influence on innovation performance
4. H4: information and analysis has an influence on innovation performance
5. H5: workforce management has an influence on innovation performance
6. H6: process management has an influence on innovation performance

Research Model

The proposed research model is:

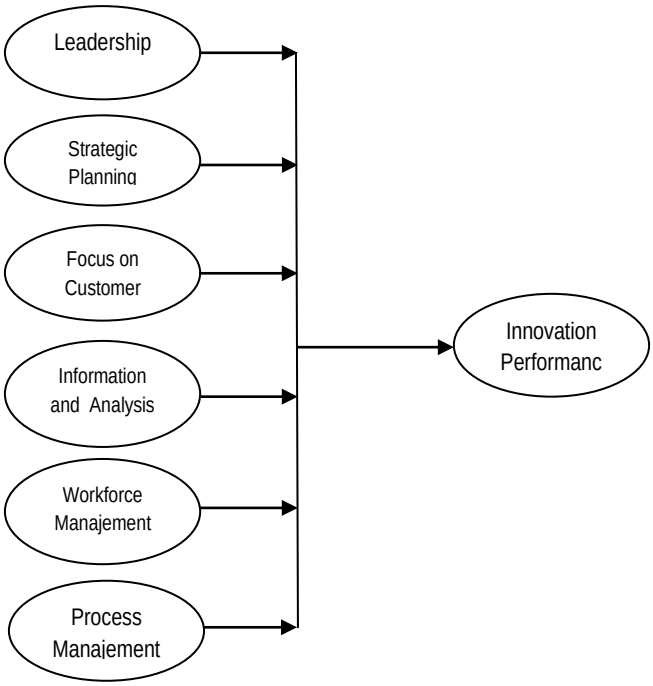

Figure 1. Research Model

RESEARCH METHOD

To achieve the research objectives in analyzing the effect of TQM on innovation performance, six dependent variables were used i.e leadership, strategic planning, customer focus, information and analysis, workforce management, and process management. Beside that innovation performace was applied as independent variable. Moreover, the instruments used for measurement were prepared in accordance with the variable that will be measured using a 5-point Likert scale.

The population in this study is all manufacturing companies in West Java registered in the Manufacturing Industry Directory that published by the Central Statistics Agency of West Java Province in 2006. The selection of West Java province

as the population of the study based on data from the Capital Investment Coordinating Board since almost 60% of manufacturing industry in Indonesia is located in West Java. Furthermore, the sample in this study includes big manufacturing companies located in West Java. Probability sampling was applied as sampling method with simple random sampling as the sampling technique. Probability sampling is used when the elements in the population have equal opportunity to be selected as subjects in the sample (Sekaran, 2003). And simple random sampling is applied when every element in the population are known and have the same opportunity to be selected as subject to obtain a sample size that was determined. The samples in this study were taken from the Manufacturing Industry Directory published by the Central Statistics Agency of West Java in 2006.

Data used in this study are primary data wherein the method of data collection is done through a survey using questionnaires. Herein the mail survey was conducted by sending a questionnaire through mail to the respondents who have been determined. After the data was collected, the next step was analyzing the sequence data by conducting the test of validity, reliability and hypotheses using multiple linear regression analysis.

RESEARCH RESULTS AND DISCUSSION

Data Collection

Data were collected by sending questionnaires, with a total of 1.374 copies of questionnaires. The results of the distribution of questionnaire shows that from 1.374 copies of questionnaires, as many as 32 questionnaires were returned because of unknown addresses, 155 questionnaires were returned and could be used, and the rest 37 questionnaires were returned but could not be used because the information provided was incomplete.

All manufacturing companies who have participated and taken as sample in this study represent large-scale manufacturing companies with the criteria of at least 100 workforces. This criterion is based on the criteria issued by the Central Bureau of Statistics (2003).

Industrial types of samples were classified according to the classification of industrial field operations at the industrial directory issued by BPS (2003). Based on the classification of industrial field operations by BPS, there are 20 types of industries as shown in table 1.

Table 1. Classification of Industrial Manufacturing Company in West Java

No.	Industry Type	Amount
1.	Nonmetallic minerals	1
2.	Furniture & wood processing industry	5
3.	Rubber and rubber materials	10
4.	Wood and articles of wood	6
5.	Motor vehicle	6
6.	Paper and pulp	3
7.	Chemicals and chemical's products	20
8.	Leather and leather goods	2
9.	Electricity nd electrical equipment	11
10.	Basic metals	3
11.	Food and beverages	41

12.	Machinery and equipment	5
13.	Machines office equipment	8
14.	Apparel	15
15.	Publishing and printing	3
16.	Gas Processing	2
17.	Radio, TV and electronic equipment	6
18.	Textiles	9
19.	Metal goods	7
20.	Tobacco	-
	Total	155

Source: Processed data

Validity and Reliability Test Results

To achieve the research objectives that have been defined, firstly, the testing of the validity of instruments was conducted. Validity testing is done through Confirmatory Factor Analysis (CFA). Measurement using CFA is shown with indicator of each construct that has a significant loading factor which proves that the indicator is a unit measuring instrument that measures the same constructs and can predict well constructs that should be predicted (Hair et al., 2006). CFA measurement was performed on each given question which shows a grouping of the variables that had been specified.

Based on the results of CFA's calculation, it indicates that the acceptable convergent validity is items that have a factor loading greater than 0.40 and significant level of 5%. From the results of factor analysis, the overall validity of nearly all the items shown above 0.40 a nd there are three questions that must be excluded because they do not meet the validity requirements of kp2, pl5, and pl6. For that, those three items of question must be removed in the next validity analysis. By looking at the results of both analyses, all items show the validity above 0.40. This signifies that the instruments used in this study actually measure the real thing (Sekaran, 2003).

Table 2. Results of the Final Validity Testing

Item	***Component***							**Notes**
	1	**2**	**3**	**4**	**5**	**6**	**7**	
Kp1							.694	valid
Kp3							.732	valid
Kp4							.804	valid
St1				.803				valid
St2				.702				valid
St3				.546				valid
St4				.871				valid
Pl1						.562		valid
Pl2						.784		valid
Pl3						.842		valid
Pl4						.684		valid
I1			.792					valid
I2			.810					valid
I3			.761					valid
I4			.711					valid
Tk1					.666			valid

Tk2			.750	valid
Tk3			.657	valid
Tk4			.688	valid
Tk5			.596	valid
Pr1		.609		valid
Pr2		.700		valid
Pr3		.713		valid
Pr4		.737		valid
Pr5		.767		valid
Pr6		.656		valid
K1	.635			valid
K2	.490			valid
K3	.578			valid
K4	.517			valid
K5	.761			valid
K6	.877			valid
K7	.825			valid
K8	.706			valid
K9	.626			valid

Having tested the validity, the next step was conducting reliability test. The reliability testing of each construct was done by using the coefficient of Cronbach's Alpha and item-to-total correlation that is useful to improve the measurement by eliminating the items that could decrease the Cronbach's Alpha. From the result of reliability testing, the value of Cronbach's Alpha obtained in all constructs is greater than 0, 60. And since each constructs have alpha values above 0.60, it means that all constructs have met the reliability test. In other words, the internal consistency of each items of questions in the questionnaire are acceptable. The full results of the reliability test using Cronbach's Alpha can be seen in Table 3

Table 3. Reliability Test Results

Variabel	***Cronbach's Alpha Value Based on Standardized Items***	**Notes**
Leadership (Kp)	.727	Reliable
Strategic Planning (St)	.758	Reliable
Customer Focus (Pl)	.744	Reliable
Information and Analysis (I)	.793	Reliable
Manpower Management (Tk)	.728	Reliable
Process Management (Pr)	.829	Reliable
Innovation Performance (K)	.880	Reliable

After the question had been tested for validity and reliability, then the next step is testing the hypothesis. In this research, the hypotheses were tested using multiple linear regressions. The variables of leadership, strategic planning, customer focus, information and analysis, workforce management, and process management, were applied as independent variables. While the innovation performance as dependent variables. By using multiple regression models in SPSS version 12, the value of t as parameter estimation, multiple correlation coefficients (R), and

coefficient of multiple determinations ($R^{2)}$ were obtained, as well as the regression coefficient for each independent variable. The application of α for 0.05 on t his research means it has 95% of confidence level.

Referring to the limits above, it can be said that if the value of $p \leq 0.05$, it means that the independent variables influence the dependent variable significantly, with 95% of confidence level and tolerate a maximum deviation level of 5%, while the coefficient of multiple determination ($R^{2)}$ indicates the ability of independent variables that jointly explain the variation of the dependent variable.

For more details, test results of multiple regression can be seen in table 4

Table 4. Multiple Regression Test Results

Independent Variables	Coefficient	Standard Error	t	Sig t
Leadership (Kp)	.229	.069	3.065	.003
Strategic Planning (St)	-.149	.077	-2.093	.038
Customer Focus (Pl)	.162	.075	2.157	.033
Information and Analysis (I)	.153	.059	2.135	.034
Manpower Management (Tk)	.154	.066	2.108	.037
Process Management (Pr)	.190	.096	2.429	.016
R^2				.226
Adjusted R^2				.236
F				8.930
Sig F				.000

Based on test result in Table 4, it indicates that all the independent variables have significant impact, which means that those independent variables can give a positive influence on innovation performance simultaneously. However, the values of R^2 in this model is very low (only 0.226) which means that 22% of the company's innovation performance variation can be explained by the variables of leadership, strategic planning, customer focus, information and analysis, workforce management, and process management. However, by considering the contribution given by each independent variable, then it can be concluded that all independent variables have a s ignificant effect on t he level of $\alpha \leq 0.05$.

CONCLUSION AND RECOMMENDATION

Conclusion

This study aims to analyze the effect of TQM implementation that includes the variables of leadership, strategic planning, customer focus, information and analysis, workforce management, and process management toward innovation performance of manufacturing companies. Many studies have focused on the impact of quality management on bus iness performance. Prajogo and Sohal (2006) examined the relationship of TQM implementation on pe rformance quality and innovation performance and showed that TQM has an affect on quality performance and innovation performance.

Data were collected by sending questionnaires with a total of 1.374 copies of questionnaire. The results of the distribution of questionnaire shows that from 1.374 copies of questionnaires that were sent, as many as 32 questionnaires were returned because of unknown addresses, 155 que stionnaires were returned and could be used, and the rest 37 questionnaires were returned but could not be used because the information provided was incomplete. All manufacturing companies who have participated and taken as sample in this study represent large-scale manufacturing companies with the criteria of at least 100 workforces. This criterion is based on the criteria issued by the Central Bureau of Statistics (2003).

Statistical test of the collected data was done gradually, namely through the test of validity, reliability, and multiple linear regression. The validity test results indicate that there are three items of question (kp2, pl5, and pl6) that must be removed from subsequent analysis because they were not clustered in the right factors. While the reliability test shows that all variables are reliable. Futhermore, the hypothesis test results using multiple linear regression shows that all the independent variables have a s ignificant effect on the dependent variable simultaneously. However, the values of R^2 in this model is very low (only 0.226) which means that 22% of the company's innovation performance variation can be explained by the variables of leadership, strategic planning, customer focus, information and analysis, workforce management, and process management. However, by considering the contribution given by each independent variable, then it can be concluded that all independent variables have a significant effect on the level of $\alpha \leq 0.05$.

Suggestion

Based on t he conclusions, it is expected that this research could have implications for future research. The limitations in this study should be refined for subsequent research. As for things that need to be considered for further research are:

1. This research is expected to contribute to further research in the field of Operations Management. This research analyzes performance in terms of performance innovation. The next study is expected to use other measure of performance, for example by adding a marketing performance and financial performance, so that the effect of quality management towad the overall business performance can be determined.

2. The sample for this research only covers manufacturing industries in West Java. Subsequent research is expected to take samples in other areas or wider region that can accurately portray the industry in Indonesia.

3. In this research, the samples were taken from all types of industries without specializing in specific industry types. Subsequent research is expected to draw a sample in some specific industries thus the results have strong characteristics of the selected type of industry.

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A FRAMEWORK OF PERFORMANCE MEASUREMENT SYSTEM TO MEASURE THE SUSTAINABILITY FURNITURE PRODUCTION IN SMALL-MEDIUM ENTERPRISES (SMEs)

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ABSTRACT

There are many Small-Medium Enterprises (SMEs) that produce furniture products in Surakarta Residence, Central Java, Indonesia. Their products are less competitive than the products from the other countries. One of the unsustainable of raw material is an important reason to make their export uncompetitive. This paper describes the performance measurement framework for investigating problems of the sustainability furniture production in SMEs. This will fill the lack of understanding of sustainable Supply Chain Management (sSCM) especially for Furniture SMEs in Surakarta Residence. The paper describes a structured methodology for the design of performance measurement systems in the sustainable wood supplies. This framework provided guidelines that are subsequently used to inform the development of a value chain approaches. This paper contributes a scheme to highlight a difference between input, process, output, and outcome measures in raw material procurement for furniture manufacturers. The findings of the key performance indicators for mapping problems of raw material procurement are presented. The alternatives of value chain for ensuring of sustainable raw material supplies are discussed.

Keywords: p erformance measurement system, sustainable SCM, value chain, furniture SMEs.

1. INTRODUCTION

Indonesia is rich with tropical wood species that support the furniture industry such as teak, rubber wood, mahogany, and acacia (Usaid, 2006; Asmindo, 2008). Indonesia is one of main exporter wooden furniture products to the global market (Loebis and Schmitz, 2005, T ambunan, 2006). This growth generates high demand for wood materials up to 7 million cubic meters of wood materials annually (Asmindo, 2008). Most of wooden furniture producers spread over in Java Island especially in Jepara, Solo Raya, Semarang, Surabaya and Gresik. There are many Small-Medium Enterprises (SMEs) that produce furniture products in Solo Raya, Central Java, Indonesia (Sutopo, 2006; Yuniaristanto *et al.*, 2009). To export their products, SMEs have to be part of a furniture value chain. The value chain describes a s equence of related business activities including from the provision of specific inputs (base raw materials, semi-finished materials), through primary production as well as transformation and marketing (wholesaler and retailers/distributors/exporters), up to the

final sale of the particular product to the consumer (Usaid, 2007). Since the last few decades, there are some possible problems in raw material supplies for instant unsustainable and insufficient of raw material supply, inconsistence of raw material quality, and high fluctuation of raw material costs (Sutopo, 2007, Reichert, 2007). It is of importance the sustainable wood supply to ensure the sustainability of raw material supply in furniture production for SMEs. This situation forces SMEs to not only focus on economic targets but also on social as well as on environmental issues. However, it is difficult challenges for SMEs to develop and maintain focus on the sustainability.

The sSCM is a root in supply chain management where sustainability refers to an integration of social, environmental, and economic issues (Teuteberg & Wittstruck, 2010). The New Zealand Business Council for Sustainable Development (2003) defines sustainable supply chain management (sSCM) as "*Management of raw materials and services from suppliers to manufacturer/service provider to customer and back with improvement of the social and environmental impacts explicitly considered*". Many contributors, for instant Dakov & Novkov (2008), Seidel *et al.* (2009), Croom *et al*. (2009), Juang *et al*. (2009, Ninlawan *et al*. (2010), and Teuteberg & Wittstruck (2010) have dealt with investigated literature review and models on sSCM. Exploratory study intended to provide an overview of practice and inform further researches were done by Dakov & Novkov (2008), Croom *et al.* (2009) and Teuteberg & Wittstruck (2010). Seidel *et al.* (2009), Juang, *et al*. (2009) and Ninlawan (2010) were developed models on sSCM considering supply chain issues for manufacturing and procurement in electronics industry. According to Teuteberg and Wittstruck (2010), there are two crucial problems for implementing sSCM : how measures the sSCM establishment and how relationship between sSCM establishment and long-term financial success. Furthermore, the integration of key business processes is required to achieve the suitable economic results and to leverage benefits (Simchi-Levi *et al*. 2003, Chopra and Meindl, 2004).

As in the papers cited above, none of the previous works is appropriate to investigate the challenges for SMEs to develop and maintain focus on the sustainable wood supplies for furniture SMEs. However, the SMEs have differences problems compared to large companies. In this work, a strategic level of supply chain performance evaluation is addressed, that is a framework of performance measurement system. A set of performance measures will be build up to identify the problems of SMEs on implementing sSCM. This paper will fill the lack of understanding of sustainable Supply Chain Management (sSCM) especially for Furniture SMEs in Surakarta Residence. The objective of this paper is to determine a structured methodology for the design of performance measurement systems for mapping problems of raw material procurement. In the second section in this paper, we describe a framework of PMS in the sSCM. In the third section, we describe a case study the sSCM for furniture production in Solo Raya SMEs. Finally, conclusions and future research directions are presented in Section 4.

2. A FRAMEWORK OF sSCM FOR FURNITURE PRODUCTION IN SMEs

SMEs are dominating up to 85% furniture producers and the rest are large enterprises or trading/exporter houses in Solo Raya (Sutopo, 2007). It is important to discuss a specific framework of sSCM for furniture production in SMEs because they have specific characteristics compared to large enterprises. We pictured the real condition to determine the relevant system then investigated possible sSCM issues related to the SMEs in Solo Raya.

2.1 The Furniture Industry Value Chain

The relationship between the SMEs and the large enterprises (LEs) in Solo Raya furniture industry can be described using value chain analysis. This concept considers the business transactions from inputs to raw material production through harvesting, trading, processing/manufacturing, and distribution up to final consumption. In order to attain more insight into the furniture industry value chains (IVC), we conduct a field research in the furniture cluster in Solo Raya (Sutopo, 2006, 2007). Survey respondents were collected from multiple sources and included interviews with

suppliers, manufacturers, distributors, retailers, and Indonesia Furniture Association. This study is aimed to map the value chains (physical supply chain and actors), from input suppliers to end consumers; and to describe the mechanisms and the inter-relationship (main activities and objectives) of these firms throughout each step of the IVC. The Furniture IVC can be shown in Fig. 1

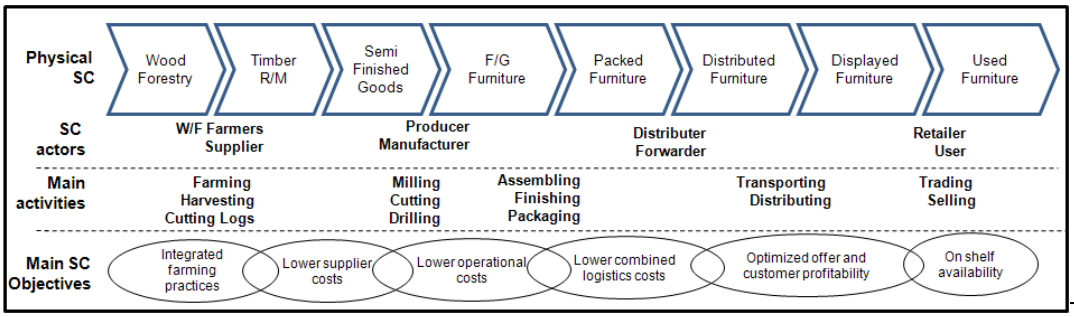

Figure 1: The Furniture Industry Value Chain

2.2. A specific framework of sSCM for furniture production in SMEs

A specific framework of sSCM for furniture production in SMEs can be developed into two steps (Fig.2). First, we capture current relationship between the SMEs and the LEs in furniture industry and then describe the scope and activities of the SMEs related to sSCM. According to NZBCSD (2003); Dakov & N ovkov (2008); Ninlawan *et al*. (2010); Teuteberg & Wittstruck (2010); a scope and activities of the SMEs related to furniture sSCM is described. In general, we observed about procurement, manufacturing, distribution, and/or reverse logistics cycle. Then, we investigated significant issues for the relationship between the SMEs and the Les related to raw material procurement for furniture manufacturers. The procurement cycle discuss some activities related to sustainable source of raw materials including all components; short-long term supply, inventory levels and fair play, consisting of involvement in activities that include the reduction, reuse and recycling of materials in the process of purchasing for SMEs. The manufacturing cycle is defined as furniture production processes which use inputs (water, air, energy and materials) with relatively low effect on environmental impacts (waste, pollution, and contamination). The manufacturing cycle can lead to lower operational costs and production efficiency gains. The distribution cycle are consists of green packaging and green logistics. Packaging characteristics such as size, shape, and materials have an impact on distribution because of their affect on t he transport characteristics of the product. Reverse logistics cycle is the process of retrieving the product from the end consumer for the purposes of capturing value or proper disposal. Activities include collection, combined inspection/selection/sorting, reprocessing/direct recovery, redistribution, and disposal.

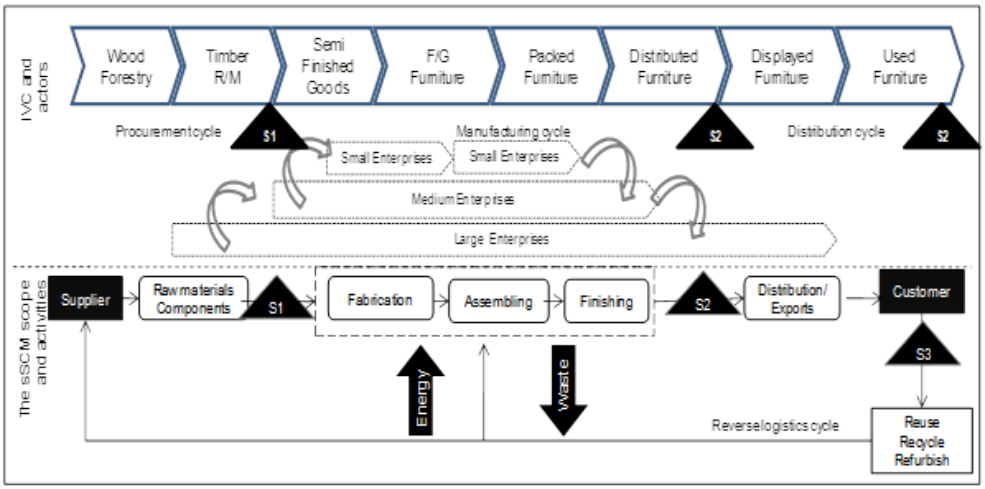

Figure 2: A specific framework of sSCM for furniture production in SMEs

The furniture clusters in Solo Raya are selected for case studies. Their products can be categorized as bedroom (30%), living room (30%), kitchen (20%) and case goods such as bookcases, cabinets and dressers (20%). T he supply chain considers the interactions between a business and its customers and suppliers. The SMEs are heavily dependent to export their products due low quality, little marketing knowledge and a lack of sustainable supply of raw material (Reichert, 2007). The SMEs also have some limitations related to procurement, internal operations and product development & stewardship (Tambunan, 2006; Sutopo, 2006, 2007; Yuniaristanto *et al,* 2009). Key constraints of integrating SMEs into value chains in sSCM are: lack of information about sSCM (what is a sSCM and why it is important; how to implement a sSCM for their business) and SMEs often rely on hierarchical patron-client relations and stratified value chains, with an unequal distribution of benefits. Furthermore, the partnership between the SMEs and the LEs into a part of the furniture sSCM is challenging due to the following important constraints: diversity of constitution of SMEs (with informality and insecure financial resources), lack of managerial capacity and bargaining power to deal with business partners (financial institutions; buyers, and etc) and inadequate market information.

3. A Scheme of PMS in sSCM for Furniture Production in SMEs

SMEs need to recognize that they have to identify, understand and manage issues within their own company in the sSCM issues. The furniture industry in the Solo region has not been able to compete in the global market some possible problems related to sustainability of wood supplies. The SMEs have some barriers for implementing sSCM. To address these issues, it is important to measure problems in current system. It is important to develop a suitable performance measurement system to address SMEs issues including the sSCM scope, structure, and activities. A performance measurement system (PMS) can be defined as the set of metrics used to quantify both the efficiency and effectiveness of actions (Neely *et. al*. 2000 and Bourne *et. al,* 2003). Based on a specific framework of sSCM for furniture production in SMEs, we focus on manufacturing cycle especially for representing the relationship between the SMEs and the LEs including procurement, internal operations and product development & stewardship. Then, we investigate a scheme to highlight a difference between input, process, output, and outcome measures in raw material procurement for furniture manufacturers (Figure 4).

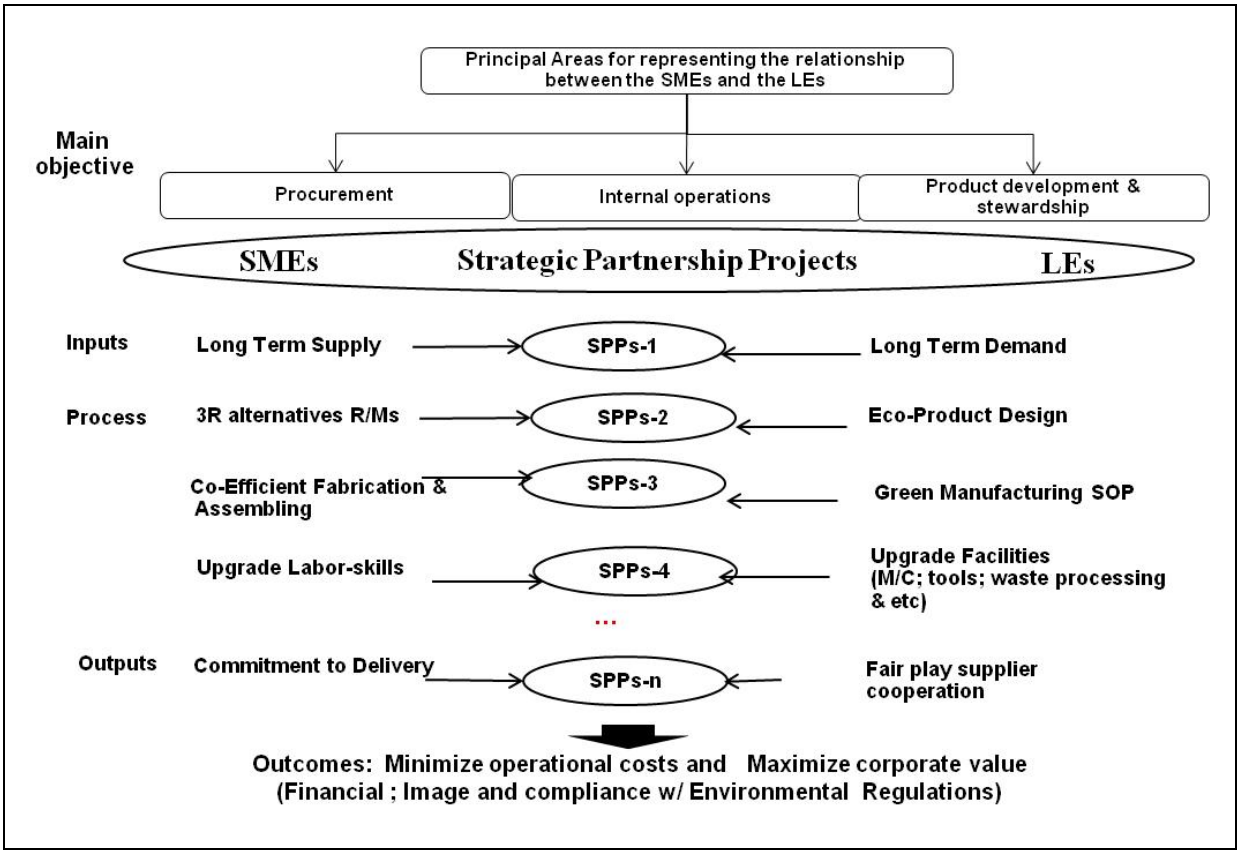

Figure 4: A scheme of PMS in sSCM for Furniture Production in SMEs

Based on Fig. 4., there are some strategic partnership projects between the SMEs and the LEs. The objectives of every SPPs will be investigating problems, extensive field study on industrial practices and experiences, construction of the sustainability furniture production models, and models validation in terms of model structure, behavior, and predictability to solve the problems. The report presents briefly the concept of SPPs, its requirements, activities and outcomes. It makes a proposal for a scheme of PMS in sSCM for Furniture Production in SMEs, which suggests more holistic approach of thinking and way of visualization, incorporating more environmental, social, and economic aspects. To make this proposal clear, a more profound description of the possibilities for action is offered.

4. CONCLUSION

Establishing sSCM for furniture manufacturing in Solo Raya is heavily determined by the relationship between the SMEs and the LEs. The SMEs have some limitations related to procurement, internal operations and product development & stewardship. Therefore, in this study, a specific framework of sSCM for furniture production in SMEs was established. Then, this works give a scheme to highlight a difference between input, process, output, and outcome measures in raw material procurement for furniture manufacturers. It makes a PMS tool for mapping problems of raw material procurement. The following conclusions were summarized:

- The relationship between sSCM establishment and long-term financial for SMES could be presented outcomes not only to minimize operational costs but also to maximize corporate values.
- The SMEs should consider following key performance indicators: long term supply; 3R alternatives R/Ms; Co-efficient fabrication & assembling; upgrade labor-skills; and commitment to delivery.
- This result is pre-study for in detail further researches.

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THE UTILIZATION OF RARE SUGARS (8 KINDS OF KETOHEXOSES) TO CHICKEN SAUSAGE MAKING

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ABSTRACT

Rare sugars are defined as monosaccharides that exist in nature but are only present in limited quantities. Rare sugars have the potential to be used in sweeteners and as food products with new functional characteristics to prevent diabetes, arteriosclerosis and obesity by suppression of lipid accumulation and hyperglycemia. In this experiment, rheological property (breaking strength) and weight loss after cooked of chicken sausages added with different sugar (8 kind rare sugar) were determined. The results showed that the chicken sausage with addition D-Psicose, L-Sorbose, L-Tagatose and L-Fructose have a good reologycal properties than sucrose. The highest value of breaking stress was 1,22 x 10^5 N/m^2 with D-Psicose treatment and the highest value of breaking strain was 36,09 % with L-Fructose treatment. Seven Kinds of Ketohexoses (D-Psicose, D-sorbose, D-Tagatose, L-Psicose, L-Sorbose, L-Tagatose, L-Fructose) were superior to decrease weight loss of chicken sausage than sucrose, The result indicated that rare sugars can improved their ability to hold water in sausage.

Key words : chicken, sausage, rare sugars

BACKGROUND

Chicken meat is an important food for meal which is well accepted by consumers all over the world. It is rich in essential amino acids and comprises high quantity of proteins, hence consumption of meat chicken and meat products such kind chicken sausage is currently growing. Sausage is an emulsion-type meat product and the main ingredients are meat, fat, water, salt, sugar, polyphosphate Sausages being one of the product that are delicious and nutritious due to their high content of protein, fats, vitamins and minerals. Sausages are comminuted and seasoned meat roducts that may be also cured, smoked, molded and heat processed (Judge et al, 1989). The major factors used in determining the quality of fresh sausage are colour, stability, general appearance, cooking properties and eating properties.

Rare sugars are defined as monosaccharides that exist in nature but are only present in limited quantities. There are more than 50 kinds of rare sugars while naturally abundant monosaccharides such as D-glucose and D-fructose are very few in number. Rare sugars such as of D-Psicose showed high antioxidative activity and excellent food properties and is promising as a functional dessert for alderly people (Sun et al., 2007).

Granstrom et al (2004) describe a scheme to display all the rare sugars in a ring-form called an “Izumoring”. There are three different Izumorings, one for tetroses, one for pentoses, and one for hexoses. A scheme was drawn for the production of ketohexoses based upon the network composed of the four groups comprising all of the ketohexoses and hexitols. We can draw a s ymmetric Izumoring comprising of 16 aldohexoses, 8 ketohexoses, and 10 hexitols. All the compounds are connected to each other by enzyme reactions or by hydrogenation reactions.

A ketohexose synthesis strategy using the Izumoring clearly suggests a

way for designing a production process for any ketohexose from D-fructose that can be produced from D-glucose. For example, L-fructose has some interesting properties as a source of energy (Klein et al, 1993) and as an inhibitor for glycoproteins (Muniruzzaman et al., 1996). Following the route of the Izumoring from D-fructose to L-fructose we can facilitate the production method for L-fructose via four reactions. The first step is epimerization of D-fructose to D-psicose by D-tagatose 3-epimerase (Itoh et al., 1995). The second step is reduction of D-psicose to allitol (D-,L-allitol) by oxidoreductase (Takeshita et al.,2000). The third reaction is transformation of allitol (D-,L-allitol) to L-psicose by oxidoreductase. The final step is epimerization of L-psicose to L-fructose by D-tagatose 3-epimerase (Itoh et al, 1995).

In sausage making, after all ingredients are mixed together, meat emulsion is obtained and sausage is formed after heated, Therefore emulsifying and gelling properties are required in sausage making. T exture of sausage usually determined by viscoelasticity, high viscoelasticity indicates a good texture of sausage. Viscoelasticity is related to gelling property, when gel matrix is formed, water and other liquid substances will be held in this matrix. T herefore, if gel matrix can hold water well, sausage will have better viscoelasticity.

Concerning to health problem, health detrimental ingredients such as fat, NaCl, sucrose and polyphosphate have been tried to omit. Alternative methods to maintain sausage texture with reduced amount or none of unsatisfied substance, such as using pressure, enzyme, or adding with the other ingredients such as rare sugar have been studied (Mugurama et al.,2003).

In this experiment, rheological property (breaking strength) and weight loss after cooked of chicken sausages added with different sugar (8 kind of Ketohexoses) were determined.

MATERIAL AND ANALYSIS

Meat Chicken, salt and sucrose were purchased from local supermarket. D-Psicose (D-Psi), D-sorbose (D-Sor), D-Tagatose (D-Tag), D Fructose (D-Fru), L-Psicose (L-Psi), L-Sorbose (L-Sor), L-Tagatose (L-Tag), L Fructose (L-Fru) were obtained from rare sugar cluster, Kagawa University, Japan. For Sausage making, firstly, meat chicken and salt, polyphosphate and sugar were mixed together by a food processor (Food Processor TK-551, Tescom Japan) for I minute after that added with cold water, the mixture was mixed again by the some food processor for another I minute. Meat batter was left for 15 minute in a bowl with ice outside. After that, the meat batter was stuffed into a cel lulose casing (25 mm d iameter, captain stag Belgium). The stuffed sausages were heated in a water bath at 80^{o}C for 30 minute, cooled down by leaving at r oom temperature for 2-3 hours.The ingredients ratio is showed in Table 1 and the flowchart of research showed in Figure 1.

Table 1. Ingredients in sausage making, different rare sugars were added into sausage

No	Code	Treatment	Material of sausage				
			Chicken meat	Cold Water	Sugar/ rare sugar	polyphosp hate	Salt
1	C	Control/Sucrose	200 g	50 ml	6 g	1 g	4 g
2	D-Psi	D-Psicose	200 g	50 ml	6 g	1 g	4 g
3	D-Fru	D-Fructose	200 g	50 ml	6 g	1 g	4 g
4	D-Tag	D-Tagatose	200 g	50 ml	6 g	1 g	4 g
5	D-Sor	D-Sorbose	200 g	50 ml	6 g	1 g	4 g
6	L-Psi	L-Psicose	200 g	50 ml	6 g	1 g	4 g

7	L-Fru	L-Fructose	200 g	50 ml	6 g	1 g	4 g
8	L-Tag	L-Tagatose	200 g	50 ml	6 g	1 g	4 g
9	LSor	L-Sorbose	200 g	50 ml	6 g	1 g	4 g

To analyze rheological property, sausage were cut vertically for 2 cm thick and measured the breaking strength by creep measurement using a r heometer (Rheoner RE2-3305, Yamaden Japan) Interfaced with a computer for computation of creep phenomena. Furthermore to analyze weight loss, sausage were weighed before and after heating, and was expressed as a precentage, weight loss was calculated by the following formula :

$$\text{Weight loss (\%)} = \frac{\text{Weight after heated} - \text{Weight before heated}}{\text{Weight before heated}} \times 100$$

RESULT AND DISCUSION

Figure 1a. Showed the value of breaking stress of chicken sausage added with D-Psi was 1.22 x 10^5 N/m^2, that the highest value than Sucrose (1,02 x 10^5 N/m^2) and the other rare sugars. The value of breaking stress with D-Sor, D-Tag, D-Fru, L-Psi, L-Sor, L-Tag and L-Fru, were 0.95 ; 0,99 ; 0.99 ; 1,02 ; 1,05 ; 1,07 and 1,11 (x 10^5 N/m^2). Moreover, the value of L-Sor, L-Tag and L-Fru were higher than value of sucrose, that added to chicken sausage.

Rare sugars as a s ausage additive contributes to improving and intensifying some properties of meat, protein, water-binding and emulsifying capacities. But not all kind af ketohexoxes have significance effect to increase of breaking stess value. D-Psi, L-Sor and L-Fru have ability to make meat emulsion In sausage making. Therefore emulsifying and gelling properties are required in sausage making. Texture of sausage usually determined by viscoelasticity, high viscoelasticity indicates a good texture of sausage. Viscoelasticity is related to gelling property, when gel matrix is formed, water and other liquid substances will be held in this matrix. Therefore, if gel matrix can hold water well, sausage will have better viscoelasticity. The result indicated that D-Psi, L-Sor, L-Tag and L-Fru were superior and had acceptable function properties of breaking stress than sucrose.

Both the rheological properties and texture must be correlated with the structure and composition of the meat products. Therefore, evaluating a meat product's rheological properties can help manufacturers to understand its flow and operation properties, estimate the protein network and gelation mechanism, and predict final product texture (Park *et al.*, 1994).

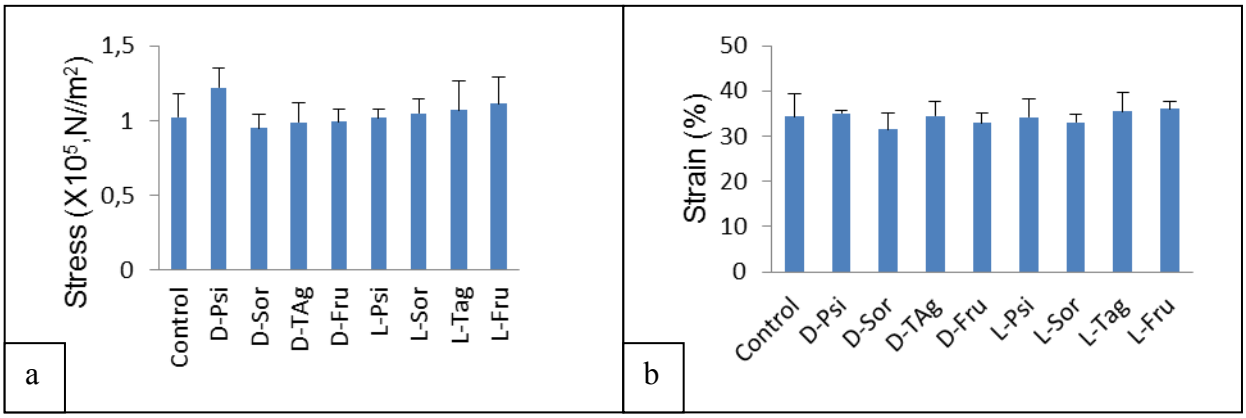

Fig 1. Breaking stress (a) and breaking strain (%) (b) of chicken sausage added with different rare sugars. Each value represents error bars represents standard deviations (n=3).

The other sausage additive have the some function with rare sugars to improving rheological properties of sausage. Salt is the main flavoring agent used in making sausages and it contributes to basic taste characteristics of the final product. Salt also "solubilizes" and extracts the muscle protein on the surface of meat particles. This semi-fluid protein film coagulates during heating, binding the meat particles together and producing a firm sausage texture, most sausage formulations contain 1 to 3% salt. Altough the other sausage additive have the some function with rare sugars to improving the quality of rheology properties, rare sugars have advantages as a functional food to improving in the medical field. Rare sugars such as of D-Psicose showed high antioxidative activity (Hayakawa, 2008). Rare suars can prevent diabetes, arteriosclerosis and obesity (Sun *et al*., 2007).

Figure 1b. showed the value of breaking strain of chicken sausage added with D-Psi was 35,11%. It has higher value than sucrose (34,27%) but lower than L-Tag and L-Fru. T he value of breaking strain with D-Sor, D-Tag, D-Fru, L-Psi and L-Sor were 31,42% ; 34,41% ; 32,93% ; 34,18% and 32,99%. Furthermore, the highest value of of breaking strain of chicken sausage added with L-Fru was 36,09%. Moreover D-Sor, and D-Fru resulting the value of breaking strain lower than sucrose. Chicken sausage properties can be improved with addition some ingredients to increase water-binding and emulsifying capacities. But not all kind af ketohexoxes as a ingredients have significance effect to increase of breaking strain value. D-Psi, D-Tag, L-Psi, L-Tag, L-Sor and L-Fru have ability to increase breaking strain In sausage making than sucrose treatment. The result indicated they treatments were superior function to increase reologycal properties of breaking strain.

As seen in Figure 2, weight loss value of D-Psi treatmant was 10.40%, that the lowest value than other treatment. Furthermore, D-Sor value 11,12% was lower than L-Sor 11,63%, however D-Tag and D-Fru have the higher value than L-Tag and L-Fru. Weight loss value of chicken sausage added with D-Tag and D-Fru were 11,41% and 12,97%. On the other hand, weight loss value chicken sausage added with L-Tag and L-Fru were 11,40 and 11,39.

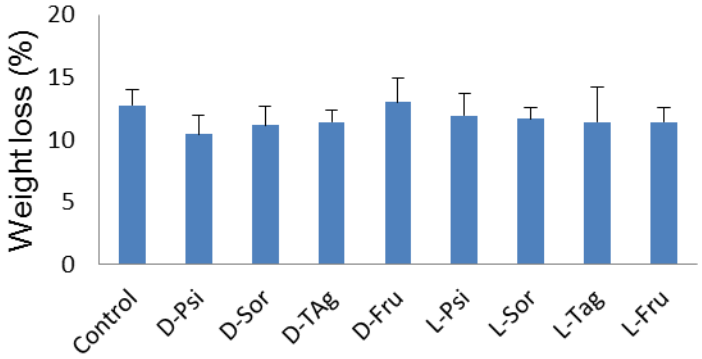

Fig 2. Weight loss of chicken sausage after heated at 80^{o}C for 30 minute. Each value represents error bars represents standard deviations (n=3).

Weight loss is one of the most important properties of emulsion type sausage products as it is related to water holding capacity. Higher water holding capacity of meat decreased weight loss in

final products. Water holding capacity is defined as the ability of meat to retain its own or added water during application of external forces such as cutting, heating, grinding or processing (Judge et, al 1989). Water is added to be retained in many finished sausage products. Water aids the salt in "solubilizing" meat proteins, helps the mixing of the batter and contributes to the juiciness of the final product.. The research result showed that several rare sugars had a significant influence than sucrose to decrease weight loss of chicken sausage. Seven Kinds of Ketohexoses were superior to decrease weight loss than sucrose, On the other hand, one kind Ketohexoses (D-Fru) was inferior than sucrose, because it has higher value of weight loss. The result indicated that rare sugars can improved their ability to hold water in sausage.

CONCLUSION

D-Psi, L-Sor, L-Tag and L-Fru can improved reologycal properties of chicken sausage than sucrose. The highest value of breaking stress was 1,22 X 10^5 N/m^2 with D-Psi treatment and the highest value of breaking strain was 36,09 % with L-Fru treatment. Seven kinds of Ketohexoses (D-Psi, D-Sor, D-Tag, L-Psi, L-Sor, L-Tag, L-Fru) were superior to decrease weight loss of chicken sausage than sucrose, The result indicated that rare sugars can improved their ability to hold water in sausage.

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ABSTRACT

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SUCCUS BASE PRODUCT IN COUGH MEDICINE COMPETITION

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ABSTRACT

OBH Combi become a generic brand for Black Liquid Syrop Cough Medicine in Indonesia since early 90's. Black Liquid Syrop (OBH) has been an old formulation made by pharmacist for more then 100 years and can be made as a compound medicine by the pharmcist. Due to the high demand and pratices by most of pharmacist in Indonesia , Combiphar look as the opportunity to standarize the market by creating a mass production of OBH and branded OBH Combi. The response was very positive because that will reduce the complexity of making it by the pharmacist and also reduce their inventory of raw material as well as standard of giving to the consumer. During the crisis of 1997/98 where most company reduce their marketing expenditure, Combiphar is doing the opposite direction by investing heavly on the brand as well as spreading their coverage nation wide. The situation forced industry players to revisit pricing strategy because of the weakening purchasing power and consumers got smarter which they prefered to choose products with better value for money. With its price advantage in comparison to Multi National Company products, OBH Combi put more investment behind the brand across all areas: production line, distribution forces and brand communication in order to build strong brand awareness, consumers loyalty and trusted image. Using succus as one of key active ingredients, OBH Combi established its position as a long-heritage product that is trusted for its efficacy, a quick solution for cough problem. The brand becomes a leading player in cough medicine, rank no 1 in succus base cough syrup and rank no 2 in cough syrup market.

SUSTAINABLE MINING OPERATIONS AT PT TIMAH (PERSERO) TBK INDONESIA: A HARMONIZATION AMONG STAKEHOLDERS

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ABSTRACT

Facts that mining operation can potentially damage the environment are often understood by the community disproportionately. Mining operation involves a sequential process that can be justified from the aspects of mining, operational safety, financial impact, as well as ecological and environmental. In Indonesia, mining operation should meet environmental guidelines regulated in *AMDAL* (Analysis on t he Environmental Impacts) in the beginning and concludes with environmental restoration or reclamation stipulated in Decree of Director General of Public Works No. 236/1996, Decree of the Minister of Forestry and Plantation No. 146/Kpts-II/1999 and mine closure with the Minister of Energy and Mineral Resources Regulation No. 18/20. Until the year of 2009, PT Timah has done post-mining land reclamation area of 12.460 h ectares (consisting of 75% onshore and 25% ex-mining pond) and in 2010 will also conduct reclamation of another 2000 hectares. The main problem in reclamation is the re-mining by illegal activity that will disturb the environment as the excavation will take place at an already reclaimed land. Reclamation problems faced are: the extremely low level of acidity in post-mining water, minimum amount of top soil in mined area, re-mining, high land surface temperature and minimal rainfall in the dry season. Harmonization among the needs of mining profits by the state through mining royalties and dividends, environmental sustainability for the community and mining business operations should always be conducted to achieve the goals of each stakeholder.

Keywords: post-mining, regulation, operational, reclamation, stakeholders

MICROEMULSION AS DELIVERY SYSTEM FOR ANTIOXIDANT AND OTHER FUNCTIONAL COMPONENT OF FOOD

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ABSTRACT

It is well known that most of the bioactive or functional components in foods are lipophilic. These lipophilic components may include bioactive lipids, flavors, antimicrobials, and antioxidants. Incorporation of these functional ingredients in the formulation of food and beverage products, particularly aqueous-based food and beverage products, can be difficult. One way that the industry has attempted to satisfy these conflicting requirements is to incorporate the water immiscible materials using microemulsions. A microemulsion is dispersion of two immiscible liquids in which the individual droplets of the dispersed phase have an average radius less than about one-quarter the wavelength of light.

Because of thermodynamic stability, microemulsions are easy to prepare and require no significant energy contribution during preparation. Microemulsions have low viscosity compared to other emulsions. The formation of microemulsion is reversible. They may become unstable at low or high temperature but when the temperature returns to the stability range, the microemulsion reforms. Surfactants must be carefully chosen so that an ultra low interfacial tension ($< 10^{-3}$ mN/m) can be attained at the oil / w ater interface which is a prime requirement to produce microemulsions. Concentration of surfactant must be high enough to provide the number of surfactant molecules needed to stabilize the microdroplets to be produced by an ultra low interfacial tension.

The use of microemulsion as delivery systems can improve the efficacy of bioactive lipids such as carotenoids, omega-3 fatty acids, tocopherol, and flavonoid compounds, without undesirable side effect on organoleptic properties of the food or beverage. It can also contribute to long-term shelf stability under typical food and beverage shipping, storage and use conditions.

INTENSIFIED TREE PLANTING ON THE LOGGED-OVER FORESTS IN KALIMANTAN TO PROVIDE MEANS FOR REDD^{+} IMPLEMENTATON: LESONS-LEARNED AND ROADMAP OF SILIN PROGRAM

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ABSTRACT

Massive carbon stored on forests and existing high of deforestation rate make Indonesia potential for any support to retaining carbon, in order to contribute to the global efforts in stabilizing atmospheric CO2 concentration. Initially, REDD architecture has been strongly associated with more conservation approach, and Indonesia has been contributing as a major part in developing this scenario. Unfortunately, as a developing countries, forests play a key role for development, and thus merely conserving forests will be facing various political challenges at ground level. As a consequence of being as development agent, forest is within the condition in a highly dynamics, especially dynamics of carbon (turnover of harvesting-new planting-growth) is very high. To accommodate this, a new rule of play called REDD+ is introduced to allow any carbon gain from a new tree planting on the logged-over forests is being accounted.

To provide insight on how REDD+ is potentially adopted in logged-over forests areas, here we present our experiences in developing an intensified tree planting of dipterocarps in Kalimantan.

BIO-CONSERVATION OF FLORA AND FAUNA AT FIRST FOREST FLOOR AS SECOND SEED DISPERSER IN PAHMUNGAN VILLAGE, KRUI, WEST LAMPUNG [1]

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[1] Paper Presented in GEN Seminar 3 rd and Rispecia 4th Nusa Dua Bali Beach Hotel, August 7- 8 th, 2010
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ABSTRACT

Repong Damar area is one of Community Based Forest Management scheme in Pekon Pahmungan, Krui, West Lampung, that the important habitat for specific flora and fauna. Harianto and Winarno (2008) had been done vegetation dynamic research continuously for 4 years. Following by Dewi and Harianto (2009) who researched fauna biodiversity through interview the community and transect. These research would be as important information and data for the next research to investigate flora and fauna in first forest floor as niche of flora and fauna.

Research had been done for 4 months in 2010 in permanent plot Repong Damar in Pekon Pahmungan, Krui West Lampung and will continue for species identification and analyze the role of flora and fauna in biodiversity cycles especially in the first strata of forest floor. Traps method was used for identification of fauna insect and dung beetles in first forest floor. Literature study and plot base on seedling stage were used for species of vegetation in this area.

The fauna analysis in the first forest floor found mammalia (6 species), aves (7 species), other (11 species), various insect and dung beetles were investigared. Analysis of flora found 3 species: Damar mata kucing (*Shorea javanica*), durian (*Durio zhibethinus*), and duku (*Lansium domesticum*) were a mutual species in our research area. And, dung beetles provide a species for representatives from second seed disperser in first forest floor, tunneller type as bio-resources for seed disperser's role.

“Forest Carbon Budgeting for REDD”

FOREST CARBON BUDGETING FOR REDD TO COUNTER CLIMATE CHANGE

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ABSTRACT

Although COP 13 in Copenhagen in 2009 failed to agree upon the introduction of the REDD (Reducing Emission from Deforestation and Degradation) scheme, it is very likely to be introduced in not so distant future as one of the important post-Kyoto measures of reducing carbon emission globally. Being the incentive to reduce carbon emission for developing countries, the REDD concept is totally different from the reduction obligation of the Kyoto Protocol, but the basic method of accounting forest carbon budget is very likely to be inherited from the Kyoto Protocol, i.e. the "Good Practice Guidance for Land Use, Land-Use Change and Forestry (IPCC 2003)", in which accurate, transparent and complete forest carbon accounting is mandatory. To fulfill this requirement, measurements of forest carbon stock at the term head and term end at least as ground truth for expanding nationally or regionally by remote sensing or by modeling are inevitable. Similarly as in the Kyoto Protocol, several options should be available in terms of tier levels as well as of the means of data retrieval. In this session, on top of their forest and forestry status, technical, political and social preparedness for REDD of several selected countries are discussed for smooth introduction of the forthcoming REDD scheme.

ISSUES IN AND SOLUTIONS FOR FOREST

CARBON BUDGETING IN LAOS

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ABSTRACT

Laos is a r elatively less developed country, which however has started implementing economic reforms in the 1980s. Laos is a multi-ethnic society consisting of more than 49 ethnic groups, they house holds are dependent on forests for collection of wood and NTFP for own consumption and sales with different

degrees and many of them practice shifting cultivation. The government of Lao PDR gives the important of about avoiding catastrophic climate change, we need to limit global warming resulting from increased concentrations of greenhouse gases in the atmosphere. This means limiting and reducing global net emissions. But how and why and where a carbon budget comes in.

Issues in solutions are such as:

- Lack of alternative livelihood or production systems to replace shifting cultivation in remote areas and access to market together with lack of social services such as education and health care

- Incomplete land use planning including forest zoning and village level land use planning and land titling and insufficient resources for management of each land or forest zone

- Unclear resource and land tenure
- Weak coordination between sectors
- Weak law enforcement and governance
- Insufficient understanding or ignorance of existing laws and regulations by business people and local people
- Limited human and financial resources

TOWARD GOOD PEATLAND GOVERNANCE: CHALLENGES IN ACCOUNTING OF CARBON IN TROPICAL PEATLAND

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ABSTRACT

Due to rapid peatland utilization for economic activities, about half of peatforests in Indonesia has switched from previously very efficient carbon sequestering into a massive carbon emittor system and contribute to significant global emission hot-spot. This emission is largely due to peatland drainage and human-related fire during land preparation. Any efforts that merely based on conservation has been proven to be very challenging , since peatland is now considered as major arable land available to many districts in Sumatera, Kalimantan and Papua. Increasing land-based economic activities following decentralization and expanding plantations for supplying palm oil and pulp-paper has increased draining and cultivation of peatforests. In the current national issue where comitment on reducing the emission is being implemented and get various global supports, existing peatland opening is becoming a major leakage of green house gas emission and need to be strictly monitored.

We will present recent study located in one amongst largest tropical peatland areas in Sumatera ie. Kampar Peninsula (700,000 ha) (Riau province which totally composed of about 4-6,7 million Ha deep peatland). to share our findings and challenges in an efforts to understand process controlling carbon stock-flux components incl. impacts of land management, and how to upscale carbon stock and flux at landscape scale predicting pattern under disturbance (human intervention, climate change). This information will be next promoted to provide means for supporting good peatland governance, especially that all peatland management should satisfy environmental issues to reduce emission, whilst at the same time any established production system o peatland should also satisfy long-term sustainability and not adding the existing abandoned land.

ISSUES AND CHALLENGES IN IMPLEMENTING REDD SCHEME IN PARAGUAY

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ABSTRACT

Forest cover in Paraguay had massive changes in the last decades. In the Eastern region, where almost 95% of the population live, forest cover was reduced to 8% of what existed in 1945. This situation has threatened several species of animals and plants and it has also caused a reduction in the stock of wood fuel which is the main energy used by the population. Simultaneously to this rapid decline of forest cover, Paraguay is suffering from intense degradation processes which are mainly driven by forest fires. By the year 2007, fire had burned 500,000 hectares under severe drought conditions with more than 100,000 people affected.

This scenario has that Paraguay would be one of the pilot countries of the Latin American and Caribbean region to implement the UN-REDD Programme. Currently, its National Joint Programme (NJP) is under development but there are aspects that should be strengthened. Data access procedures are needed considering that National IPCC reporting requirements suggests that all relevant data should be made available in a national forest carbon information system. A national forest carbon inventory needs to be established in order to get precise information. Therefore, human and technical resources are needed for field work, measurements and data interpretation and analysis.

Complementarity with other initiatives can facilitate the implementation of NJP such as monitoring strategy implemented by Forestry National Institute, establishment of permanent plots along Paraguay by National University of Asuncion and the possibility of installing CO_2 monitoring devices and other equipment financed by Japan International Cooperation Agency (JICA).

PROCESS FOR ESTABLISHING REDD BASELINES IN VIETNAM

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ABSTRACT

Forests, especially tropical forests, play a major role in the sequestration of atmospheric carbon; they offer great potential for reducing greenhouse gas emissions. Recognizing the importance of tropical forests in the climate change mitigation efforts, proposals have been being advanced to compensate tropical forest countries for reducing emissions from degradation and deforestation (REDD) as part of a future international climate agreement. Although the international community failed to reach a binding REDD agreement at the end of 2009 (COP15 – Copenhagen), a number of key issues are extremely to be the parts of REDD will be implemented in future. A baseline is an essential precursor to a viable and robust international compensation scheme for REDD; it provides a benchmark against which emissions reduction can be calculated. An important obstacle to REDD project development is the lack of data for baseline definition. The government of Vietnam wants to promote REDD projects and had set up the necessary institutions for REDD. Some projects have been being conducted to calculate the carbon emissions of Vietnam for establishing its national REDD baselines, but they are in small scale due to lacks of technical standards and insufficient finance. Therefore, Vietnam needs not only finance but also technical assistances from international organizations and developed countries. This report focuses on some initial results, the difficulties and the requirements for establishing REDD baselines in Vietnam.

ESTIMATION OF BELOWGROUND BIOMASS AND CARBON STOCK IN SECONDARY FORESTS AND RUBBER AGROFORESTS IN JAMBI, CENTRAL SUMATRA

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ABSTRACT

In recent decades, deforestation of tropical forests has accelerated and valuable natural resources have been lost. Forests are important in controlling CO_2 concentration in the atmosphere. They absorb CO_2 during photosynthetic process and store it as organic material in plant biomass. Objective of this study is to estimate belowground biomass and carbon stock in secondary forests and rubber based community forests. In this study, two types of vegetation cover, secondary forests and rubber based community forests were selected. In each type, three semi permanent plots with size 20m x 20m were established. Inventories of all trees with diameter at breast height (dbh) of more than 2 cm in each plot were done; the trees were numbered, identified their names, and measured their dbh. To estimate the belowground biomass, 10 trees in each vegetation type were selected and used as destructive samples. The ten trees were chosen based on species and range of stem diameters (dbh). Allometric relations between *dbh* and the total dry weight (*TDW*) of belowground biomass were formulated and discussed based on the obtained data. Estimated amounts of carbon stocks in the belowground biomass of the forest types will be discussed in this paper.

Keywords: belowground biomass, carbon stock, secondary forest, rubber agroforest

COULD WE EXPAND FORESTS AREAS IN INDONESIA ?: LESSONS LEARNED FROM COMMUNITY FORESTS DYNAMICS IN ACROSS JAVA WITHIN THE LAST 20 YEARS AS REVEALED BY SATELLITE IMAGERIES

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ABSTRACT

Forest cover occupies more than 70% of total terrestrial ecosystem in Indonesia. However, deforestation and forest degradation is widely occur in Indonesia and thus many efforts have been promoted to maintain existing forests areas or even to increase forest areas under activities to strengthen the national capacity to stabilize atmospheric CO_2. Whilst many regions are strongly characterized by lossing of their forest areas and now is struggling to re-planting their deforested-degraded areas. There are many challenges in re-forestation in outer of Java. In contrast, in Java, forests area is steadily increasing in term of quality and quantity. This is despite much higher population pressure on forests in Java.

In this paper, we will share our study on quantification of dynamics of forest area under community concessionaires (owned small-holders). Time-series (1990-2008) of Landsat ETM +7 and Spot imageries were used and were ground-truthed in across 20 districts in order to derive time-series carbon-based or land-cover map of community forests in Java. This study found that increasing forest cover under high population areas in Indonesia is inevitable.

STAND STRUCTURE AND SPECIES COMPOSITION IN RELATION TO CARBON BUDGETING MAU FOREST, KENYA

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ABSTRACT

Mau forest has undergone serious degradations over the past decades ranging from illegal logging to settlements. This study was to assess the aboveground biomass, species composition and horizontal structure of the forest to understand its ecological state. The study was conducted in 7 plots each measuring 30 x30m over 2,000 m a.s.l. A total of 254 individuals, belonging to 19 families, 21 genera and 25 species were inventoried. The preliminary result shows that the most common family was the Apocynaceae representing 22.8%, while Alangiaceae, Podocarpaceae, and Flacourtiaceae, each with over 10%. The most common species *Rauvolfia caffra* accounted for 22.8%. Shannon diversity index for the families was 2.56 indicating the level of diversity. Diameter size for all species combined followed the reverse *J*-curve, typical of uneven aged mixed forests with the class of 10-14.9 cm recording the highest number of occurrence. The forest supports a basal area of 24.3 $m^{-2}ha^{-1}$ and aboveground carbon stock of 214 Mg C ha^{-1}. The biomass of *Rauvolfia caffra,* a dominant species, accounted for over 10% and the total estimates compared to other tropical rainforests in Asia and Africa is similar.

LAND-COVER CLASSIFICATION OF DEGRADED PEAT SWAMP FOREST USING AIRBORNE LASER PROFILING

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ABSTRACT

A preliminary land cover classification of degraded peat swamp of Central Kalimantan, Indonesia was conducted using Airborne Laser Profiling (ALP). Field observation prior to the present analysis revealed six cover types, i.e. logged forest, drained forest, grassland, farmland, burn and fallow/bush, of which the last two cover types were spared in the present analysis covering a sample area of 40 km^2 and focusing especially on forest type classification. Of various quantitative measures of vegetation such as spatial distribution of foliage deducible from ALP, only vegetation height and cover density were used in this preliminary analysis.

The result of this bivariate analysis revealed that distinction among the four cover types, i.e. logged forest, drained forest, grassland and farmland is basically possible. Although the present bivariate classification still leaves considerable overlap respectively between the logged and drained forests as well as between the grassland and farmland, introduction of variance or skewness of canopy height, or laser reflection hierarchy (i.e. spatial distribution of foliage) as the third variate would easily resolve the overlap. With more variates closely representing vegetation structure and configuration reducible than from the satellite, ALP has greater potential of accurate and versatile land-cover classification then does the satellite image which is widely used today.

ESTABLISHMENT OF NATONAL FOREST DATABASE FOR REDD IN VIETNAM

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ABSTRACT

Forests play a signicant role in maintaining the ecological balance besides providing various benefits to society. Further, maintaining forest ecosystems can contribute to increased resilience to climate change. It is a well known fact that deforestation and forest degradation, through agricultural expansion, conversion to pastureland, infrastructure development, destructive logging, fires etc., account for nearly 20% of global greenhouse gas emissions, more than the entire global transportation sector and second only to the energy sector. It is now clear that in order to constrain the impacts of climate change within limits that society will reasonably be able to tolerate, the global average temperatures must be stabilized within two degrees Celsius. This will be practically impossible to achieve without reducing emissions from the forest sector, in addition to other mitigation actions.

The study is aimed at the finding of biotic pressure on the forests management, establishment of forest database for REDD. The methods consisted of both on screen visual interpretation of satellite image data for the preparation of forest type and density maps and forest inventory data related to the study. The entire spatial and non-spatial database were integrated, analyzed and modeled under GIS software. The study revealed the assessment of total area, suitable with respect to its technical. Results show that the totally Vietnam has forest areas of 13.12 mil ha accounting for 38,7% of the total natural land of the country and Total timber volume for the whole country were about 751.5 mil m3; and 8.4 bi ll bamboo stems by 2008 forest inventory. Forest covers in Vietnam changes drastically from 1943 to 1990, slightly from 1990 to 1995 and increase from 1995.

Establishment of forest database was to use the experiences, techniques and develop methodologies for extracting information useful for other forestry and ecological studies, techniques for extracting quantitative information, information for the use of the forest resources protection and conservation, forest ecosystem studies and studies pertaining to forest's role in climate using satellite remote sensing also have been initiated in the country. Land use study in Vietnam get more and more attention with using remote sensing and GIS technique and with more emphasis on socio-economical factors and human dimension.

PRESENT STATUS OF REDD-RELATED PROJECTS IN PNG

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ABSTRACT

Papua New Guinea (PNG) signed the Kyoto Protocol (KP) in 1997 and ratified in 2000. Under the United Nations Framework Convention on Climate Change (UNFCCC) all Parties are requested to report their GHG emissions in their respective National Communications.

The country reported its First National Communication to the UNFCCC in 2004 and is now working on the Second National Communication, which it hopes to present during the Conference of Parties (COP16) in Cancun, Mexico in December 2010.

PNG will be utilizing the Inter-governmental Panel on Climate Change (IPCC) *Good Practice Guidelines* (GPG) and *Guidance* methodologies to report starting from Tier 1 and work towards Tier 3 approach 3.

This presentation provides an overview on PNGFA (PNGFRI's) role in the development of a methodological strategy for implementing REDD projects and undertaking pilot/demonstration activities within the readiness phase.

PNG is currently embarking on a development plan that incorporates a REDD+ strategy through inclusive multi-stakeholder consultations and building capacity in monitoring, reporting and verification (MRV). This cross sectoral approach will allow all relevant government agencies and stake holders to collaborate in implementing and facilitating the process of carbon stock assessment and budget accounting as well as initiating pilot REDD and CDM projects in the country.

PROCESS FOR ESTABLISHING REDD BASELINE IN LAOS

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ABSTRACT

The approach to determine national baseline for measuring reduced emission from deforestation and degradation (REDD) has emerged as central to negotiation over a REDD mechanism in a post-Tokyo policy framework. The baseline approach is critical to the success of a REDD mechanism because it affects the quantity, credibility and equity of credits generated from efforts to reduce forest carbon emission.

REDD (Reducing Emissions from Deforestation in Developing countries) is now a commonly shared concept of conserving forests as a climate mitigation strategy by providing incentives for the conservation of carbon stored in existing forests. REDD is considered a cost-effective way to reduce emissions which could contribute to sustainable forest management in developing countries.

Base on t he COP 13 Decision on "reducing emissions from deforestation in developing countries: approaches to stimulate action" paved the way for further work on REDD by encouraging the Parties to build capacities for

i) data collection,
ii) emissions estimations and monitoring and
iii) to undertake demonstration activities to enhance forest carbon stocks.

The Process for establishing REDD baseline in Laos must be followed: Joint Forest Carbon Partnership Facility in 2015 A ssigned Responsibility Agency, and Forming REDD Task Force in 2015, Negotiate with Donors on REDD Programmes (incl. Bilateral and International Organisations), Conduct Joint-Feasibility Studies for Establishing the Pilot REDD Programmes and Capacity Building on REDD.

“Functional Food”

EVALUATION OF FOOD FUNCTIONS BY ANIMAL CEL CULTURE AND EXPERIMENTAL ANIMALS

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ABSTRACT

Animal cell culture has become an essential tool for the study of most biochemical and physiological processes. Many kinds of functions of foods and foodstuffs can be evaluated by cell culture techniques by using various cell types. On the basis of the evidence obtained by cell culture, we examine the functions of food in mice or rats.

We are revealing some kinds of physiological functions such as immunostimulation activity, allergy suppression activity, anti-metabolic syndrome activity, and anti-cancer activity by using various cell lines. In addition to cell lines, we use primary immune cells from murine immune tissues such as spleen, Peyer's patches, and mesenteric lymph nodes (MNL) for *in vitro* assay. Primary immune cells are very useful for evaluation of the effects of substances on varieties of immune cells. Following *in vitro* assay, the effect of the substance *in vivo* may be examined. We normally use mice for revealing the food functions in the body. Mice are orally given substances for several weeks and examined various responses in the body.

An extensive screening of various foodstuffs revealed that a water-soluble fraction of kale (*Brassica oleracea*) has an immunoglobulin (Ig) production stimulating activity on human–human hybridoma HB4C5. The stimulatory effect was also observed on lymphocytes from MNL and Peyer's patches from mice administered with kale extracts for 14 days. Kale extracts were purified by anion-exchange chromatography and subjected to ESI-LS-MS/MS analysis to identify the active substance. The result indicated that the active substance is ribulose-1,5-bisphosphate carboxylase/oxgenase (RubisCo).

ALLERGY SUPPRESSION ACTIVITY OF GREEN CRAB EXTRACTS

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ABSTRACT

Allergic diseases such as pollinosis, atopic dermatitis, and allergic asthma are global health problem and increasing in the number of patients. These allergic diseases are triggered by immunoglobulin (Ig) E produced by lymphocytes. Hence, we have screened IgE production-suppressing factors in food stuffs to develop anti-allergy functional foods. As a result of screening, we found that extracts from green crab (*Carcinus maenas*) suppress IgE production by human myeloma U266 cells *in vitro*. In addition, we examined whether green crab extracts suppress allergic response in allergic model mice. Female 6-week-old BALB/c mice were induced allergy reaction by intraperitoneal injection of ovalbumin (OVA), and the mice were orally given green crab extracts or 10 mM NaPB as vehicle for 28 days. After the experimental period, Ig levels in mice sera and cytokine production of splenocytes were measured by enzyme-linked immunosorbent assay. Furthermore, Igs and cytokines mRNA expression levels in splenocytes were measured by quantitative real-time PCR technique. As a result, oral administration of green crab extracts significantly decreased total IgE level in serum as compared with control mice. The production of interleukin (IL)-4 known as one of the Th2 cytokines inducing IgE production was significantly suppressed by uptake of green crab extracts. Moreover, *ex vivo* assay revealed that green crab extracts down-regulate IgE and IL-4 mRNA expression levels in splenocytes. These results indicate that green crab extracts might suppress allergy response not only by suppression of the IgE production by lymphocytes, but also by improvement of Th1/Th2 balance *in vivo*.

IMMUNOGLOBULIN PRODUCTION STIMULATING FACTORS IN CITRUS PEEL

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ABSTRACT

Auraptene (AUR) and b-cryptoxanthin (b-CRP) are well-known components in citrus peel, and possess several physiological functions such as anticancer effects. We focused on the immunoregulatory functions of AUR b-CRP.

We investigated the immunoglobulin (Ig) production stimulatory effects of AUR and b-CRP on human-human hybridoma HB4C5 cells, splenocytes, and mesenteric lymph node (MLN) lymphocytes from BALB/c mice. The amounts of Igs and cytokines produced by immune cells in culture medium were measured by ELISA. The effects on gene expression levels in hybridomas and lymphocytes were examined by quantitative real-time RT-PCR technique. AUR was administrated to female 6-week-old BALB/c mice for 2 weeks to investigate the effects *in vivo*. After administration, the activities of splenocytes and MLN lymphocytes from mice were examined *ex vivo*.

b-CRP dose-dependently enhanced IgM production by HB4C5 cells. AUR also stimulated IgM production by HB4C5 cells about 2-fold. Gene expression level in HB4C5 cells was stimulated by both b-CRP and AUR. IgA and IgG production by splenocytes from BALB/c mice were obviously enhanced by b-CRP or AUR treatment *in vitro*. Real-time RT-PCR analysis revealed that AUR and b-CRP accelerated IgA mRNA expression level in lymphocytes to enhance IgA production. In addition, IgA, IgG, and IgM production by MLN lymphocytes were also increased.

AUR was orally administered to BALB/c mice for 2weeks, and immunostimulatory effect of AUR *in vivo* was examined. AUR significantly activated IgA, IgG, and IgM production of splenocytes and MLN lymphocytes, though it was not affected serum Ig levels at all.

PREBIOTIC EFFECT OF ARROWROOT AND SWEET POTATO

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ABSTRACT

Modern consumers are increasingly interested in their personal health, and expect the foods they eat to be beyond tasty and attractive also safe and healthy. Recently acute and chronic gut disorders continues to increase. As efficient therapies are few, attention has turned towards the use of so called functional foods to mediate against gut disorder. Prebiotic effects in the gut can be evaluated on the basis of the growth of health promoting bacteria such as lactobacilli and bifidobacteria as well as the decrease in intestinal pathogens. Sweet potato and arrowroot are the local tubers found in Indonesia and are containing of high dietary fiber. Our study on the functional properties of these local tubers indicated that sweet potato and arrowroots potentially used as prebiotics. Sweet potato fiber contained oligosaccharides (verbacose), while arrowroots contained raffinose and stachyose which had health benefit to the gastrointestinal tract. Sweet potato fiber extract increased the population of *Lactobacillus acidophilus* and found to be very useful in preventing diarrhea caused by bacterial pathogens in rats. Supplementation of arrowroots flour in the diet improved intestinal health of *Sprague Dawley* rats as indicated by increasing number of *L. acidophillus* and *Bifidus* cells and surpressed *Clostridia* and *Eschericia coli*. Further study is needed to evaluate the application of those local tuber as functional foods.

Key words: prebiotic, sweet potato, arrowroot, local tubers

IMMUNOMODULATORY EFFECT OF INDIGENOUS PROBIOTIC : IN VITRO AND IN VIVO STUDIES

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ABSTRACT

Probiotics can communicate and cooperate with the immune system to organize cooperative strategies. They stimulate the body's immune cells, activating the cell-mediated responses, the humoral responses, and indirectly, the body's barrier mechanism through immunoglobulin production. They stimulate T-cells, B-cells, macrophages, NK-cell, and production of cytokines.

The aim of the research was to to evaluate the immunostimulatory effect of heat-killed indigenous probiotics (*Lactobacillus acidophilus* Dad13, *L. plantarum* Mut7, *L. acidophilus* D2, and *L. acidophilus* N2) in HB4C5 cell-line and Balb/c mice. The HB4C5 cell line is the fusion product of human B lymphocytes from a lung cancer patient and human fusion partner NAT-30 cells. *Lactobacillus acidophilus* Dad13 was isolated from "dadih" (fermented buffalo milk of West Sumatera). *L. plantarum* Mut7 was isolated from "gatot" (fermented cassava of Yogyakarta). *Lactobacillus acidophilus* D2 and *Lactobacillus acidophilus* N2 were isolated from the fecal material of newborn babies in Sardjito Hospital, Yogyakarta. The probiotic was prepared by heat-killed the cell suspension at 80 ^{o}C for 10 min. The concentrations of probiotic cell were 10^9, 10^8, 10^7, and 10^6 cell/ml. The female Balb/c mice were obtained from ACTL, Ehime University, Japan.

The results showed that Dad13, Mut7, and D2 stimulated the IgM production in HB4C5 cell-line, whereas N2 did not. The IgM production was higher in the highest cell concentration (10^9 cells/ml). *In vivo* animal study showed that all strains did not stimulate the IgA, IgG, and IgM production in serum and splenocyte, might be due to the short oral administration (7 days). In further study, Mut7 could enhance the production of TNF-α and IFN-γ in mice splenocyte, and enhanced the production of IgA in serum of Balb/c mice administrated with Mut7 for 14 days.

As a conclusion, heat-killed probiotic bacteria *L. plantarum* Mut7 enhanced the immune responses *in vivo* after 14 days supplementation.

THE EFFECT OF ARROWROOT (*Maranta arundinacea*) ON IMMUNOSTIMULATION RESPON *in vitro*, SCFA AND PHYSICO-CHEMICAL PROPERTIES OF RATS COLON

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ABSTRACT

Arrowroot (*Maranta arundinacea*.L) is a local product in Indonesia potentially to be developed as functional food. The objectives of this research was to evaluate the immunostimulation effect of arrowroot extracts and effect of diet supplemented with arrowroot flour on physical and chemical properties in rats digesta. Arrowroot starch was added on s plenocyte and the amount of immunoglobuline was measured by enzyme-linked immunosorbent assay (ELISA). *In vivo* study was conducted using *Sprague Dawley* rats with AIN93 diet as a control and arrowroot diets. The results revealed that arrowroot starch has immunostimulation effect *in vitro*. Diet with the arrowroot flour decreased pH value of rat colon, enhanced short chain fatty acid (SCFA) concentrations and molar proportion of SCFA especially butyrate and increased water content of digesta. It can be concluded that supplementation of arrowroot powder in the diet improved physico-chemical properties of rat digesta toward colonic healthy.

Key words: *arrowroots, immonostimulation, SCFA, colon*

“Molecular Genetics of Tropical Rain Forest”

CHLOROPLAST DNA POLYMORPHSIM IN THE LOCAL POPULATIONS SERAYA (*Shorea curtisii* Dyer)

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ABSTRACT

Seraya (*Shorea curtisii* Dyer) belongs to the Red Meranti group and broadly distributes in hill dipterocarp forests in Malay Peninsula and northeastern coastal part of Borneo (North of Rajang River). We determined 2,480bp of cpDNA non-coding regions (trnH-psbA-trnK, trnL-trnF) for 6 populations in Malay Peninsula and 2 populations in Borneo, and found 13 nucleotide subtitutions, which determined 12 haplotypes. Phylogenetic analysis revealed two distinctive groups of haplotypes; one in Malay Peninsula with 9 haplotypes and the other in Borneo with 3 haplotypes. In each haplotype group, one common haplotype type with high frequeciy was found. It is shown that all of the other haplotypes were derived from one of these two common haplotypes. No haplotypes, which were shared in two regions (Malay and Borneo) were found. High genetic differentiation between the regions (F_{ST} = 0.959, d_A = 0.00159) and low genetic differentiation among the populations within the regions (F_{ST} = 0, d_A = 0.00000) were found. Tajima's D was -2.0023 ($P < 0.05$) in Malay Peninsula. This shows Seraya populations had experience bottle neck followed by rapid expansion in this area. The value was negative (D = -1.1624), but was not significant in Borneo. Sequence analysis with other Red Meranti species revealed that the sequences in at least two haplopypes of Seraya in Malay Peninsula was shared with other species. This suggests Seraya originated in Malay Peninsula.

ANTIOXIDANT POTENTIAL OF INDONESIAN MEDICINAL PLANTS GROWING IN EAST KALIMANTAN

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ABSTRACT

Important phytochemicals are extensively isolated and identified from a large number plant at different levels. An important aspect where the phytochemicals have been used is an antioxidative mechanism to control free radicals. Free radicals are reported to generate cataract, cancer and various degenerative diseases. Flora of East Kalimantan appears to be a rich and interesting source for supplementary ethnomedicinal and phytochemical studies. In this paper, the scavenging activity toward free radical propagation and toxicity against brine shrimp of some Indonesian medicinal plants growing in East Kalimantan were reported. Extractions of the 15 dried powdered plant samples were performed using ethanol at room temperature. A free radical scavenging activity against a common stable radical, DPPH (1,1-diphenyl-2-picryl hydrazil) was assayed to evaluate the antioxidant activity of the plants. Toxicity of the plant extracts against *Artemia salina* was evaluated using the brine shrimp lethality test. Result of free radical scavenging assay indicated that *Murayya koenigii*, *Cinnamomum burmanni* and *Syzigium polyantha* have potential as natural antioxidant with more than 80% DPPH scavenging activity and low toxicity against brine shrimp. The results also suggest that the level of antioxidant activity in the selected plants varies to a great extent. Of the plant extracts tested, toxicity against brine shrimp was displayed by *Eugenia aquea* and *Phaleria macrocarpa* which caused more than 50% mortality. Upon achievement of this work, and using more plant samples, an extra benefit of these medicinal plants may be found.

SHOREA PROJECT: A COLLABORATIVE RESEARCH ON GENETIC VARIATION OF SHOREA SPP IN INDONESIA

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ABSTRACT

Indonesia is the region of highest species diversity of Dipterocarpaceae, particularly *Shorea* which is the most popular genus. The diversity of *Shorea* is under assault from deforestation and habitat alteration. Attempts to maintain the existing genetic variation of this important genus need to be taken urgently. However, efficient selection and design for genetic conservation of Shorea require good understanding of the genetic diversity and its dynamics in time and space at all levels. Through two collaborative project initiatives (2003-2005) funded by German Research Foundation (DFG) and ASEAN-EU University Network Program (AUNP), Faculty of Forestry IPB took part and co-implemented several activities aiming at determining genetic variation of Shorea spp and building capacities on conservation of tree genetic resources. This paper presents the outputs and outcome of the activities and discusses the possible future impacts on effective science-policy interfacing with regards to sustainable utilization of forest tree genetic resources.

Keywords: Shorea, genetic variation, sustainable forest management, conservation, science-policy interfacing

CHLOROPLAST DNA VARIATION OF *Shorea leprosula*, MIQ IN BORNEO DETECTED BY MICROSATELLITE MARKERS

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ABSTRACT

Shorea leprosula, Miq is member of dipterocarpaceae family. It is ecologically and economically important in Indonesia. In present study, we used chloroplast microsatellite to observe the haplotype distribution and to assess the variation within and among populations of *S. Leprosula* from Borneo. Based on chloroplast microsatellite analysis, two haplotypes were observed for *S. leprosula*, namely haplotype H1 and H2, respectively. The low chloroplast DNA haplotypes variation is closely related with chloroplast DNA characteristics such as slow mutation rates The value of genetic differentiation measured for *S. leprosula* was G_{st} = 0.071 (H_t = 0.072; H_s = 0.066). The G_{st} values in this study is lower than the mean G_{st} value estimated in angiosperms plant for maternally inherited.

Key words: Shorea leprosula, Chloroplast DNA, Genetic Variation, Microsatellite markers

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“Plant Factory”

EARLY DETECTION OF DROUGHT STRESS IN TOMATO PLANTS WITH CHLOROPHYLL FLUORESCENCE IMAGING SYSTEM IN GREENHOUSE

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ABSTRACT

The speaking plant approach (SPA) is a highly sophisticated concept for environmental control in current greenhouses. This concept is defines the optimal plant cultivation conditions should be achieved by monitoring the physiological status of the plants. The first and most important step of SPA is to obtain plant physiological information and then to judge whether or not the plant is healthy. For this purpose, imaging techniques have been thoroughly investigated. Chlorophyll fluorescence imaging technique is useful to evaluate the photosynthetic functions of plant body. In our previous study, we developed a chlorophyll fluorescence imaging system for the measurement of chlorophyll fluorescence images of tomato plants in greenhouse. This system images chlorophyll fluorescence induction phenomenon, a dynamic change in chlorophyll fluorescence intensity induced by an excitation light under dark condition and analyzes the shape of the induction curve, i.e. the time course of the chlorophyll fluorescence intensity during this phenomenon. The shape of the induction curve is characterized with the initial maximum peak (P), the following transient dip (S) and secondary small peak (M). We defined a photosynthetic function index (PFI; the fluorescence intensity of P divided by the average fluorescence intensity from S to M) to evaluate the shape of the induction curve. In this study, we applied this system to detect drought stress in hydroponically-cultivated tomato plants in a greenhouse.

UNFAVORABLE EFFECTS OF TROPICAL ENVIRONMENTS ON MELON (*Cucumis melo*) FRUIT QUALITY IN THE SIMPLE GREENHOUSE

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ABSTRACT

In the food production using hydroponics, fruit quality that produced is often better than that from conventional method (soil culture). This system was frequently used as model experimental system,however, tropical environmental conditions affect fruit quality in the hydroponics food production especially in the simple tropical greenhouse which is not environmentally controlled in.

Simple hydroponics food production using Melon (*Cucumis melo*) was cultivated in the simple greenhouse, without any controlling of environments, such as temperature, relative humidity and solar radiation. Fresh melons from hydroponics were evaluated through physical (fresh weight and diameter) and chemical (firmness, acidity, color evaluation, water content, sugar content, and sensory evaluation) for quality parameter and compare with that produce from soil culture.

Melon plant can not growth well on the hydroponics enclosed in simple tropical greenhouse, caused variability of air temperature, especially of high air temperature (37-40^{o}C) on the greenhouse and also in nutrient solution of hydroponics that frequently occurred. Melon fruit that produced in this cultivation could not perfectly made the net, fully change of the color, smaller the physical parameter, and relatively lower of quality on the chemical parameter compare with that produce from conventional method in soil culture. Furthermore, we need this information to develop and anticipate unfavorable effects on the automatic hydroponics food production for melon in tropical greenhouse.

A CONCEPT OF CUSTOMIZABLE AGRICULTURAL PRODUCT: KANSEI ENGINEERING APPROACH TO PLANT FACTORY

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ABSTRACT

Today's products are often sold in saturated markets in competition with many similar products. Each product needs to offer features which make it distinguishable and affective. A customizable product is a product which is produced with some affective features to satisfy consumers. Up to date, there is no concept for applying customizable product to agricultural products. The main problem of agricultural product is its dynamic features due to hardly controllable biological activity. In this paper, a concept of customizable agricultural product using Kansei engineering approach to plant factory was proposed. Kansei engineering is a consumer-oriented technology for product development. Kansei is a Japanese word which means a consumer's psychological image and feeling regarding a product. When a consumer wants to buy an agricultural product, he or she has an image of the product such as "Fresh and Delicious". In addition, consuming agricultural product could stimulate the different feeling such as "Energetic, Vigorous and Lively". Kansei engineering approach enables translating such kind of consumer images and feelings to the product features. Plant factory can be used as the problem solution to produce customizable agricultural products. Plant factory is defined as a production system in which plants are under continuous production control throughout the growth period until the harvest. Since environmental factors in a plant factory are observable and controllable, biological activity can be controlled to provide affective product features. A concept of customizable agricultural product was proposed to provide potential value added product in terms of consumer-driven agriculture.

SIMULATION STUDY OF TROPICAL GREENHOUSE ENVIRONMENTS UNDER SEVERAL SCENARIOS

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ABSTRACT

A generic greenhouse model based on energy and mass balance principles was developed to predict the behavior of a standard peak greenhouse under several scenarios. The greenhouse was alternatively: (1) naturally ventilated, (2) naturally ventilated and fanned, (3) naturally ventilated, fanned and shaded. The energy and mass balance equations were solved by an iterative procedure with a computer program. Climate data and greenhouse characteristics were used as inputs for the simulation. Several simulations are presented and discussed with the aim of addressing the potential of greenhouse expansion to low land areas of Indonesia. The simulation produced realistic approximations of the dynamic behavior of greenhouse environments with different operational strategies.

THE SUPERVISED MULTI-AGENT SYSTEMS FOR A LARGE SCALE GREENHOUSE-BASED CROP INDUSTRY

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ABSTRACT

The complexity of a large scale greehouse-based crop industry is characterized by the number and size of greenhouses, the varieties of crops and the corresponding treatments, the scheduling of crop production, the distributed locations of greenhouses and the corresponding climate conditions. This must be handled by a control system that employes multi-agent systems to cope with various tasks and objects. The agents are supervised to act collaboratively and concurrently to manage all greenhouses involved in a large scale crop industry. This paper describes the design of the supervised multi-agent systems for a large scale greenhouse-based crop industry. The simulated prototype is also described to show potential applicabilities of the system proposed. The supervisory controller is the heart of the supervised multi-agent systems since it s upervises, coordinates, directs and instructs all the agents to behave and function for collaborative work. The generality and modularity of the system architecture allows its application for various a large scale agroindustries that used closed-house systems (e.g. poultry house, broiler house, duck house, flower house).

Keywords : green-house, supervisory controller, multi-agent systems, agroindustry

ESTIMATION OF FIRMNESS, SOLUBLE SOLIDS CONTENT, AND ACIDITY OF DRAGON FRUIT (*Hylocereus undatus)* BASED ON FRUIT COLOR

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ABSTRACT

The cultivation of dragon fruit (*Hylocereus undatus*), a group of new cactus fruit crops originating in tropical America, has spread to tropical and subtropical regions throughout the world. Currently, there is much interest in developing this crop for fresh fruit export beyond the 'local' Asian markets. Dragon fruit has potential for use as a source of functional ingredients to provide nutrients that may prevent nutrition-related diseases and improve physical and mental well-being of the consumers. This research introduces a simple and rapid-nondestructive method for quality assessment of dragon fruits.

Dragon fruits in various growing stages (14-43 DAA) were obtained from an orchard and measured for quality parameters. The fruit color was measured nondestructively using Chromameter; firmness, soluble solids content, and acidity were measured destructively. Each quality parameter was modeled as a function of fruit age by using regression method. Based on the fruit color measured nondestructively, the age of fruit was estimated using a developed regression model of fruit color. Thus, the other quality parameters were estimated using the significant model based on the estimated age of fruit.

The cubic regression modeled the fruit color, firmness and soluble solids content as a function of fruit age significantly, but did not modeled the acidity. Using the significant regression model of fruit color, the age of fruit from different sample set was estimated then used for estimated firmness and soluble solids content. Paired t-test shows that the estimated firmness and soluble solids content were not significantly different from the actual ones. Using this method, many quality parameters could be estimated at the same time based on the fruit color.

MASS TRANSFER DURING DRYING OF PADDY USING DIRECT SUN DRYING

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ABSTRACT

Page equation was used to evaluate mass transfer and the constant drying rate (k) of paddy by direct sun drying and modified sun drying with employing the green house effect. The k parameter was used to predict water content of paddy during drying process. In this research, 15 kg of paddy were spread in the tray of dryer with the thickness of 3 – 4 cm and then dried using both drying methods. The changes of temperature and water content were observed every 30 minutes.

Result showed that constant drying rate (k) with modified sun drying using green house effect was higher than direct sun drying, respectively and this parameter could be used to predict water content of paddy during drying process accurately.

Key words: Paddy, sun drying, drying rate, green house effect

INTERMITTEN IRRIGATION WITH AUTOMATIC FUZZY TIMER CONTROL

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ABSTRACT

A fuzzy timer control (FTC) technique was developed for application in intermitten irrigation control. FTC is the modification of the general fuzzy logic control (FLC) which have been widely known and been applied in various control systems. The difference with the original FLC is that FTC give timer output rather than the magnitude of the actuator, and good for application with on-off device when the simply on-off control system is not perefered. The FTC was applied in simulation using water balance analysis of weather, evapotranspiration and soil condition information. FTC showed good performance in the anticipation of water level fluctuation to maintain water level near the setpoint, but faced difficulty with heavy rainfall event in rainy season. The simulation was conducted using spreadsheet programmed with macro basic language. The simulation also gave the irrigation capacity of 1.3 lt/sec.ha for rainy season and1.6 lt/sec.ha for dry season, with each performance index of 11871.5 a nd 42 25.4, which values are the results of optimization during the simulation.

Keywords : Fuzzy Control, Irrigation, Automatic Control

“Biodiversity and Natural History Museum”

BIODIVERSITY AND INSECT COLLECTIONS IN FOUR INSTITUTES

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ABSTRACT

Georissus overbecki was described by Dr. F. van Emden from Yogyakarta in 1934. There is no additional record and information about this species. Is this species already extinct or still alive? I explored this species by two ways: indoor (literature and specimen) and outdoor (field investigation). I rediscovered this species in Yogyakarta in 2009, and I also report the difficulties in taxonomic studies.

ALTITUDINAL GRADIENTS IN TROPICAL ICHNEUMONID SPECIES-RICHNESS IN NORTHERN SULAWESI, INDONESIA

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ABSTRACT

Increasing accumulation of data shows that tropical ichneumonid faunae are no more species-rich than extra-tropical ones, despite the fact that most of their host groups show increased tropical species-richness. Ichneumonidae is parasitoids whose larvae develop whilst feeding in/on the host and has two different lifestyles, koinobiont (allows further hosts' development) or idiobiont (inhibits further hosts' development). Host range of koinobiont is relatively narrow (specialist) and vice versa (generalist). The phenomenon of ichneumonid species-richness decreasing toward the equator is thought to result from that specialist can't inhabit tropics because of low host density caused by tropical high biodiversity.

However, the composition of tropical upper montane ichneumonid faunae is thought to resemble more closely that of temperate rather than tropical regions. The host density hypothesis predicts that specialist might form a larger proportion of a montane fauna in the tropics, because the diversity of potential hosts is much lower at high altitude than tropical lowland.

I investigated tropical ichneumonid fauna by malaise traps with four level altitudinal gradients (100, 500, 900 a nd 1200m) for a month in northern Sulawesi, Indonesia. In consequence of identification into morphospecies, Simpsons' index of diversity relatively high (15 or more) and the ratio of specialist exceeds 80% at 900m and 1200m areas. Whereas at 100m area, although Simpsons' index is the highest (25.14), the ratio of specialist is extremely low (38.6%) and number of individual is the lowest. This results advocate previous hypothesis and additionally suggests that generalist are more variety in the tropical lowland.

“Hydrological Issues under Global Warming”

AVERAGE AREA RAINFALL CALCULATION IN KUROSE DAM CATCHMENT AREA

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ABSTRACT

Precipitation data provide is important data for basic engineering planning, especially for civil engineering and agriculture engineering. An rain gauge records rainfall at geographically point. In most of hydrologic analysis, average depth of rainfall over the area under consideration is required to computed an hourly, daily, storm period, ten-day, monthly or annually basis. This average depth of rainfall over the area is called Areal Average Rainfall. The areal average rainfall (AAR) is necessary for water balance reckonings, agriculture, planning of urban regions, flood modelling, projecting of water resources, climate workings and for the estimation of water run-off. One of the basic problems of hydrometeorology is to estimate AAR from point rainfall values, which are measured at a set of irregularly located meteorological stations in a region. Estimation reliability is dependent on the density, position, distribution and representation ability of meteorological stations, and the methods applied to the data. Some practical methods to calculate average rainfall in a watershed area are : (1) the arithmetic mean; (2) the Thiessen polygon; (3) elevation regression method. Unfortunately, the most commonly used Thiessen (1911) polygon method for AAR calculations does not consider areal rainfall amounts recorded at individual stations in the partition of the whole catchment area into smaller polygonal subareas. Therefore, once the polygons are obtained on the basis of existing rain gauge network configuration they remain the same as long as meteorological station locations do not change or there are no additional stations. However, it is logically plausible to expect that the subareas should change in response to the spatial variation of rainfall. In other words, the partition should be based not only on the rain gauge network configuration but also on the recorded rainfall amounts at the stations. This method is called Percentage Weighting Polygon (PWP). PWP is a method that consider the periodically rainfall amount on each rainfall stations. From the results of average areal rainfall calculation, elevation regression method has given significantly different result from others three methods. These differences occur because elevation regression method was obtained from regression line between elevation of weather station and rainfall rate at that station. Some regression line cannot present 100 % of rainfall event that occur in station. In purpose for result validation, next step of this research is validate the average areal rainfall calculated by use runoff model.

A STUDY ON THE MECHANISM OF CATASTROPIC EARTH DAM FAILURE USING HIDRO-GEOTECHNICAL APPROACH

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ABSTRACT

The catastrophic failure of Situ Gintung dam on 27th March 2009 has caused more than 100 casualties from a tsunami as caused by more than 10 m/s flow velocity resulted from the embankment failure in only less than 2 hours. This failure is a specific phenomenon that happened rarely in the case, but it should be realized that it may occur anytime and anywhere. The era of mitigation efforts as a part of disaster management cycle requires various parties to understand the dam failure phenomenon. These include the understanding on the mechanism of hydrology-hydraulics process in conjunction with the dam structural integrity, as well as its abrupt of the discharge during the failure process. Prior to the dam failure occurrence, a relatively high intensity of rainfall (more than 70 mm/hrs) occurred at the catchment area. Besides, the embankment structural condition is far than at fair condition. These were indicated by apparent physical conditions such as too narrow spillway, insufficient width of spillway crest, imperfect interface between spillway structure and soil embankment, utilization of downstream embankment for housing, etc. These of course contributed the Situ Gintung dam failure phenomenon which needs to be studied thoroughly. The geotechnical analysis indicates that interaction between the dynamic of water elevation and the cutting slope of earth fill dam plays a significant role in the occurrence of dam failure. The appurtenances of Situ Gintung and the cutting slope due to the houses construction were evaluated to understand the historical aim of the dam development. A two-dimensional stress-strain analysis has been performed to figure out the distribution of relative shear stress and plastic points on the dam embankment at the time of failure. The safety factor decreases from 1.426 at the un-interfered embankment to 1.266 due to the cutting slope and the increase of reservoir water level.

EVALUATIONS THE ACCURACY OF CMORPH OUTPUT FOR RAINFALL DATA INTERPOLATION IN INDONESIA

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ABSTRACT

The demand to reliable rainfall data is rapidly rising, but on the other side lacking of full-skill observer remains a problem. Global rainfall data derived from satellite estimation is growing as an alternative. This study aims to assess the accuracy of NOAA CPC Morphing Technique (CMORPH) output for rainfall estimation in particular areas. Area of study are Meulaboh, Gorontalo, Amahai, Tarakan, Juanda, Menado, Pontianak, Tabing and Palangkaraya which accordingly represent three existing rainfall patterns in Indonesia i.e. Equatorial, Monsoonal and Local. Main activities involved in the study are: (i) Derived the rainfall estimation from CMORPH output by downscaling the area to 3 different domains i.e. 1x1 grid (grid specifically covers the weather station location), 3x3 grid and 5x5 grid; (ii) Physical Component Analysis (PCA) to determine the best-fit domain. This analysis revealed that 3x3 grid domain provided the best result; (iii) developed a simple regression model to describe the correlation between CMORPH estimation data with ground observation data; (iv) Developed a correlation model between the selected PCA component with observation/ground data; (v) Validated the model with the latest observation/ground data. The study indicated that 3x3 grid domain provided rainfall estimation that perfectly reflects its observation/ground data, both for wet season and dry season.

Keywords: CMORPH, Downscaling, Rainfall

RELATIONSHIP OF MICROCLIMATE, SOIL ORGANIC CARBON AND CO_2 EMMISIONS FROM SOIL SURFACE AT DIFFERENT CANOPY COVER IN PALU, CENTRAL SULAWESI, INDONESIA

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ABSTRACT

This study aims to determine the amount of CO_2 emissions from soil surface in Bariri tropical forest, Lore Lindu National Park Palu, Central Sulawesi, Indonesia. We studied the relationship of microclimate, soil organic carbon and CO_2 emmisions from soil surface at different canopy cover (low canopy cover, medium canopy cover, high canopy cover). CO_2 emmisions from soil surface was measured in May 2008 using closed chamber method. We took gas sample before closing chamber (0 min) and after the chamber was closed, we took one gas sample for CO_2 after 6 min. At the same time, we measured soil surface temperature, soil temperature at a dept 5 cm, air temperature, soil moisture at a dept 10 cm and take of soil sample at a dept 30 cm for analysis soil organic carbon. Based on the measurement result, mean of CO_2 flux from soil surface is 299.15 $mgCO_2m^{-2}h^{-1}$ or 7.14 t onC $ha^{-1}yr^{-1}$. The measurement result show the existence of difference on emission CO_2 from soil surface at different canopy cover. The range of flux CO_2 for low canopy cover, medium canopy cover, high canopy cover were 329.33-375.77 $mgCO_2m^{-2}h^{-1}$, 213.30-403.08 $mgCO_2m^{-2}h^{-1}$, 209.24 -304.18 $mgCO_2m^{-2}h^{-1}$ respectively. CO_2 emmisions from different canopy cover (low canopy cover, medium canopy cover, high canopy cover) positif correlated highly with soil temperature surface (R=0.75,P<0.09; R=0.74,P<0.1; R=0.70,P<0.13), s oil temperature (R=64,P=0.17; R=81,P=0.05; R=0.75,P=0.08), air temperature (R=0.71,P<0.05; R=0.26,P=0.08; R=47,P<0.05), negative correlated with soil moisture (R=-0.17,P=0.02; R=-0.43,P<0.05; R=-0.39,P=0.01), and soil organic carbon (R=0.02,P=0.64; R=-0.51,P<0.37; R=-0.15,P<0.53).

ANALYSIS OF LANDUSE CHANGE TO SURFACE RUN OFF AND WATER DEMAND AT CIMANUK WATERSHED

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ABSTRACT

The downstream of Cimanuk watershed is an agricultural production area for rice and palawija. The agricultural area reached 165,500 hectares or about 49% of the total Cimanuk watershed area. The region's agricultural productions were constrained by the increasing rate of land use change from agriculture to non-agriculture and by the unequal agricultural water distributions especially during dry season. Based on these problems, a research about land use changes and water demand assessment in the region is important.

The aims of this research are as follow: (1) to build a land use change model for Cimanuk watershed, (2) to estimate surface run-off impacted by land use changes in different recurrence periods of rainfall, and (3) to estimate water demands in Cimanuk watershed.

Land-use change models were developed under six different equations using logistic regression technique, with determination coefficient ranges from 0.05-0.2, and with 53% precision. F-test shows that all of the six equations are significant. Additionaly, t-test result indicates that the population is the most significant variable that influence the land use conversion from dry land to settlement (227.86) and from dry land to dry land (-55.19). The highest portion of the increasing rate of land use change is occurred in settlement, i.e. about 18.71% from 1999 to 2006.

This study suggests that water demands for Cimanuk watersed will increase during 2006-2020 periods. In 2006 and 2010, the largest water demand comes from agricultural sector (sub-sector of agriculture fields), i.e. around $0.7x10^9$ m^3. In 2020, the largest demand comes from the domestic sector (sub-sectors of urban population), i.e. about $1.8x10^9$ m^3.

AGRO-ECOLOGICAL FACTORS THAT INFLUENCE THE JATROPHA GROWTH

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ABSTRACT

Jatropha curcas is included as perennial crops, and it had been understood by Indonesian people since more than seven decades as a plant producing renewable biofuel. At the present decade, plants producing biofuel are expected to be developed to overcome the lowering nonrenewable fuel reserves. There are a myths that jatropha may grow well on the marginal lands and draught condition, good performance plant on the non fertile soils, no need agronomic management and it resistances to all plant pests and diseases. The present study was conducted to identify the environmental factors that influenced the growth of jatropha at marginal land on Potorono village, Yogyakarta Province. Jathropha was already planted by local people on the village road sides and on the marginal land field at the local governmental land of this village. They grew jatropha on these areas with the purpose was to prevent the competition to area for foodstuff crops. The results showed that the growth of jatropha was restricted by low content of organic matter, plant nutrition and the worst soil drainage. Applications of manure and macro nutrients (N, P and K) to this crop were able to increase the crop performance. There were shown that the amounts of shoot, flower and fruit bunch were increase by manure and nutrients treatments. Result of the field observation shown that there were identified several kinds of the plant pest, such as *acarina*, *scutellarids*, grasshopper, and mealy bugs. that attacked the plant leafs and fruits. There were plant leaf necrotic symptom also observed that was attacked by pathogenic fungi. Accordingly, jatropha is like the general plants that needs a good agro-ecological condition to grow well and producing large amount of jatropha fruit.

Keywords: jatropha, marginal land, plant nutrition, pests, diseases

PHENOMENON OF THE INCREASING SEA LEVELS AS INDICATION OF GLOBAL WARMING

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ABSTRACT

Global warming is cause by green house effect. Global warming also influence for the increasing of world temperature. The increasing of world temperature give impact for the environment problem such as the increasing of sea levels. On 2007, the temperature of St. George, Utah reached 48^{o} C meanwhile the temperature of Surabaya was all around 30^{o}-37^{o} C (NASA).

The increasing of world temperature which is caused by global warming also give impact to the ice melting of north Pole and south pole. Since 1960 until 2005, the amount of gleitser in all around the world were lost until 8.000 m^{3} (NASA). The ice melting process in the pole increase sea levels. Nowadays, sea level has increased until 120 meter since the ice age in 18000 years ago. Since 3000 years ago until the beginning of the 19th century, sea level has a little increasing 0,1-0,2 mm per year. Sea level could be increase until 7 meters that could sink a whole beaches, ports, and land all around the world.

The environment damage especially in sand mining and abration caused the sinking of 26 i slands in Indonesia. The impact of climate change are increasing of temperature and the unpredictable season. The increasing of temperature cause ice and gleitser in north and south pole melted. This condition cause evaporation of sea water and inreasing of sea level.

Key words : increasing, sea-level, global warming

“General Topics”

LAND USE CONVERSION OF AGRICULTURE AND EFFECTS ON MEAT SELF SUFFICIENCY PROGRAM IMPLEMENTATION IN INDONESIA

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ABSTRACT

Humans and the land is like two sides that can never be separated from each other, meaning that in establishing their lives, people absolutely need the land. As population growth and development of human civilization, control and use of land began to shift. Land that originally served as media cultivation (agriculture), it gradually turned into a multifunctional utilization. Specific changes from agricultural to use for non-agricultural use for which became known by the term over land use (conversion) of land, increasing from time to time. Since 2005 until 2010 the government of Indonesia has launched the beef self-sufficiency program, with a target reduction of imports of cattle and beef from 28% to 10%, through the local livestock resources. Implementation of this new program effective in 2008 that success in 2010 was not achieved. To project self-supporting targets to be achieved through three main policy of delay slaughter policies, import steer policies and the policies of beef cattle ruminant feed supply; performed simulations with two scenarios as follows: 1) Scenario I; only do policy heifer slaughter delays by 5 percent from number slaughters per year, 2) Scenario II; to delay slaughtering policies as well as the scenario I and made heifer imports from Australia in stages, 100 thousand tail in 2006, 200 thousand tails in 2007 and 300 thousand tails each in 2008, 2009 and 2010. Stage and the amount of imports adjusted heifer breeder readiness, capacity and availability of heifer feedloters in exporting countries. Above simulation with the assumption that "Ceteris paribus", meaning other things being equal/no change. The fact on the ground indicates that the convertion of agriculture land through the non farm, would mean a reduction in agricultural land area, it means reducing carrying capacity for livestock. Carrying capacity of land for beef cattle per hectare ranges between 1-1,9 livestock units, means to reduce the carrying capacity of 110,000 to 209,000 tails annually. This is related to the availability of feed ingredients for livestoct which also decreased agricultural land narrows. Thus the adequacy of beef projections still need more serious efforts if it does not want to fail. Breakthroughs that can be taken is to promote the cultivation of a beef cattle outside the island of Java still has a larger carrying capacity and can be introduced by palm oil plantations. Extensification measures to beef cattle farming outside Java is intended as an effort to answer the challenges of agricultural land convertion rates on the island of Java greater. Over the function of agricultural land into non-agricultural self-sufficiency programs threaten the meat, therefore the government needs to control the rate of transfer of agricultural land use with the rules in favor of the agricultural sector.

Keywords: Land use conversion, Agriculture, Meat self sufficiency

CANOPY STRUCTURE AND FORAGE QUALITY OF THE DWARF AND NORMAL NAPIERGRASSES FOLLOWING TWO YEARS AFTER ESTABLISHMENT

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ABSTRACT

In order to determine canopy structure and forage quality under 3 planting densities at 4-, 8- and 16-plants/m^2 and 2 cutting frequencies at 3 times and 2 times in 2006 and 2007, respectively, 2 dwarf varieties (early-heading type, DE and late-heading type, DL) and 2 normal varieties (Wruk wona, Wr and Merkeron, Me) were compared in the following 2 years after establishment. Canopy structural characters were measured every month in 2006 and 3 times at the cutting in 2007. Crude protein concentration (CPC) was measured at each cutting both years and *in vitro* dry matter digestibility (IVDMD) of each plant organ was examined only in 2006. Although leaf area index (LAI) tended to increase with the increase in planting density both years, it was not responsive to planting density at the final cutting both years. Relationships between LAI and crop growth rate (CGR) were positively correlated and those between LAI and net assimilation rate per total solar radiation (NAR/S) were negatively correlated both years, while the difference in these relationships among varieties was not apparent in either year. Canopy extinction coefficient (K) was linearly and negatively correlated with LAI, and Wr tended to have higher K and DL lower K than other varieties throughout the seasons both years. Mean transparent angle (MTA), measured by plant canopy analyzer, tended to increase from July to November in 2006, while it was less variable among seasons in 2007 than in 2006. DL generally had a higher MTA than other 3 varieties, which was corresponded with lower K in DL than in other varieties. CPC of leaf blade (LB) was higher in Me than in Wr, while CPC of stem with leaf sheath (ST) tended to be highest in dwarf varieties, followed by Me and Wr both years, except for the third cutting in 2006 when the variations in CPC among varieties were small. IVDMDs of LB and ST were higher in dwarf varieties than in normal varieties, except for ST at the third cutting in 2006. The relationships between dry matter weight and IVDMD in ST and LB+ST were negative in normal varieties, while IVDMD was not affected by dry matter weight in dwarf varieties.

THE CONTRIBUTION OF EHIME UNIVERSITY IN THE INDONESIAN'S BIODIVERSITY HOTSPOT: WALLACEA REGION

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ABSTRACT

Wallacea as region of intermediacy has very high endemic species found nowhere else in the world. This region included in the coral triangle, consisted of four different groups of islands with complex geological history and populated by a mixture of Indo-Malayan and Australasian biogeography. Lack of concern both of Indonesian government and academician cause the high biodiversity of Wallacea decreased and endangered. Since May 2003 Ehime University (EU) Japan that started its research in South Sulawesi Province, constructed research ship "Cinta Laut" to serve research and education program in Wallacea region. In order to know the present contribution of EU to this region, mainly after the construction of "Cinta Laut", a study was done between October 2009 and June 2010. Data were collected by observation and short interview, both in Ehime and South Sulawesi. In addition, many documents and photos were also studied. EU has significant role in the development of Wallacea region. It develops researches on the sago plantation and livelihood of sago-based communities as well as maritime research and education program and other things associated with it i.e. coastal community health and education, boat engine, timber species for boatbuilding, the ecology of small islands, logging activity and insular forest management. Remote islands, especially Spermonde Islands constitute the most important place observed. The early EU's activities were mostly affected by the Center of Southeast Studies (CSEAS) at Kyoto University. Until now EU has not studied yet about mammals, birds, amphibians, reptile those have high percent endemism in Wallacea region.

“Supply Chain in Practices”

BARRIERS OF SUSTAINABILITY OF EMERGING MANGOSTEEN SUPPLY CHAIN

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ABSTRACT

Identification of barriers is necessary to manage the sustainability of emerging mangosteen supply chain in Bogor district. The purpose of this paper is to identify barriers of sustainability of emerging mangosteen supply chain in Bogor district and understand their mutual relationships

Data and information were collected through in depth interview, participative discussions and a review of literature. The chain characteristics were mapped to describe the flow of product, funds and information. Interpretive Structural Modeling was used to illustrate the interrelationship of barriers of the chain sustainability.

The results of the analysis showed that distrust with partners, the incompatibility of character and ethics in working together, discrepancies in business development, inequality interests and goals, as well as resources that are not mutually supportive partners are barriers of sustainability of mangosteen supply chain in Bogor District which required maximum attention to be managed due to their high driving power to generate other barriers.

Keywords: barriers, emerging supply chain, mangosteen, Interpretive Structural Modeling

INFLUENCE OF PARTNERS' TRUST LEVEL, PARTNERING SUCCESS LEVEL WITH BENEFITS OF PARTNERSHIP ON CONSTRUCTION PROJECTS IN THE PROVINCE MALUKU

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ABSTRACT

This study aims to test whether the partners' trust level have an influence on partnering success level and test whether the Partnering success level have an influence on the benefits of partnership.

This research was conducted in the Province of Maluku, the respondents are the parties involved in construction projects of the client / owner of the project (services in the Province of Maluku), construction companies and consulting firms. Sampling technique was purposive sampling, in which there are two criteria must be met is for project owners are agencies that have construction projects in the year 2008 until this study was conducted, to contractor companies and consulting firms is the company that handles the project from agencies construction project owners, and the second criterion is the contractor companies and consulting firms must have a minimum working experience of 5 years. This research is a survey research using a questionnaire, which use a questionnaire divided in two ways namely direct and distribute the mailing survey. The questionnaire used Likert scale 1-5. Questionnaires distributed numbered 200, which returned as much as 195 and a decent used to analyze as many as 193. Data analysis to test the hypothesis using an alternative method of SEM is PLS.

The results showed that partners' trust level have a positive influence for the partnering success level, the same result at the partnering success level have a positive influence for the benefits of partnership.

***Key Words** : Partners' trust level, partnering success level, benefits of partnership.*

[1] Ucapan terimakasih penulis berikan kepada yang telah berkontribusi pada penelitian ini, Adi Djoko Guritno (UGM, Jogyakarta), Perengki Susanto (UNP, Padang), Dinas Pendidikan Nasional, Dinas Pekerjaan Umum, Dinas Kesehatan, Dinas Perhubungan, Dinas Sosial, Dinas Koperasi dan Usaha Kecil Menengah, Dinas Pertambangan, Dinas Perikanan dan Kelautan dan Dinas Dinas Pariwisata Tingkat satu Propinsi Maluku, GAPINDO Propinsi Maluku.
Penulis bersedia untuk memberikan data yang dibutuhkan terkait dengan penelitian ini.

INFORMATION TECHNOLOGY, RELATIONSHIP COMMITMENT AND CONFLICT ON REVERSE LOGISTICS

Comparation Study of Franchised Retail and Independent Retail

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ABSTRACT

Environment damage issue, the changes of consumers' behaviour and government regulation in spite of the association had given support to business owner to make changes in business process that he/she does (Business Process Reenginering/BPR). One of them is integration of reverse logistics approach in the process of forward supply chain in several manufacture, including retail. Product return is one of the forms of reverse logistics which is done by its retail.

This research was aimed at finding the return pattern product in retail and attempting the description about the relationship commitment aspect, conflict and the usage of information technology in returning process from retail to supplier. This research used multiple case study. There are four kinds franchised retails which are compared to three other independent retails as the objects.

The result reveals that reverse logistics pattern in franchised retail and independen retail are almost the same. The relationship commitment aspect and conflict between franchisee (retail) and franchisor (supplier) and the usage of information technology have no relationship with reverse logistics process for all products (durable and non durable) sold by both retails.

Key words: Forward supply chain, reverse logistics, franchised retail, independent retail, relationship commitment, conflict and information technology

REALITY CHALLENGES SUPPLY CHAINS' DYNAMIC IN SUPPORTING SALES STRATEGY

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ABSTRACT

Almost 200 companies play in over the counter (OTC) products where the Top 20 accounts for 72% of total 170 local companies *(ITMA MAT Q1-2010)*. Every year, managers in charge to run commercial units face great challenges in find ways to grow sales and deliver more profits, especially for those in low tier rank. For Business Manager one of the biggest challenge in couping with growing sales volume is to determine the best-fit model in distribution to support the overall business strategy. Despite there is no magic-formula in choosing the model, the subject brought up for discussion will briefly share common factors considered by practioners in determining the options. In comparison to small companies, big companies enjoy many advantages in dealing with distributors such as lower distribution fee, exclusive services, choose big distributors with strong penetration to all type of shops. In a company where growth strategy lies on OTC products, beside traditional pharma stores i.e. pharmacies, drug stores and modern trade; an OTC product like cough medicine should have a strong presence in general trades (GT) considering 45%-50% of consumers purchase the product from GT also called warung *(Nielsen RA report, May 2010)*. However, for cost reason most distributors normally appoint sub-distributors to reach GT instead of visit those small retailers directly. In the other hand, a company with high content of consumer-healthcare products need wide availability in modern trade (supermarkets). This is because, supermarkets provide space and opportunities for the brands to build emotion-bond with target consumers, which is very important for personal-care products. Hence, a company with personal-care majority will go to distributors with Modern Trade resources and capabilities. In principal side, the job has not completely done untill real consumption happens. In the world of consumer-healthcare products, fierce competition also happens in 'availability and visibility' games. To win the competition, business managers have to win the in-store battle as well as win the heart of consumers' through various brand activations.

Key words: grow, sales, distribution, shops

THE MECHANISM OF VEGETABLES TRADING BETWEEN PRODUCER AND SUPERMARKET THAT CAPABLE TO COORDINATE THE SUPPLY CHAIN

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ABSTRACT

The problem faced by a large supplier of agricultural products or vegetables in this case, is relied in setting the terms of trade with multiple retailers. The producer supplies to independent retailers (the supermarkets) who in turn sell the vegetables to consumers. Any vegetables traded in this supply chain must have been produced in a previous growing season, so the supplier may sell out of existing inventory. It is too late to produce additional vegetables once information on demand starts to come in.

Each independent supermarket faces an uncertain demand for each variety of vegetables. To determine how much seed to order from the supplier, the dealer maximizes his expected profits. The problem faced by the supplier is how to set the terms of trade so that each supermarket's ordering decision, driven by individual profit maximization, leads to a result that is good for the supply channel, i.e., the supply chain, as a whole.

In this paper, we examine mechanisms actually employed to set the terms of trade with the independent supermarkets. A key question we ask is whether and under what conditions these mechanisms are capable of coordinating the supply chain in the sense of maximizing total channel profits. Incentive systems are employed to propose a b etter coordination of an independent retailer decisions with supply channel objectives.

Keywords : producer, supermarket, supply chain, channel coordination

“Zeolite Chemistry and Its Industrial Application”

IMPROVEMENT OF PLANT PRODUCTION AND SOIL QUALITY BY RECYCLING BIOLOGICAL WASTES IN LOCAL AREA FOR SUSTAINABLE AGRICULTURE

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ABSTRACT

Resource management in local area has become one of the most important issues in agriculture. Especially in Japan, the government has encouraged to recycle organic wastes discharged from agriculture, industries and household garbage, because almost of potassium and phosphate rocks for fertilizers has been imported from abroad. Here three topics on agricultural recycle approach are summarized and discussed.

There is one of the globally largest cotton industrial factories in Ozu, Ehime and it has discharged a large amount of cotton waste. For recycling use of the waste, cotton mulch sheet for agriculture was developed. Addition to weed suppression, it can save cost and labor for removing the mulch sheet after harvest because the sheet is biodegradable and easily incorporated into soil, leading to improve soil fertility. Furthermore it can decrease the soil temperature under the sheet and it ma ke possible to cultivate a high quality lettuce even in hot summer. In paddy rice cultivation, a high performance on environmental conservation of the sheet was appeared that it can absorb the excess amount of nutrients but not contaminate nutrients to streams, rivers and other water systems. The absorbed nutrients would be supplied around flowering stage and taken up by rice efficiently.

Immediate developments of the appropriate application methods and systems for composts with various qualities and origins are required in sustainable agriculture. The other research topics are on nutrients efficiencies of the composts from household kitchen garbage and sewage sludge, which are produced from everywhere people lives.

UTILIZATION OF NATURAL ZEOLITE AS BIOFERTILIZER CARRIER AND ITS EFFECT ON RICE GROWTH

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ABSTRACT

Natural zeolite (NZ) as a tectoaluminosilicate posses a surface negative charge and micropores. The mineral is likely to be modified as a carrier for a nitrogen fixing bacteria such as *Azotobacter Chroococcum.* Surface modification was conducted by applying an organic surfactant ($HDTMA^+$). The main objective of this research was to find out the change of the surface adsorption and IR-spectral characteristics of the modified NZ, and the effect of natural zeolite-azotobacter complex (NZA) on N availability, N absorption and the growth of rice. Pot experiment was arranged in a completely randomized design (CRD) composed of 6 levels (0, 1, 2, 3, 4 and 5 g/pot). Basal nutrients also were added to avoid a defficiency of other nutrients. By adding a bichromate solution indicated that the adsorption capability of the modified NZ increased from the original one (3045.5 to 11701.4 mg/L). The surface change was also strengtened by the peak appearances of 2850,68 cm^{-1} dan 2919,63 cm^{-1} from FTIR spectra, while the peaks were not identified in the original one. The change of zeolite surface morphology was also known by SEM data. By applying a *Total Plate Count* (TPC) method, the amount of *Azotobacter Chroococcum* adsorbed by one gram of the modified zeolite could be known around 3.7x109 cfu/mL. Application of the biofertilizer (NZ-azotobacter) was able to increase N-available in soil and N absorption in the shoot of rice IR-64.

Keywords: modified zeolite, surfactant, biofertilizer and rice

DYNAMIC SIMULATION OF THE EFFECT OF GLOBAL CLIMATE CHANGE ON THE NATIONAL FOOD STOCK

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ABSTRACT

In line with the growth of the population from year to year, the demand of food is also increase. This meant the high intensity of crop production with high harvest yield is stressed to achieve the food crop production. the occurence of global climate change with unpredictable friendly-weather situation effect on the target of cropping system which lead to disturb the stabilization of national food security. The various actions and strategies to arrange the indegenous effort that immediately can resist the rate of global climate change is very scary. Meanwhile to develop the public awareness in conserving, preserving the environment is always keep in well-managed. This research aims to study global climate change and its effects on food security especially in national food self sufficiency. The output of this study is various strategies to maintain food stock and match with the needs. The method used is a dynamic system where the national rice supply system determined by two major sub-systems is the provision of sub-systems and sub systems demand. Each sub-system identified a specific component or factor and interacts dynamically based on the time and conditions. The results showed that mitigation strategies such as reducing exhaust emissions (carbon dioxide, methane, etc.) that cause the greenhouse effect is an action that must be done by all levels of society in order to reduce climate change impacts. This strategy is a key strategy that is able to reduce the rate of global climate change for disrupting food production. As this strategy does not impact directly on production growth, but this is applied to surveilance the occurence of severe disaster on agricultural land. The implementation of the mitigation strategies must be coupled with anticipation strategy to maintain a sustainable food security. The strategy could save Indonesia from food shortages until the year 2030. Implementation of this policy is an expansion of rice cultivation at 5% per year, stop land use and application of good agricultural systems.

Keywords: dynamic simulation, food stock, global climate change, mitigation strategy