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INDONESIAN AGRICULTURAL RESEARCH ABSTRACTS

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PREFACE

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Director of Indonesian Center for Agricultural Library and Technology Dissemination

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RICE; AGROINDUSTRIAL SECTOR; EXTENSION ACTIVITIES; INFRASTRUCTURE.

The extension service and farming support facilities in agricultural farming play an important role in agribusiness activities. This activity aimed at increasing the productivity of integrated rice farming in West Java. These two variables mentioned above have given good contribution to the performance of farmers' group in increasing their productivities. However, both variables have not yet performed optimally in terms of the agribusiness performance. To develop agribusiness in West Java there are three approaches to be chosen including increasing extension activity, improving supported facilities or both. The aim of this assessment was at investigating the effect of extension service on facilities and infrastructure supported for agricultural farming to the performance of farmers' group in conducting their agribusiness. The assessment was conducted using a survey method in Districts of Kuningan, Subang, and Karawang West Java Province from August-October 2006. The parameters observed were the performance of agribusiness, extension service activity and support facilities performance. Data were analyzed by path analysis. The results of this study showed that: (1) the activity of farmers guiding through extension service and providing production facilities could improve farmer's productivity, farming efficiency, and their income, (2) the extension service and facilities supports have positive effect on the agribusiness performance, and (3) the extension service gave a higher contribution compared to facilities support, this means that farmers guiding plays a better role than the provision of facilities.

002 YOTOLEMBAH, F.V.
Peran PPL dan karakteristik kelompok wanita tani dalam aktivitasnya di Kelurahan Boyaoge, Kecamatan Palu Barat, Kota Palu. **[Role of extension workers and women farmers group characteristic in agriculture-related activities in Boyaoge Village, West Palu (Indonesia)]**/ Yotolembah, F.V. (Universitas Tadulako, Palu (Indonesia). Fakultas Ilmu Sosial dan Ilmu Politik). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 170-175, 2 tables; 8 ref.

SULAWESI; ADVISORY OFFICERS; WOMEN; FARMERS ASSOCIATIONS; SOCIAL GROUPS; SOCIOECONOMIC ENVIRONMENT; FARMING SYSTEMS.

This study was aimed at investigating roles of agricultural extension agents and socioeconomic characteristics of women farmers group in agriculture-related activities in Boyaoge Village, Subdistrict of West Palu, Palu. This case study involved 30 agricultural extension agents and 30 women respondents belonging to Mawar I, a farming women group in that village. Data were collected using questionnaires-guided interviews. Results showed that the role of agricultural extension as the dynamic influencer was ranked the highest among other roles (motivator, educator, organizer, communicator and advisor). The social condition of women was characterized by their education, age, land ownership while their economic condition was determined by their job and level of income. Agriculture-related activities performed by women group were such as collective gardening, selling garden products and group meeting.

E10 AGRICULTURAL ECONOMICS AND POLICIES

003 ANDRIATI
Keragaan dan analisis finansial usaha tani padi: kasus desa Primatani, Kabupaten Karawang, Jawa Barat. **[Financial analysis and performance of rice farming systems: case study in Primatani villages, Karawang Regency, West Java]**/Andriati; Sudana, W. (Balai Besar Pengkajian dan

Pengembangan Teknologi Pertanian, Bogor (Indonesia)). *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian* ISSN 1410-959X (2007) v. 10(2) p. 106-118, 1 ill., 6 tables; 24 ref.

ORYZA SATIVA; LOWLAND; FARMING SYSTEMS; FERTILIZER APPLICATION; FARM INCOME; ECONOMIC ANALYSIS; JAVA.

The Indonesian average growth rate of lowland rice harvested area during 2000-2005 was only 0.20% with the production rate about 0.83% per year. This condition was estimated has a correlation to the low growth rate of productivity and quality of innovation technology on rice farming system. Based on the issue, field assessment of lowland rice farming system was conducted to analyze the labor and productivity performance and its financial analysis at Parakan and Karangjaya Villages, Tirtamulya Subdistrict, Karawang District, West Java Province. The assessment was done in two seasons, wet season of 2004/2005 and dry season of 2005 by interviewing 60 randomized selected farmers, using structured questionnaires. The results of the assessment showed that men both for family labor and hired labors dominated the labor allocation on lowland rice farming system. On wet season, the contribution of men to a family labor was 57-66% and hired labor was 58-72%, while on dry season the contribution were 60-75% and 58-73%. Type of fertilizer as an important variable in determining the lowland rice productivity both on wet season (R^2 = 0.9581) and dry season (R^2 = 0.9542). On wet season, the farming system productivity used fertilizer type yielded 3.5 ton harvesting dry grain/ha with an income of Rp 1.796.270 (R/C = 1.54) and 4 fertilizer types produced 5.8 ton harvesting dry grain/ha with an income of Rp 3.485.530 (R/C = 1.70). On dry season, productivity of each fertilizer applied were 3.2 ton harvesting dry grain/ha with an income Rp 1,287,177 (R/C = 1.41) and 5.4 ton dry grain/ha with an income of Rp 2,729,277 (R/C = 1.58), respectively.

004 MARTIN, E.

***Kelayakan ekonomi dan manfaat sosial program perhutanan sosial pada hutan tanaman industri.* Economic feasibility and social benefit of social forestry program at industrial plantation forest**/ Martin, E.; Fitriyanti, H. (Balai Penelitian dan Pengembangan Hutan Tanaman, Palembang (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 117-128, 5 tables; 14 ref.

INDUSTRIAL CROPS; SOCIAL FORESTRY; ECONOMIC ANALYSIS.

There was a doubt concerning Indonesian social forestry concept which liable to be acted as industrial plantation forest management by stakeholders. This research was aimed at gaining an objective description whether social forestry program can be optioned as Indonesian industrial plantation forest management. Research was conducted at PT. Musi Hutan Persada as one of Indonesian industrial plantation forest concession holder. This company have been applied the variance of social forestry, namely MHBM for company-community partnership at concession areas and MHR for its developing plantation forest at private owned land. Economic feasibility study and social benefit review were used to analyse the data. The result showed that MHBM is enonomically feasible for company on current interest 14%-15.55%, while rate of return for MHR can achieve 17.89%. Social benefit from social foresty application were felt both company and community. The data showed that fire on land concession tend to decrease, social conflict intensity was reduced, and source of people income and work alternative were more extended since social forestry program were implemented.

005 SAHARA, D.

***Analisis titik impas dan sensitivitas terhadap kelayakan finansial usaha tani padi sawah.* [Analysis of break even point and sensitivity on financial suitability of upland rice farming systems]**/Sahara, D.; Alam, N.; Idris (Balai Pengkajian Teknologi Pertanian Sulawesi Tenggara, Kendari (Indonesia)). *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian* ISSN 1410-959X (2007) v. 10(2) p. 119-125, 5 tables; 8 ref.

UPLAND RICE; FARMING SYSTEMS; FARM INPUTS; FARM INCOME; PRICES.

The research had been conducted in Langgomea Village, Konawe District, from June to December 2005. This research used a survey method and aimed at finding out the technology performance, expense structures and farming system income of upland rice farming system. The data, technology application, productivity, and farming system income were collected from filled questionnaires from 35 respondents. The results showed that the variety of technology application had been closed to recommended technology as shown by a production of 4.68 ton/ha. On the basis of yield price Rp 1,350/kg, the farmers income could reach Rp 3,519,000 with RCR 2.28 which means that the farming system was financially feasible. However, rice farming system was not sensitive to the change of production input price and decreasing price of paddy up to 15% though the farmers' profitability obtained by farmers declined.

E11 LAND ECONOMICS AND POLICIES

006 PASANDARAN, E.
***Alternatif kebijakan pengendalian konversi lahan sawah beririgasi di Indonesia*. Policy alternatives to control irrigated land conversion in Indonesia**/Pasandaran, E. (Pusat Analisis Sosial Ekonomi dan Kebijakan Pertanian, Bogor (Indonesia)). *Jurnal Penelitian dan Pengembangan Pertanian* ISSN 0216-4418 (2006) v. 25(4) p. 123-129, 3 tables; 20 ref.

INDONESIA; IRRIGATED LAND; LAND DIVERSION; POLICIES.

There are at least three policy alternatives considered to control conversion of irrigated land, namely policy to regulate land control through central authority, creation of personal rewards associated with development and protection of rice fields, and developing collective capacity of local communities to control their own land resources. The community model when facilitated properly is expected to be able to foster their social capital includes the willingness to self-restraint among users of land and water as through collective actions the local community provides individual with a sense of identity and belonging. As land and water will continually become scarce resources, a policy to control land conversion has to be placed within the framework of integrated land and water management approach in a river basin along with the improvement of farming systems.

E13 INVESMENT, FINANCE AND CREDIT

007 SAHARA, D.
***Kajian struktur biaya dan alokasi curahan tenaga kerja pada sistem usaha tani padi sawah: studi kasus di Kabupaten Konawe*. [Assessment of cost structure and labour allocation on rice farming systems: case study in Konawe Regency]**/Sahara, D.; Idris (Balai Pengkajian Teknologi Pertanian Sulawesi Tenggara, Kendari (Indonesia)). *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian* ISSN 1410-959X (2007) v. 10(2) p. 137-148, 6 tables; 16 ref.

RICE; COSTS; LABOUR; FARMING SYSTEMS; FARM INCOME; SULAWESI.

The purpose of this research was to know the cost structure and labor distribution on rice farming system between farmer's technology and improved technology, and was carried out in Langgomea Village, Uepai Subdistrict, Konawe District, Southeast Sulawesi from January to July 2006. The improved technology included use of fertilizers, high quality seed, and planting time at once. The results showed that farmer's technology produced 4,650 kg/ha yield which equivalent to an income of Rp 3,684,500 while the improved technology produced 5,500 kg/ha yield with an income of Rp 4,479,300. The extra cost needed on repaired technology was Rp 395,200 which in turn gave the farmer an extra income of Rp 794,800 with MBCR 2.01. The result of regression analysis of labor distribution on both technologies was significantly different on 99%. Labor distribution on improved technology was greater 15.51 manpower than that on farmer's technology. The farmer will of course need extra labors if they widen the area, use more seeds, fertilizers and pesticides.

E14 DEVELOPMENT ECONOMICS AND POLICIES

008 DHALIMI, A.
***Permasalahan gambir (Uncaria gambir* L.*) di Sumatera Barat dan alternatif pemecahannya.* Problem of gambir (*Uncaria gambir*) in West Sumatra and their alternative solutions**/Dhalimi, A. (Balai Besar Pengkajian dan Pengembangan Teknologi Pertanian, Bogor (Indonesia)). *Perspektif* ISSN 1412-8004 (2006) v. 5(1) p. 46-58, 1 ill., 6 tables; 35 ref.

UNCARIA GAMBIR; ALTERNATIVE METHODS; FARMING SYSTEMS; TRADITIONAL TECHNOLOGY; CULTIVATION; MARKETING; SUMATRA.

Gambir plant is a specific location commodity of West Sumatra. Gambir farming is one of activities to increase farmers income. It is also an export commodity which contributes to local GRDP and increases export earnings. Around 80% of world demand is fulfilled by West Sumatra Province with destination countries: Bangladesh, India, Pakistan, Taiwan, Japan, South Korea, France, and Switzerland. Demands for gambir have increased all the years, and during five years (2000-2004) export volume increased 87.49% and export value increased 17.16%. Gambir is used as raw material for medicine, food, and textile industries, and also as sunlight proof color agent and for leather processing. The main problems of gambir are low productivity and low quality resulted from in optimal cultivation and postharvest processing technique. One step to solve the problems is to identify the problems and to draw a program for research and development of gambir which are comprehensive, synergic, and sustainable. This program is expected to direct the related institutions in solving the gambir problems in West Sumatra, and it is also important to avoid duplication in planning and implementation, and also for research evaluation so that it can produce action program which is strategic and dynamic, from pre-production to postharvest and marketing.

009 ERNINGPRAJA, L.
***Strategi mengembalikan kejayaan kelapa sawit Indonesia dengan barometer Malaysia.* [Development strategy of Indonesian oil palm]**/Erningpraja, L.; Wahyono, T.; Akmal, M.; Ratnawati, N.; Kurniawan, A. *Jurnal Penelitian Kelapa Sawit* ISSN 0853-196X (2006) v. 14(1) p. 47-67, 7 ill.; 2 tables; 14 ref.

OIL PALMS; DEVELOPMENT POLICIES; INDUSTRIAL DEVELOPMENT; INDONESIA; MALAYSIA.

Indonesia has a considerable potential to develop plantation and oil palm industry. The main factors in developing estate oil palm industry are supported by agroclimate and strategic geographic condition, availability of land and labour. Unfortunately, the considerable potential in Indonesia has not been exploited well and still make Indonesia one step behind Malaysia in productivity and market share. Although in 2007 Indonesia's production estimation will be higher than Malaysia, but it is due to land extension. The hindrances of Indonesia in developing oil palm industry include less availability of infrastructure, the unclear oil palm development policy, unsupported regulation and policy system of oil palm industries, less coordination in making a policy and regulation, less supporting in research and development, also in security and environmental factors. They must be handled immediately not only to compete with Malaysia as the biggest palm oil producer but also to determine the direction of policy as main foundation in developing a tough oil palm industries. Thereby, the expectation to reach glory of Indonesian palm oil as the market leader can be realized.

E16 PRODUCTION ECONOMICS

010 BASWARSIATI
***Potensi dan wilayah pengembangan kesemek junggo.* [Potency and development area of persimmon (*Diospyros kaki* L.)]**/Baswarsiati; Suhardi; Rahmawati, D. (Balai Pengkajian Teknologi Pertanian Jawa Timur, Malang (Indonesia)). *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(2) p. 56-61, 1 table; 12 ref.

DIOSPYROS KAKI; PRODUCTION LOCATION; PRODUCTIVITY; CROP PERFORMANCE; AGROECOSYSTEMS; CULTIVATION.

Persimmon (*Diospyros kaki* L.) was one of the local specific horticulture products in highland. Junggo persimmon has attractive appearance of the ripe fruit with orange to red colour. The size of fruit was 200-300 g, sweet taste, enough water and crispy. Astringent taste could be eliminated by fruit treatments. The vase life of fruit was 14 days, productivity was 400-500 kg/trees/years. Persimmon was originated of subtropical region of China and Japan. In Java persimmon was planted in highland at 1000 m up to 1500 m above sea level with high rainfall. The junggo persimmon had good market and had been exported to Singapore about 30-40 ton/seasons. The consumers prefer persimmon fruit from Junggo, Malang (Indonesia) than that from other areas of Java.

011 SUDARYANTO, T.
***Kebijakan strategis usaha pertanian dalam rangka peningkatan produksi dan pengentasan kemiskinan*. Strategic policy for increasing production and alleviating poverty in agriculture**/Sudaryanto, T.; Rusastra, I W. (Pusat Analisis Sosial Ekonomi dan Kebijakan Pertanian, Bogor (Indonesia)). *Jurnal Penelitian dan Pengembangan Pertanian* ISSN 0216-4418 (2006) v. 25(4) p. 115-122, 5 tables; 19 ref.

RICE; DEVELOPMENT POLICIES; AGROINDUSTRIAL SECTOR; PRODUCTION INCREASE; DIVERSIFICATION; POVERTY.

Agricultural sector, especially wetland farming, has multifunctionality value on enhancing food security, farmer's welfare, and maintaining environmental sustainability. Agricultural sustainability with its external agricultural land program can be implemented if the respective sector with its multifunctionality value was able to give the contribution on poverty reduction. In 2004, the absolute poverty reached 36.10 millions and most of them (68.70%) reside in rural area with the main activity (60%) on agricultural sector. The capability of the sector in increasing agricultural production and reducing poverty will be determined by three factors, i.e. 1) the capability to eliminate the constraint of agricultural production bottleneck, 2) the capacity on conducting the reorientation as well as implementation of direction and objective of rice agribusiness development, and 3) the successful implementation of farming diversification program in wetland area by considering non-rice alternative commodities such as secondary crops and horticulture. The appropriate strategic policies are: 1) facilitating the development of physical and institutional infrastructure, improving farming incentive system, and promoting labor intensive agro-industry development in rural area, 2) conducting the reorientation of direction and objective of rice agribusiness development with the main goals to improve income as well as household food security of the rice farmers, and as a tool for rural economic dynamic, and 3) developing infrastructure (physical and institutional), technology, capital, price stabilization policy, and extension services for the non-rice alternative commodities having high profitability and manageable.

012 WAHYONO, T.
***Faktor-faktor sosial ekonomi yang berpengaruh pada konsumsi minyak goreng sawit di rumah tangga di kawasan perkotaan*. Socioeconomic factors affecting palm oil consumption in household in urban areas]**/Wahyono, T.; Irianto, H. *Jurnal Penelitian Kelapa Sawit* ISSN 0853-196X (2006) v. 14(1) p. 21-32, 1 table; 21 ref.

PALM OILS; COOKING OILS; CONSUMPTION; HOUSEHOLDS; URBAN AREAS; SOCIOECONOMIC ENVIRONMENT.

This research has been conducted in 2005, to understand consumption cooking oil in household level, and consumer's need and preferences. This research based on a descriptive method with regression econometric to analyse factors influencing demand for cooking palm oil consumption. The research area is selected purposively, the metropolis as the sample of representative samples of consumer's behaviors dynamics. At the metropolis, 210 samples were taken at three different markets including traditional, mini market and supermarkets. The result showed simultanneously effect of all variables including age,

education, amount of family member, income, price of cooking palm oil per liter, price of cooking non palm oil per liter; and dummy market level were significant (at 95% confidence level) to consumption volume of cooking palm oil. Partially, variables that significant (at 90% confidence level) were age and amount of family member. The differentiation of consumers behaviour of cooking palm oil, were also considered choices of the location of purchasing and price of cooking palm oil. While consumer's preferences that needed producer attention were variety of packaging criteria of cooking palm oil quality, packaging material, and cooking palm oil aroma.

E20 ORGANIZATION, ADMINISTRATION AND MANAGEMENT OF AGRICULTURAL ENTERPRISES OR FARMS

013 PRAWOTO, A.A.
Produksi awal dan kajian ekonomis usaha tani nilam aceh* (*Pogostemon cablin* Benth.) *sebagai tanaman sela kakao muda*/Early yield and economical study of Pogostemon cablin as intercrop in young cocoa *(Theobroma cacao* L.*). /Prawoto, A.A. (Pusat Penelitian Kopi dan Kakao, Jember (Indonesia)); Sholeh N.P., M. *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(3) p. 168-190, 10 ill., 6 tables; 26 ref.

POGOSTEMON CABLIN; COMPANION CROPS; THEOBROMA CACAO; LEUCAENA LEUCOCEPHALA; ARECA CATECHU; INTERCROPPING; FARMING SYSTEMS; OILS; QUALITY; ECONOMIC ANALYSIS.

Pogostemon cablin is an important source of volatile oil for pharmaceutical and cosmetic products. Agronomical aspect of this commodity needs open ecosystem, but for certain level of shading, this crop may yield economically. A study to evaluate the effect of *P. cablin* as intercrop on young cocoa farm, had been conducted during 2005, in Kaliwining Experimental Station of Indonesian Coffee and Cocoa Research Institute (ICCRI) at 45 m above sea level, D climate type (Schmidt and Fergusson), and on low gley humic soil. The experiment was arranged in factorial and the field design was split plot replicated three times. The main plot was no shade tree, shade of *Leucaena glauca* and *Areca catechu*, while the subplots were fertilizer dose (per ha/year), i.e. without fertilizer (P0); 140 kg Urea, 35 kg SP-36, 70 kg KCl (P1); 280 kg Urea, 70 kg SP-36, 140 kg KCl (P2); and 560 kg Urea, 140 kg SP-36, 280 kg KCl (P3). The result showed that *P. cablin* cultivated without shading gave better growth and yield than the shading treatment; meanwhile Leucaena shading showed better growth and early yield than the *A. catechu* shading. Fertilizer rate of P1 produced the highest leaf weight and oil yield, although P3 possessed the highest growth variables of plant height, stem diameter, number of leaves, leaf area and chlorophyll content. For the dry weight biomass variable, highest yield was obtained from no shade tree and P1 treatment. Using chromatography gas analysis, retention time of patchouli alcohol was 15-18 minutes, it was found that the content was influenced by shading treatment, i.e. 25.15% in monoculture, 28.73% in Leucaena and 25.21% in *A. catechu* treatment. For the oil viscosity variable, the monoculture treatment showed the highest value (23.21 centipoise), followed by *A. catechu* (11.60 centipoise) and Leucaena treatment (8.65 centipoise). Intercropping of *P. cablin* with young cacao did not show negative effect on young cacao growth. This study demonstrated that pre-cropping of *P. cablin* in young cacao provided opportunity to farmers to have additional income, the benefit cost ratio (B/C) for Leucaena treatment 1.00-1.35 depend on fertilizer dose, while for *A. catechu* treatment gave no profit (B/C 0.59-1.03 depend on fertilizer dose). Meanwhile, *P. cablin* monoculture cultivation gave B/C 1.44-2.71.

014 RITUNG, S.
***Prospek perluasan lahan untuk padi sawah dan padi gogo di Indonesia.* Prospect of extensification for paddy fields and upland rice in Indonesia**/Ritung, S.; Hidayat, A. (Balai Besar Penelitian dan Pengembangan Sumber Daya Lahan Pertanian, Bogor (Indonesia)). *Jurnal Sumber Daya Lahan* ISSN 1907-0799 (2007) v. 1(4) p. 25-38, 1 ill., 4 tables; 18 ref.

ORYZA SATIVA; UPLAND RICE; RICE FIELDS; EXTENSIFICATION; INDONESIA.

Population of Indonesian people are increasing rapidly, with population growth 1.5%/year. It means that the demand of foods also increases. Meanwhile, agricultural land, especially paddy fields which covers 7.7 million hectares can not fulfill the need of Indonesian food especially rice, corn, and soybean. Therefore, imported rice, corn, and soybean increases lately. Supply and demand of rice in year 2010 is predicted about 32.65 million tons rice and 36.77 million tons rice respectively, thus about 4.12 million tons of rice deficit will be occurred. Deficit of rice about 5.8 million tons in year 2015 and 7.49 million tons in 2020 has also been predicted. To produce rice as much as predicted, harvest area of 13,500-15,000 hectares of paddy fields or about 9,000-10,000 hectares paddy fields are required based on standard acreage, assuming that growth index is 150%. Paddy fields conversion, especially in Java is uncontrollable, therefore the stability of national food security is in danger. During 1981-1999, national paddy fields conversion covers 1,628 thousand hectare where 61.6% occurred in Java. Most of the paddy field which have been converted was actually land with technical or semi technical irrigation having high productivity. Even in the last three years (1999-2002) paddy field conversion has increased about 187,720 hectares a year. The potential of land availability for paddy fields extension in Indonesia covers 8.28 million hectares which consists of 2.98 million hectares swampy areas and 5.30 million hectares non swampy areas. The largest potential paddy fields area in Indonesia can be found in Papua, Kalimantan, and Sumatra, covering 5.19 million hectares, 1.39 hectares, and 0.96 million hectares, respectively. Meanwhile in Sulawesi, Maluku and North Maluku, Bali and Nusa Tenggara, and Java, the potential paddy fields are only 0.42; 0.24; 0.05; and 0.014 million hectares, respectively. Paddy field extensification strategy can be done by utilizing potential paddy field in irrigation areas, optimizing paddy field in bareland, and conducting paddy field extensification in large potential areas such as in Papua and Kalimantan.

015 SWASTIKA, D.K.S.

Analisis kebijakan peningkatan produksi padi melalui efisiensi pemanfaatan lahan sawah di Indonesia. **[Analysis of rice production increase policies through lowland use efficiency in Indonesia]**/Swastika, D.K.S. (Pusat Analisis Sosial Ekonomi dan Kebijakan Pertanian, Bogor (Indonesia)); Wargiono, J.; Soejitno; Hasanuddin, A. *Analisis Kebijakan Pertanian* ISSN 1693-2021 (2007) v. 5(1) p. 36-52, 1 ill., 10 tables; 9 ref.

RICE; PRODUCTION; ECONOMIC POLICIES; LAND DIVERSION; INDONESIA.

Rice is an important staple food for more than 95% of the Indonesians. In addition, rice is also a strategic political commodity. Since the early of independence, Indonesia has tried hard to increase rice production. However, for more than three decades, domestic rice production was not able to meet its growing demand, so that Indonesia remains dependent upon rice import. This condition was made worse by conversion of fertile lowland in Java. Therefore, rice production growth was levelling-off. In the future, there should be some efforts to increase rice production, although land conversion is still going on. This study aimed at assessing the performance of lowland use, its contribution and prospect to increase rice production. The results showed that lowland is the main source of rice production. In 2005, the irrigated and rain-fed lowland planted rice was 6.84 million ha, with the average cropping index of about 1.61. This figure indicates the potential to increase rice production through improvement of cropping index. The result of SWOT analysis showed that improvement of cropping index is the strategic policy to compensate land conversion. Another potential is improvement of intensification through promotion of HYVs in line with integrated crops management. The implementation of these strategic policies should be supported by development and renovation of infrastructures as well as establishment of credit scheme to enable farmers to adopt modern technology.

016 SYAM, A.

Dinamika dan struktur pendapatan usaha tani padi di Sulawesi Tenggara. **[Dynamic and income structure of rice farming systems in Southeast Sulawesi (Indonesia)]**/Syam, A.; Sahara, D. (Balai Pengkajian Teknologi Pertanian Sulawesi Tenggara, Kendari (Indonesia)). *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian* ISSN 1410-959x (2007) v. 10(1) p. 11-19, 1 ill., 7 tables; 8 ref.

RICE; FARMING SYSTEMS; PLANT PRODUCTION; PRODUCTIVITY; PRICES; FARM INCOME; COST BENEFIT ANALYSIS.

The research was aimed at knowing the rice dynamic in Kendari and Kolaka Regency, Southeast Sulawesi, including the increase trend of areas, production and productivity, yield and rice price, and the structure of rice farming system before and after the increase of fuel's price. The research used the secondary data collected from 1995 to 2004 and primary data collected by a survey method involving 40 farmers in each-regency started from February till March 2006. The results showed that the rice production increased by 1.37% per year although the harvest area decreased to 0.06% per year. Kolaka's rice production contributes 30% and Kendari contribution is 50.39% of the total province rice production. The development of postharvest rice price (from 2000-2004) showed an average increase of 8.39% per year while the rice price paid by consumers increased 7.06% per year. Therefore, the rice price on the farmer's level was around 41.07% per year. Result of financial analysis indicated that the farmers' income in Kendari increased by 20.87% and the farmers' income in Kolaka increased by 22.73% as compared to before and after the increase of fuel's price. The increase of price was due to the increase of rice price from Rp 1,100/kg to Rp 1,350/kg of yields (dried rice) or an increase of 22.75%.

E50 RURAL SOCIOLOGY AND SOCIAL SECURITY

017 SUYANTO, S.
Imbalan jasa lingkungan untuk pengentasan kemiskinan. **[Rewarding for environmental services for poverty alleviation]**/Suyanto, S.; Khususiyah, N. (World Agroforestry Centre, Bogor (Indonesia). Southeast Asia Regional Office). *Jurnal Agro Ekonomi* ISSN 0216-9053 (2006) v. 24(1) p. 95-113, 3 ill., 7 tables; 15 ref.

AGRICULTURAL POLICIES; LAND OWNERSHIP; LAND DIVERSION; ENVIRONMENTAL FACTORS; POVERTY; RURAL POPULATION; FARM INCOME; SUMATRA.

This study indicated that land rights delivered to poor farmers as one type of reward for environmental services was not only important as income sources but also necessary to improve equity in income and land holding size. This study supported policy to hand over land rights to poor farmers who provide environmental services and considers such initiative in favor of poor people under the state land management. Land rights award for upland poor farmer was a win-win solution in respect to the interest of forest conservation and poverty alleviation. Reward mechanism for environmental services is not widely applied in Indonesia, although similar initiatives have been carried out at lower levels.

E70 TRADE, MARKETING AND DISTRIBUTION

018 DELIANA, Y.
Perbedaan biaya transaksi antara integrasi vertikal dan transaksi bebas di tingkat pedagang pengumpul jagung di Jawa Timur. **Differences of transaction cost between vertical integration and free transaction of corn at small trader level in East Java**/Deliana, Y. (Universitas Padjadjaran, Bandung (Indonesia). Fakultas Pertanian). *Jurnal Agrikultura* ISSN 0858-2885 (2008) v. 16(3) p. 195-199, 5 tables; 7 ref.

MAIZE; MARKETING; COSTS; MARKETING MARGINS; JAVA.

The main problem of corn marketing in East Java is that the price of farm gate always low either at the peak production season or the time of corn scarcity with farmer share of 30% - 40%. It is predicted that the low price of corn at the farm gate was caused by high transaction cost. According to the theory, transaction cost of vertical integration is less than that of free transaction. To know that theory is correct, the research has been taken by using the explanatory survey method to 35 respondents of wholesaler conducted by census from 14 districts in East Java and 63 small trader selected by simple random sampling. The result of this research showed that for those who practiced vertical integration, the

transaction cost was even higher than that of free transaction at small trader level, which was contradictive with the theory. Vertical integration did not result in more profit than free transaction, and this existing transaction practiced between small trader and wholesaler was based upon selling practicality, not based on transaction cost.

019 KRISDIANA, R.
Preferensi industri tahu dan tempe terhadap permintaan komoditas kedelai di Jawa Tengah. **[Tofu and tempeh industries preferences of soybean demand in Central Java (Indonesia)]**/Krisdiana, R. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.). Bogor (Indonesia): Puslitbangtan, 2006 p. 647-656, 6 tables; 6 ref.

SOYBEANS; HIGH YIELDING VARIETIES; CHOICE OF SPECIES; SEED SIZE; CONSUMER BEHAVIOUR; SOYFOODS; FOOD INDUSTRY; QUALITY; DEMAND; JAVA.

The objective of this research were to (1) identify consumer preference for some soybean varieties based on market demand, (2) identify industrial response to some preeminent varieties of soybean. Location of the research in production center and soybean industrial center in Klaten, Wonogiri, Sragen, Sukoharjo, Solo, Karanganyar, Boyolali, Grobogan, Blora, and Pati Regencies. Five tofu and tempeh industries were selected for each regency. Research was conducted by surveying and soybean practices for making tofu and tempeh from soybean. Data was collected using a laminated random method (stratified random sampling). Strata of industrial product type were (1) tofu industry and (2) tempeh industry. Industrial respondents were shown examples of preeminent varieties of soybean with the characteristics of medium size and big seed to be studied and selected according to industrial preferences for raw ingredients. Parameters measured included (1) seed size, (2) color of seed husk; and (3) seed shape. Preference data was analysed using a tabulation method. Results of the research indicated that soybean preference for tofu industry was yellow colored and a portion of green color seed, big seed size and a flimsy husk. The preeminent variety selected was Argomulyo. While for tempeh industrial preference was colored soybean, big seed size and flimsy husk, and preeminent variety of Burangrang.

020 LUKISWARA.
Kinerja pasar pada pasar komoditas pisang (Musa* sp.*): suatu kasus di tiga kecamatan sentra produksi pisang Kabupaten Cianjur, Jawa Barat. **Performance of bananas market: a case in the three subdistrict of bananas production center, Cianjur Regency, West Java**/Lukiswara (Universitas Padjadjaran, Bandung (Indonesia). Fakultas Pertanian). *Jurnal Agrikultura* ISSN 0858-2885 (2008) v. 16(3) p. 200-206, 3 tables; 6 ref.

BANANAS; MARKETS; JAVA.

The objective of this study was to evaluate the performance of banana (*Musa* sp.) market in the three sub-districts of banana production centres in Kabupaten Cianjur. The research used survey method both descriptive and explanatory. Number of farmers sampled in this study were 230 banana farmers and 72 various traders. The data were analyzed descriptively by using Ravallion model. Empirical analysis indicated that there was no strong market integration between producer's market and retailer's or consumer's market. The conclusion is that the market performance is less efficient.

F01 CROP HUSBANDRY

021 ADINUGRAHA, H.A.
Pertumbuhan setek pucuk sukun asal dari populasi Nusa Tenggara Barat dengan aplikasi zat pengatur tumbuh. **Growth of leafy cuttings of breadfruit trees taken from Nusa Tenggara Barat (Indonesia) with the application of growth regulator hormone**/Adinugraha, H.A.; Moko, H. (Pusat Penelitian dan

Pengembangan Hutan Tanaman, Yogyakarta (Indonesia)); Cepi. *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 93-100, 2 tables; 16 ref.

ARTOCARPUS ALTILIS; CUTTINGS; PLANT GROWTH SUBSTANCES; GROWTH; NUSA TENGGARA.

Propagation of breadfruit trees (*Artocarpus altilis*) could be conducted by leafy cuttings method. The objective of experiment was to evaluate the effect of shoot cuttings position and growth regulators on the success of breadfruit shoot. The experiment was conducted at the Center for Plantation Forest Research and Development, Yogyakarta from May to October 2005. The experiment was arranged in completely randomized design with 2 factors. The first factor was shoot cuttings position, i.e. upper shoot cutting (P1) and lower shoot cutting (P2), meanwhile the second factor was growth regulator concentrations, i.e. K0 = control, K1 = 25%, K2 = 50%, K3 = 75% and K4 = 100%. Each treatments consisted 6 replications and 8 samples of shoot cutting each. The parameters observed were percentage of shoot growth, percentage of rooted cutting, the number and length of root, conducted one month interval. The result showed that upper shoot cutting gave better significantly effect on percentage of shoot growth, percentage of rooted cutting, the number and length of root than lower shoot cuttings. Growth regulators also gave better effect on all parameters observed than control.

022 DARWATI, I.

***Status penelitian purwoceng* (*Pimpinella alpina* Molk.) *di Indonesia*. [Research status of purwoceng (*Pimpinella alpina* Molk.) in Indonesia]**/Darwati, I. (Balai Penelitian Tanaman Obat dan Aromatik, Bogor (Indonesia)) Roostika, I. *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(1) p. 9-15, 1 ill., 4 tables; 16 ref.

PIMPINELLA; CULTIVATION; IN VITRO CULTURE; BIOCHEMISTRY; PHARMACOLOGY; PLANT EXTRACTS; INDONESIA.

Purwoceng is a commercial medicinal plant that could be used as aphrodisiac, diuretic, and body fit enhancer. The plant is indigenous of Indonesia that grew endemically at Dieng Plateau in Central Java, Pangrango Mountain in West Java, and mountainous area in East Java. Recently the population is getting rare because of high genetic erosion. Based on the erosion level, the purwoceng is categorized as endangered species. In order to prevent from extinction, the conservation has to be done. The efforts of conservation could be conducted together with the efforts of its utilization optimally and sustainable. So far there were not many researches on purwoceng. Several aspects that had been reported were on agronomy, *in vitro* culture, phytochemistry, and pharmacology. However, the results of those researches had not been optimal and satisfying. Breeding research had not even been reported. This condition opened large opportunities for researchers to develop the researches that had been conducted to obtain the new technology. The supported technologies and the completed information would enhance the development of this commodity especially at industrial scale.

023 EMMYZAR

***Pengaruh intensitas naungan terhadap pertumbuhan dan produksi klon harapan panili.* [Effect of various shading intensity on the growth and production of vanilla promising clones]**/Emmyzar; Ferry, Y.; Rosman, R.; Karmawati, E.; Rochmat, I.. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia) : Balittro, 2006 p. 167-173, 2 tables; 6 ref. 633.8/BAL/l bk1

VANILLA PLANIFOLIA; CLONES; CULTIVATION; SHADING; HIGH YIELDING VARIETIES; GROWTH; YIELDS.

Study on effect of various shading levels on vanilla growth in the early stage was conducted in Sukamulia experimental garden, Sukabumi, 450 m asl, with B1 climate according to Oldeman classification system

and Latosol soil type. Treatments tested were two vanilla clones and shading levels. The experiment was set up in factorial experiment design with vanilla clone as a first factor and 5 shading levels (75, 65, 55, 45 and 35%) as second factor. Each plot consisted of 20 seedlings, with planting space 1.5 m x 1.75 m and each plot was repeated three times. There were 600 vanilla seedlings planted and observed during the experiment. The results showed that coefficient of variance of the seedlings was around 15%, except those of bud length and stem diameter. In general, vanilla clone 1 showed better performance than clone 2 in the parameters of bud length, stem diameter, nodes number and leaf number. The same condition also noticed in other parameters, such as length, thickness and width of leaves. Since this research was a preliminary study, further observations were needed.

024 HARAHAP, I.Y.
Keragaan awal pertumbuhan dan potensi produktivitas berbagai varietas kelapa sawit yang ditanam dengan populasi tinggi. **[Early growth performance and productivity of some oil palm varieties planted with high population]**/Harahap, I.Y.; Pangaribuan, Y.; Listia, E. (Pusat Penelitian Kelapa Sawit, Medan (Indonesia)). *Jurnal Penelitian Kelapa Sawit* ISSN 0853-196X (2006) v. 14(1) p. 1-10, 2 ill., 5 tables; 5 ref.

ELAEIS GUINEENSIS; VARIETIES; GROWTH; PRODUCTIVITY; PLANT POPULATION; CROP PERFORMANCE.

To determine the response of the early performance of some oil palm varieties planted with high population an observation was done during August 2006 on the September 2001 planting area. The area located at Membang Muda Plantation, PTP Nusantara III, Aek Kanopan, North Sumatra. The trial was designed in factorial randomized completely block design, with 2 factor treatments, that were 6 IOPRI's oil palm varieties and 2 kinds of oil palm tree population (high, 181 trees per ha; and standard, 128 trees per ha). The observation variables included vegetative and generative organs. The result showed that at the early vegetative performance, environmental stress was occured which was shown by longer leaves rachis growth. The leaves rachis of Rispa, Yangambi, Dolok Sinumbah, and Dolok Sinumbah x Bah Jambi varieties planted with high population was longer compare to standard population, while, LaMe was the oil palm variety that more tolerant under that condition. Commonly, the total of fruit and female inflorence bunch of each individual tree on high population was not different with standard population for almost of the varieties. Therefore, in the area with high population produced higher fruit and female inflorence bunch than standard population. Productivity potentials of fresh fruit bunch on the high population was 22.5-30.6 ton/ha/year. This productivity was much higher (about 34%) compare to standard population productivity (about 17.7-22.9 ton/year). Based on early vegetative and productivity potentials performance, LaMe variety was considered as potential material which could use in the oil palm population practice management system.

025 NURYANI, Y.
Karakteristik empat aksesi nilam. **[Characteristic of four accessions of patchouli (*Pogostemon cablin*)]**/Nuryani, Y. (Balai Penelitian Tanaman Obat dan Aromatik, Bogor (Indonesia)). *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(2) p. 45-49, 4 tables; 12 ref.

POGOSTEMON CABLIN; CHEMICOPHYSICAL PROPERTIES; LIPID CONTENT; QUALITY.

Characterization of four accessions of patchouli was conducted to obtain the information on characteristics to be utilized for future breeding program. The experiment was conducted in three locations, namely Ciamis, Cimanggu, and Sukamulya. Four accessions of patchouli namely 0003, 0007, 0012, and 0013 were tested in a randomized block design with five replications, plant spacing of 100 cm x 50 cm, and 100 plants/plot. The plant were first harvested six months after planting and the second harvested four months after the first harvested. The observation were made before the first harvested on morphological characters, production, oil content, and oil quality. The result showed that some of morphological characters such as plant height, accessions of primary and secondary branches, length of primary and secondary branches, length and width of leaf as well as numbers of leaves on primary branches on

accession of 0012 were higher than that of other three accessions. The highest production of dry terna (13.278 t/ha) and patchouli alcohol content (33.3%) was observed on accession 0012, while the highest oil content (3.2%) on accession 0007. The main morphological character that can be used to identify those accessions of patchouli was the colour of stem, accessions 0012 was green with slight purple, 0003 and 0007 more purple, and 0012 dark purple.

026 SAIDAH

Kajian teknologi budi daya kacang tanah spesifik lokasi di Lembah Palu, Sulawesi Tengah. **Evaluation of cultural practices for peanut in Palu Valley, Central Sulawesi**/Saidah; Syafruddin; Chatijah; Munier, F.F.; Ardjanhar, A. (Balai Pengkajian Teknologi Pertanian Sulawesi Tengah, Palu (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang, 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia) : Puslitbangtan, 2006 p. 474-482, 3 tables; 13 ref.

ARACHIS HYPOGAEA; CULTURAL METHODS; CULTIVATION; TECHNOLOGY TRANSFER; AGRONOMIC CHARACTERS; YIELD COMPONENTS; SOCIOECONOMIC ENVIRONMENT; FARM INCOME; SULAWESI.

In Central Sulawesi, low dryland lies 77% of the total dryland areas (1,036,000 ha). In Palu Valley, the area of low dryland is 38,694 ha. Farming development in Palu Valley has been dominated by horticultures, small ruminants, poultry and annual crops. One of the major annual crops planted is peanut. However, the production remains low (0.5-1.1 tons dry pod per ha). This is due to poor cultivation techniques applied by farmers. The aim of this research was at examing cultivation technology packages for peanuts in low drylands based on specific characteristics of the location. The research was located in Porame Village, Marawola Distric, Donggala Regency. The research examined two technology packages, i.e. farmer techniques and introduced techniques. The results showed that peanut production using farmer techniques and introduced techniques was 401.8 kg/ha and 800.5 kg/ha, respectively. Farmers faced problems on limited funds and low education, no access to financial institution, although farmer appreciation to technology remain good. The impacts of the research were the majority of the non cooperating farmers now utilize manure and use peanut trash for fodder. Net incomes of farmers planting peanut using introduced techniques was Rp 2,759,250/ha/planting season, whereas using farmer techniques was Rp 1,051,700/ha/planting season with R/C were 2.13 and 1.67, respectively. Environmental aspects such as houses and land were also positive.

027 SUKARMAN

Perbaikan teknologi penyediaan bahan tanaman. **[Improving vanilla planting stock technology]**/Sukarman; Melati; Ferry, Y.; Sukamto; Emmyzar; Mahmud, Z. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 151-158, 6 ill., 8 ref. 633.8/BAL/l bk1

VANILLA PLANIFOLIA; PLANTING STOCK; GRAFTING; GROWTH; PRUNING; TECHNOLOGY.

One constraint in developing vanilla is inadequate seed from high yielding variety and uniformity of vanilla growth in the field. Therefore, an experiment in improving technology for plant propagation has been conducted to find out vegetative propagation technology as basic to determine standard operational procedure (SOP). The experiments have been conducted both in green house and field at Natar (Lampung), Bogor and Sukamulia agricultural experimental garden. Plant materials were taken from vanilla mother plants at Natar (Lampung). The activities were started by nursery in green house, and continued to field experiment. Factorial experiment with 2 factors and 3 replications arranged in split plot design. The main plot was 2 different types of bud physiological age, i.e., 6 months and 12 months after main stem cutting, while the sub-plots were combination of 2 clones and 5 internodes position, there are: (1) clone 1 + 1st internodes, (2) clone 1 + 2nd internodes, (3) clone 1 + 3rd internodes, (4) clone 1 + 4th internodes, (5) clone 1 + 5th internodes, (6) clone 2 + 1st internodes, (7) clone 2 + 2nd internodes, (8) clone

2 + 3rd internodes, (9) clone 2 + 4th internodes, (10) clone 2 + 5th internodes. Cuttings of vanilla from different treatments were planted in nursery, then 3 - 4 months later will be planted in Sukamulia agricultural experimental garden. Observed variables were budding periods, growth of bud (number of leaf and length of bud). In 2005, the activity was focused on topping of vanilla plants in order to produce 2 different physiological ages of new bud (6 and 12 months after topping) from mother plant garden in Natar experimental garden. Land preparation and planting of the live supports (Glirisidia) in Sukamulia experimental garden was also conducted. Variables observed were percentage of budding, number of internodes and length of new budding. The results indicated that growth of buds with 8 months physiological age was 86.0 - 92.0%, the length 225.5 - 245.6 cm and internodes number ranged 32.3 - 35.0. Bud with 2 months old had growth percentage of 80.33 - 88.67%, bud length 48.86 - 50.69 cm and internodes number of 6.53 - 7.79. Clone 1 had higher growth percentage than clone 2, however, bud length and internodes number were lower than those of clone 2.

028 WIDJAJANTO, D.
Evaluasi kesesuaian lahan untuk budi daya tanaman kakao (Theobroma cacao L.) di DAS Gumbasa Hulu, Kabupaten Donggala. **[Evaluation of land suitability for *Theobroma cacao* cultivation in Gumbasa Hulu Watershed, Donggala Regency (Indonesia)]**/Widjajanto, D. (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian) Sitorus, S.R.P.; Mudikdjo, K.; Murtilaksono, K.; Hardjomidjojo, H. *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 163-169, 3 ill., 5 tables; 13 ref.

THEOBROMA CACAO; LAND SUITABILITY; CULTIVATION; WATERSHEDS; PRODUCTION; LAND CLASSIFICATION; SULAWESI.

The objectives of this research were to determine actual and potential land suitability classes aggregately for cacao plantation in the Gumbasa upper catchment area and relationship between the actual land suitability class and cacao yield. This study was carried out in Gumbasa upper catchment area of Palolo in Donggala which is situated between 120o 00"- l20o 17" East Longitudes and 1o 15" West Latitudes. Soil and cacao yield were surveyed using a stratified random sampling technique. Disturbed soil samples were obtained in composite from each land unit generated by overlaying several maps such as that of topography, land use and climate. The relationship between the actual land suitability indices and the cacao yield were analyzed using a simple linear regression. Results showed that, in aggregate, the Gumbasa upper catchment area might be classified into class S3-ctsf for the actual land suitability and into class S3-csf for the potential land suitability. The relationship between the actual land suitability indices and the cacao yield was represented by an equation of Y = 390.40 + 2248X (r^2 = 0.47) where Y was the cacao yield (kg/ha/year) and X was the actual land suitability indices.

F02 PLANT PROPAGATION

029 SUPRIATI, Y.
***Multiplikasi tunas belimbing dewi (Averrhoa carambola) melalui kultur in vitro*.** **[Shoot multiplication of star fruit (*Averrhoa carambola*) by *in vitro* culture]**/Supriati, Y.; Mariska, I.; Mujiman (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumber Daya Genetik Pertanian, Bogor (Indonesia)). *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(2) p. 50-55, 4 tables; 12 ref.

AVERRHOA CARAMBOLA; SHOOTS; PLANT PROPAGATION; IN VITRO CULTURE; PACLOBUTRAZOL; GROWTH.

Star fruit (*Averrhoa carambola*) is one of tropical fruits having high content of vitamin C, which was higher than that in apple and grape. As fresh consumption, star fruit had a good role in decreasing human blood pressure. Main constraints of star fruit development whether for conservation purpose or for cultivation were lack of seedlings availability. *In vitro* culture technique was one of the alternative technologies capable of producing seedlings in a large quantity, uniform growth and relatively in a short period. One of the important keys in micropropagation work was the step of shoot initiation and

multiplication. This study used two kind of explants, namely shoot with single node and shoot from germinated embrio. In experiment I, shoot with single node and shoot from germinated embryo were planted at WPM media + citric acid 100 mg/l. The next activity was focused on single node shoots subcultured at WPM + BAP 0.5 mg/l. In experiment II *in vitro* shoots from previous experiment was subcultured at WPM + BA (1 and 2 mg/l) + thidiazuron (0.1 and 0.2 mg/l). To stimulate shoot multiplication rate, shoot was subcultured at WPM or MS media in combination with IAA 0.5 mg/I and zeatin 2 mg/l. To improve vigourity of the plant, *in vitro* shoots resulted from multiplication media was planted at WPM or MS media containing paclobutrazol (0.4 and 0.8 mg/l) + BA 2 mg/l + thidiazuron 0.2 mg/l. Result showed that the use of single node shoot as an explants was better than shoot comes from germinated embryo. Subculture of star fruit shoot on WPM basal media containing BAP of 0.5 mg/l produced shoot number about 4, and the shoot number could be increased until 18 by using IAA 0.5 mg and zeatin 2 mg/l. The treatment of shock temperature at 4-5°C during 4 days before planting could fasten shoot initiation time from 3 months to 1 month. An addition of 0.4 mg/l paclobutrazol on MS or WPM media containing 2 mg/l BA and 0.2 mg/l thidiazuron could improve vigourity of plantlet.

030 TRISILAWATI, O.
***Perbaikan teknik penyambungan lada potensi produksi tinggi dengan lada tahan penyakit.* [Improving grafting technique of potential high yielding pepper and disease with resistant pepper]**/Trisilawati, O.; Djauhariya, E.; Hera N.; Samsudin; Djazuli, M.; Jaenudin; Kuswadi. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005; Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 98-112, 11 tables; 10 ref. 633.8/BAL/l bk1

PIPER NIGRUM; HIGH YIELDING VARIETIES; DISEASE RESISTANCE; GRAFTING; CLIMATE; PLANT GROWTH SUBSTANCES; ANTIOXIDANTS; CALLUS.

The aim of the research was to find the microclimate condition (temperature, air humidity, light intensity), growth hormone and antioxidant concentration for optimal callus formation, and also grafting component between *Piper colubrinum* and LDL (Lampung Daun Lebar) in green house. The research was divided into 3 activities, namey (1) Effect of microclimate and growth hormone for callus formation. Microclimate condition as a main plot consisted of (a) at 55% light intensity, AH > 75%, temperature of 27 - 32 ^{o}C, (b) at 75% light intensity, AH < 75%, temperature of 27 - 36 ^{o}C, dan (c) at > 75% light intensity, AH < 75%, temperature of 27 - 36 ^{o}C. Subplot was type and dose of growth hormone: 0, 0.05, 0.1, 0.15 and, 0.2% cytokinin, 25% and 50% coconut water, with 3 replications. (2) Effect of type and concentration of antioxidants for callus formation, using completelly randomized design, consisted of 0, 50, 100, 150, and 200 ppm of titric acid and 50, 100, 150 and 200 ppm of citric acid, replicated 3 times. (3) Effect of site and grafted method to quality of grafted pepper, using completely randomized design with 2 factors, i.e (1). site graft, consisted of (a) at the middle of stem, and (b) at intercalary, (2) grafted method of cleft, veneer, and with 5 replications. Result showed that based on the optimal formation of carbohydrate, the optimal timing for grafting was at 9.30 am - 2.00 pm. Treatment of 75% light intensity, AH < 75%, temperature 27 - 36 ^{o}C combined with application of 25% coconut water on the cut site resulted optimum callus formation. Application of 50 ppm titric acid supported callus condition. Cleft method at intercalary had highest bud formation percentage.

F03 SEED PRODUCTION AND PROCESSING

031 PRAWOTO, A. A.
***Uji alelopati spesies tanaman penaung terhadap bibit kopi arabika* (*Coffea arabica* L.). Study of allelopathy of some shade trees to *Coffea arabica* L. seedlings**/Prawoto, A.A.; Nur, A.M. (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)); Soebagiyo, S.W.A.; Zaubin, M. *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(1) p. 1-12, 5 tables; 20 ref.

COFFEA ARABICA; SEEDLINGS; SHADE PLANTS; CASSIA; MACADAMIA TERNIFOLIA; CINNAMOMUM BURMANNI; ALLELOPATHY; MINERALS.

Considering social economic aspects, many coffee planters nowadays grow *Cassia spectabilis* and in the certain regions used *Cinnamomum burmani*, *Macadamia integrifolia*, *Tectona grandis* and *Cassia siamea* as shade trees or intercrops. Before being used in large scale, allelopathy study is appropriate to be done because its effect is much more difficult to be overcome than competition as growing factor. Research on allelopathy of those species had been conducted in glasshouse of Indonesian Coffee and Cocoa Research Institute using Salisbury Ross method. Leachate of *Cassia spectabilis*, *Cinnamomum burmani*, *Macadamia integrifolia*, *Tectona grandis* and *Cassia siamea*, pure media (without plant) and control (well water) were used as treatments. *Cinnamomum burmani*, *Macadamia integrifolia*, *Tectona grandis*, and *Cassia siamea* were as seedlings of one year old, and *C. spectabilis* of 3 months old were planted in polybags 20 cm x 30 cm and replicated five times. The media was a mixture of top soil, manure and sand 1:1:1 (v/v). After maintained those species for one months and Arabica seedlings for three month old, watering of coffee seedlings was done using leachate from shade trees media. Every two days, each seedling was applied with 200 ml. Control was applied with well water. Pure media was used to study the effect of nutrient supply contained in the leachate. The experiment was ended at seven month old of the coffee seedlings. The results showed that *C. spectabilis* released chemicals which showed allelopathic effect to Arabica coffee, their growth was inhibited 10% to control. The growth decreament from *Cassia siamea* and *D. zibethinus* treatment mainly caused by lower mineral content in the leachate and indicated by weak allelopathic. On the other hand *M. integrifolia* and *C. burmani* did not show allelopathic to Arabica coffee. Thus, based on allelopathy aspect, it can be included that *C. spectabilis* and *C. siamea* were not recommended as shade trees or intercrops with Arabica coffee and for *D. zibethius* its cropping pattern must be arranged so the mineral competition could be maintained minimum.

032 SOEDOMO, R.P.
***Pengaruh kemasan terhadap daya simpan umbi, bibit, pertumbuhan, dan hasil bawang putih.* Effect of packaging materials on the keeping quality of seed bulbs, the growth, and field performance of garlic**/Soedomo, R.P. (Balai Penelitian Tanaman Sayuran, Lembang, (Indonesia)). *Jurnal Hortikultura* ISSN 0853-7097 (2006) v. 16(4) p. 283-289, 3 tables; 14 ref.

ALLIUM SATIVUM; BULBS; SEED; PACKAGING; STORAGE; GROWTH; QUALITY; YIELDS.

Garlic as cooking spices was widely used in Indonesia. Most of the garlic consumed was imported in fact that some potential highlands suitable for planting garlics were ignored. The objectives of the study were to find out the best packaging materials for seed bulbs and its impact to growth and yield in the field. The trial was conducted at the seed laboratory of Indonesian Vegetables Research Institut at Lembang (1,250 m asl) in October 2004-February 2005. The subsequent planting was done in the research field of the institute to observe the performance of the seedbulbs. The experimental design was CRD for storage laboratory study and RCBD for field observation, with a split plot design. There were 7 treatments and 4 replications. The treatments were (1) polyethylene wrap + CaCO3, (2) polyethylene wrap + CaCO3 + O_2, (3) polyethylene wrap + Aquastore, (4)polyethylene wrap + Aquastore + O_2, (5) polyethylene plastic net, (6) cement paper bag + CaCO3, and (7) cement paper bag + Aquastore. The result showed that the best packaging material was plastic net with seed bulb damages of 9.6%, and storage life of 57 days. The plant height at 14, 28, 42, 56 and 70 days after planting (dap) were 6.00, 12.23, 30.00, 40.75, and 49.0 cm, respectively. The yield per plant was 80.80 g. Number of bulblet per bulb was 10.80, and diameter of bulb was 32.10 cm. Cement paper, with absorber materials of limestone and Aquastore showed damages of 12.5 and 11.0% respectively. The keeping quality stood for 62.0 days. The plant height at 14, 28, 42, 56, and 70 dap were 6.90, 12.60, 30.90, 41.15, and 49.27 cm (limestone absorber), and 8.43, 14.50, 32.25, 42.50, and 51.80 cm (Aquastore absorber), respectively. The plant survival in the field were 92.80 and 97.90%. The number of bulblets were 78.60 (limestone) and 77.70 (Aquastore).

F04 FERTILIZING

033 ARAFAH
Kajian teknologi enzim revolusi agro pengelolaan tanaman terpadu di Sulawesi Selatan. *[Assessment of agrorevolution enzyme technology on integrated plant management in South Sulawesi]*/

Arafah; Suhardi (Balai Pengkajian Teknologi Pertanian Sulawesi Selatan, Makassar (Indonesia)). *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian* ISSN 1410-959x (2007) v. 10(1) p. 68-75, 4 tables; 7 ref.

ORYZA SATIVA; FERTILIZERS; INTEGRATED PLANT PRODUCTION; ENZYMES; COST BENEFIT ANALYSIS; SULAWESI.

Technological study of agro-enzyme revolution and integrated crop management in South Sulawesi was carried out to know the effectiveness and efficiency of Enzyme Revolutionize Agro and ICM as opposed to the increase of paddy products and farmers' earnings. This study was executed in Tabaringan Village, Sub District Galesong Utara, and District Takalar from the plantation date 16 May to the harvest date 11 August 2006. This study was done on farmers' farms with the following treatment formula: (1) Enzyme, (2) ICM and (3) Non enzyme. The results of the study indicated that the highest production of rice was obtained at the ICM treatment which was equal to 8,800 kg/ha compared to enzyme treatment and non enzyme treatment which produced only 7,040 kg/ha. The highest production cost obtained at enzyme treatment that was equal to Rp 8,526,224 followed by ICM treatment that was equal to Rp 5,850,280 and the lowest at non-enzyme treatment of Rp 5,551,224. The efficiency of production cost at ICM treatment was 31.38% higher compared to enzyme treatment. The highest farmers' earnings was obtained at ICM treatment that was equal to Rp 9,989,720/ha, while at enzyme and non enzyme treatments reached Rp 4,145,776 and Rp 7,120,776/ha, respectively. Therefore, the provision of enzyme itself in form of bio-culture cannot improve the paddy production and further does not give any benefit for the farmers.

034 BAON, J.B.

Intensitas penutup tanah Arachis pintoi dan inokulasi rhizobium serta penambahan fosfor dan pengaruhnya terhadap pertumbuhan tanaman kakao dan status hara di lapangan. **Intensity of ground cover crop *Arachis pintoi*, rhizobium inoculation and phosphorus application and their effects on field growth and nutrient status of cocoa plants**/Baon, J.B.; Pudjiono, H. (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)). *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(2) p. 76-90, 2 ill., 6 tables; 20 ref.

THEOBROMA CACAO; ARACHIS PINTOI; COVER PLANTS; GROWTH; RHIZOBIUM; INOCULATION; PHOSPHORUS; SOIL FERTILITY; CALOPOGONIUM.

Arachis pintoi is potential as a cover crop for cocoa (*Theobroma cacao* L.) farm, however information regarding its effect on the growth of cocoa plants in the field is very limited. The objective of this experiment was to investigate the combined influence of ground cover crop *A. pintoi*, rhizobial bacterial inoculation and phosphorus (P) fertilizer on the growth of cocoa in the field and nutrient status. This experiment was laid out in split-split plot design consisted of three levels of cover crop (without, *A. pintoi* and *Calopogonium caeruleum*), two levels of rhizobium inoculation (not inoculated and inoculated) and two levels of phosphorus application (no P added and P added). The results showed that in field condition the presence of *A. pintoi* as cover crop did not affect the growth of cocoa. On the other hand, *C. caeruleum* as cover crop tended to restrict cocoa growth compared to *A. pintoi*. Application of P increased leaf number of cocoa plant. Biomass production of *A. pintoi* was 40% higher than that of *C. caeruleum*. Soil organic carbon and nitrogen contents were not affected by ground cover crops, though higher value (0.235% N and 1.63% organic C) was obtained from combined treatments of inoculation and P addition or neither inoculation nor P addition. In the case of no rhizobium inoculation, soil N content in cocoa farm with *A. pintoi* cover crop was lower than that of without cover crop or with *C. caeruleum*. Cover crop increased plant N content when there was no inoculation on the other hand rhizobium inoculation decreased N content of cocoa tissue. Tissue P content of cocoa plant was not influenced by *A. pintoi* cover crop or by rhizobium inoculation, except that the P tissue content of cocoa was 28% higher when the cover crop was *C. caeruleum* and inoculated.

035 DARMAN, S.
Penurunan aktivitas aluminium monomerik dan hasil kedelai akibat pemberian ekstrak kompos limbah tandan buah sawit dan pupuk fosfat pada Oxic Dystrudepts. **[Effects of oilpalm waste compost and phosphate fertilizer application on decreasing monomeric aluminum activity and soybean yield in Oxic Dystrudepts]**/Darman, S. (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 121-128, 1 ill., 4 tables; 16 ref.

GLYCINE MAX; COMPOSTS; OIL PALMS; AGRICULTURAL WASTES; EXTRACTS; ALUMINIUM; PHOSPHATE FERTILIZERS; YIELDS.

This experiment was intended to study the aluminum activity and soybean yields on Oxic Dystrudepts in response to the application of a compost extract of oil palm fruit bunch waste. It was also directed to examine the optimum dose of the extract required for decreasing the monomeric Al activity associated with reduced need of phosphate fertilizer. The experiment applied a factorial randomized block design with two factors. This first factor was the dose of compost extract which ranged from 0 to 1.500 l/ha and the second one was phosphate fertilizer dosages which varied from 0 to 150 kg/ha. Results showed that the application of the compost extract decreased the monomeric Al activity, increased soil pH and concentrations of available P, CEC and yield of soybean. A maximum soybean yield of 2.90 t/ha dry seed was obtained with an application of compost extract of 1.098.74 l/ha and P fertilizer of 113.65 kg P/ha.

036 ERWIYONO, R.
Keefektifan pemupukan kalium lewat daun terhadap pembungaan dan pembuahan tanaman kakao. **Effectiveness of foliar application of potassium on flowering and fruiting of cocoa**/Erwiyono, R. (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)); Sucahyo, A. A.; Suyono; Winarso, S. *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(1) p. 13-24, 4 ill., 6 tables; 14 ref.

THEOBROMA CACAO; POTASH FERTILIZERS; FOLIAR APPLICATION; FLOWERING; FRUITING.

An experiment of foliar application of potassium on cocoa has been carried out in Kaliwining Experimental Station, Indonesian Coffee and Cocoa Research Institute in Jember to study its effectiveness on the flowering and fruiting of cocoa. The experiment was arranged according to factorial randomized completely block with 2 factors. The first factor was soil application of potassium fertilizer in two levels, i.e. without fertilizer and with K-fertilizer (KCl). The second factor was application of potassium from two sources, i.e. KCl and KNO3, with 3 levels, i.e. without fertilizer (sprayed with water only), K-fertilizer as KCl and K-fertilizer as KNO3. The experiment was done in 4 replications. Parameters observed included newly formed flowers, new young fruits and the fresh-developing fruits. The results showed that foliar application of fertilizer was more effective than soil application and plant response was better in increasing new flower formation. On the other hand, the effect of soil application of fertilizer was slow. Foliar application of potassium followed by soil application of potassium fertilizer was more effective in the form of KNO3 rather than KCl in increasing new flower formation. The dosage of foliar application of potassium could not significantly increase new young fruit formation, while the dosage of soil application of potassium significantly increased new young fruit formation.

037 FATHURRAHMAN
Karakteristik tumbuh, kadar N biji, dan pengaruh komponen hasil terhadap hasil kacang gude **[*Cajanus cajan* (L.) Mill sp]** ***galur ICPL 84031 akibat pemupukan P dan pemulsaan jerami padi pada berbagai jarak tanam.*** **[Effects of phosphate fertilizers and rice straw mulches on the growth characteristic, seed nitrogen content and yield component at different planting distances of pigeon pea]**/Fathurrahman (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 129-134, 3 ill., 1 table; 10 ref.

CAJANUS CAJAN; PHOSPHATE FERTILIZERS; STRAW MULCHES; SPACING; YIELD COMPONENTS; CROP PERFORMANCE

This field experiment was carried out to study effects of phosphorus fertilizer and rice straw mulching on growth characteristics (CRG and LAI) and seed nitrogen contents of pigeon peas (ICPL 84031 line) and those yield components on pigeon peas yield at different planting distances. The experiment was done during the dry season in Mpanau Village, Palu, Central Sulawesi. A factorial split plot design was applied and each treatment was repeated three times. Results showed that the CRG and LAI of the pigeon peas followed a quadratic trend. Higher levels of phosphorus fertilizer were associated with higher seed nitrogen contents. The dominant yield component affecting the yield was the number of seed per plant followed by weight of 100 dried seeds.

038 MUHARDI
Pertumbuhan dan hasil jagung manis yang diberi berbagai bahan organik di lahan kering daerah Palu. **[Effects of various organic matter on the growth and yield of sweet corn on dryland in Palu (Indonesia)]**/Muhardi (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 140-144, 4 tables; 13 ref.

ZEA MAYS; SWEET CORN; ORGANIC MATTER; ORGANIC FERTILIZERS; GROWTH; YIELDS; TIMING; FERTILIZER APPLICATION; DRY FARMING; SULAWESI.

The aim of this experiment was to evaluate responses of sweet corn to the application of organic matters and their application times. This experiment was conducted in dryland of Tondo Village, Palu with a randomized block design. Treatments tested were (1) NPK fertilizers, (2) bokashi trash + feces applied at 1 week before planting (wbp), (3) bokashi trash + feces at 3 wbp, (4) bokashi trash + animal manure at 1 wbp, (5) bokashi trash + animal manure at 3 wbp, (6) feces at 1 wbp and (7) feces at 3 wbp. The organic matters were applied at 15 t/ha, while the NPK fertilizers consisted of urea, SP-36 and KCl applied at 300, 200 and 100 kg/ha, respectively. Plant variables observed were plant height, number of leaves, stem diameter, chlorophyll content, fresh weight of cob and sugar content. Result showed that the treatment did not significantly affect all the parameters observed.

039 NURSYAMSI, D.
Kebutuhan hara kalium tanaman kedelai di tanah Ultisol. **[Potassium fertilizers requirement in Ultisols for soybean]**/Nursyamsi, D. (Balai Penelitian Tanah, Bogor (Indonesia)). *Jurnal Ilmu Tanah dan Lingkungan* ISSN 0853-6368 (2006) v. 6(2) p. 71-81, 1 ill., 6 tables; 13 ref.

GLYCINE MAX; POTASH FERTILIZERS; NUTRITIONAL REQUIREMENTS; SOIL CHEMICOPHYSICAL PROPERTIES; PLANT RESPONSE; ACRISOLS.

Field experiments were conducted in Ultisols of Deli Serdang, North Sumatra to study soil factors that affect soil potassium availability, select extraction method, determine the critical level of soil potassium, and calculate potassium fertilizer requirement for soybean. The experiments used randomized block design, five potassium levels, nine replications, and used soybean as plant indicator. The levels of potassium treatment were 0, 20, 40, 80, and 160 kg K/ha from KCl fertilizer. The result showed that soil organic-C and cation exchange capacity were found out as the main soil factors that affect soil K availability in Ultisols. The fertilization of K significantly increased grain yield in Tanjung Gusti where the grain yield increased from 0.81 to 1.99 t/ha (about 146%) by using 80 kg K/ha. HCl 25% was selected extraction method to estimate K fertilizer requirement in Ultisols for soybean. The availability class of soil K for soybean was low (<340), medium (340-1150) and high status (more than 1150 ppm K2O extracted by HCl 25%). K fertilizer requirement to attend maximum yield were 210, 190, and 150 kg KCl/ha while to attend optimum yield were only 85, 2, and 0 kg KCl/ha for low, medium, and high status of soil potassium, respectively.

040 RUHNAYAT, A.
Tanggap dua klon harapan panili terhadap pemupukan organic. **[Response of two vanilla promising clones to organic fertilizer application]**/Ruhnayat, A.; Djazuli, M. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 159-166, 5 tables; 11 ref. 633.8/BAL/l bk1

VANILLA PLANIFOLIA; CLONES; HIGH YIELDING VARIETIES; ORGANIC FERTILIZERS; GROWTH; AGRONOMIC CHARACTERS; PLANT RESPONSE.

The experiment was performed from January - December 2005, at Sukamulya Experimental Garden, Sukabumi. Five months age of vanilla clone 1 and clone 2 were used as plant materials with Gliricidia sp. as living-post (stand). Vanilla seeds were treated by non pathogenic *Fusarium oxysporum* (Bio-FOB Vanilla). The objective of the experiment was to obtain alternative organic fertilizer and an appropriate dosage of Bio-TRIBA to support the release of superior variety of vanilla. Experiment was arranged in split-plot design with three replications. The main plots were two promising clones of vanilla (clone 1 and clone 2) and the subplots were kinds of organic fertilizers (10 kg/tree/year of manure, 250 g/tree/year of dried leaf of glyricidia, and 250 g/tree/year of dried bamboo leaf) and applications of BioTRIBA (0, 5 and 10 ml/l). The observed parameters were length and diameter of stem and numbers, length and width of leaf. The results showed that there were no significant effects of organic fertilizer applied to the observed parameters, at 2 months age. Treated plot with 10 kg manure/tree/year showed the best performance than the others, but statistically the treatment was not significantly different.

041 SIRAPPA, M.P.
Kajian pemberian pupuk NPK pada beberapa varietas unggul padi sawah di Seram Utara. **[Assessment of NPK fertilizers application on high yielding lowland rice varieties in North Seram]**/Sirappa, M.P.; Rieuwpassa, A.J.; Waas, E.D. (Balai Pengkajian Teknologi Pertanian Maluku, Ambon (Indonesia)). *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian* ISSN 1410-959x (2007) v. 10(1) p. 48-56, 2 ill., 5 tables; 16 ref.

ORYZA SATIVA; HIGH YIELDING VARIETIES; FERTILIZER APPLICATION; NPK FERTILIZERS; GROWTH; YIELD COMPONENTS; CHEMICOPHYSICAL PROPERTIES; MALUKU.

The assessment was conducted to 4 newly pre-eminent varieties of rice that aimed at knowing the performance of growth and potential yields on lowland rice irrigation at North Seram. The treatment was conducted on a 4-ha of farmer's land by involving 8 cooperator farmers and 7 non cooperator farmers as a comparison. The dosage of fertilizer used by cooperator farmers consisted of 300 kg NPK Pelangi and 100 kg Urea/ha. The research was done from June 2006 until October 2006. The results indicated that the four pre-eminent varieties that were assessed, namely Fatmawati, Way Apo Buru, Gilirang and Ciherang by using NPK Pelangi, gave higher average results of the growth and yields. The average yield of grained obtained was 6.44 ton-8.20 ton harvest dried grain/ha which was higher 21-54% compared to the average yield of grain obtained from non cooperator farmers which was 5.30 ton harvest dried grain/ha. The NPK Pelangi fertilizers can be used to replace the single fertilizer in case the scarcity of fertilizer occured since it provided high yields. Of the four varieties assessed, Ciherang and Way Apo Buru varieties were recommended to be employed for further rice development in North Seram.

042 SYUKUR, A.
Kajian pengaruh pemberian macam pupuk organik terhadap pertumbuhan dan hasil tanaman jahe di Inceptisol, Karanganyar. **[Effect of organic fertilizer on the growth and production of ginger in Inceptisols, Karanganyar]**/Syukur, A.; Indah M.N. (Universitas Gadjah Mada, Yogyakarta (Indonesia). Fakultas Pertanian). *Jurnal Ilmu Tanah dan Lingkungan* ISSN 0853-6368 (2006) v. 6(2) p. 124-131, 3 ill., 3 tables; 11 ref.

ZINGIBER OFFICINALE; ORGANIC FERTILIZERS; MICRONUTRIENT FERTILIZERS; APPLICATION RATES; JAVA.

The aims of research were to study the effect of incubation length and rate of two kinds of organic fertilizer (compost of medicinal plant residues and cow manure) and their interaction on the growth and production of ginger in Inceptisol Karanganyar. The research was conducted in the green house of Soil Science Department of Agricultural Faculty, Gadjah Mada University. The experiment was arranged in a factorial completely randomized design with three factors, namely kinds of organic fertilizer (compost of medicinal plant residues and cow manure), organic fertilizer rate (0, 10, 20, and 40 t/ha) and incubation length (15 and 30 days). The results showed that the organic fertilizer (compost of medicinal plant residue and cow manure) of 20 t/ha increased plant growth until 16th weeks. Application of medicinal plant residues compost of 20 t/ha and incubated during 30 days gave the highest dry weight of total plant tissue, wet weight of rhizome and sun-dried weight of rhizome.

043 UTAMI, P.K.
Peningkatan pertumbuhan dan mutu Alpinia purpurata melalui pupuk P dan K. **Growth and flower quality improvement of *Alpinia purpurata* through fertilizer application of phosphate and potassium**/Utami, P.K.; Tedjasarwana, R.; Herlina, D. (Balai Penelitian Tanaman Hias, Cianjur (Indonesia)). *Jurnal Hortikultura* ISSN 0853-7097 (2006) v. 16(4) p. 307-313, 1 ill., 3 tables; 14 ref.

ALPINIA PURPURATA; ORNAMENTAL PLANTS; CUT FLOWERS; GROWTH; QUALITY; PHOSPHATE FERTILIZERS; POTASH FERTILIZERS; CROP PERFORMANCE.

Alpinia purpurata is one of the new tropical ornamental plants from Zingiberaceae family. The objective of the experiment was to determine the effect of phosphate and potassium fertilizer application on promoting vegetative and generative growth of Alpinia. The experiment was conducted in the screenhouse at Segunung Field Station (1,100 m asl) at Indonesian Ornamental Crops Research Institute, Cianjur, from September 2004 to August 2005. The plots were arranged in a factorial completely randomized design with 3 replications and 2 factors. The first factor comprised of 3 level of phosphate dosage i.e. 0, 36 ,72 kg P_2O_5/ha. The second factor consisted of 4 levels of potassium dosages, i.e. 0, 60, 120, and 180 kg K2O/ha. The results showed that there was no significant interaction between phosphate and potassium fertilizer application, but the use of 60 kg K2O/ha increased flower production on February 2005. Potassium appliction at K 120 kg K2O/ha signifcantly increased opened flower diameter (3.97 cm), and flower bud diameter (1.17 cm). Meanwhile, K application at 120 kg K2O and 60 kg K2O significantly increased the leaf lenght and mature flower (3.97 cm).

F08 CROPPING PATTERNS AND SYSTEMS

044 BAON, J.B.
Kajian sifat kompetisi tanaman penutup tanah Arachis pintoi terhadap pertumbuhan tanaman kakao. **Study on competition characteristics of a land cover crop *Arachis pintoi* to growth of cocoa**/Baon, J.B. (Pusat Penelitian Kopi dan Kakao, Jember (Indonesia)) Anugrina, Y. *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(3) p. 191-212, 4 ill., 9 tables; 15 ref.

THEOBROMA CACAO; ARACHIS PINTOI; ALLELOPATHY; COVER PLANTS; PLANT COMPETITION; ADENANTHERA; MICROSPERMAE; LEUCAENA LEUCOCEPHALA; GROWTH.

The existence of ground cover crop, such as Arachis pintoi in cocoa farm may enhance physical, chemical and biological fertility of soil. Nevertheless, the presence of those cover crops potentially increase the competition with main crop in various means. The primary objective of this study was to investigate kinds of competition raised when cocoa plants cultivated with ground cover crop of *A. pintoi*. This study consisted of three experiments. The first experiment aimed at studying possible allelopatic competition using root exudates solution of *A. pintoi* as well as *Leucaena leucocephala* and *Adenanthera microsperma* as check for being used for watering cocoa plants. The second experiment aimed at studying the

competition between *A. pintoi* and cocoa plants in field condition with (1) cover crop fully overlay ground surrounding cocoa basal trunk, (2) no cover crop overlay ground surrounding cocoa basal trunk in a distance of 40 cm in diameter, and (3) no cover crop as check. Third experiment aimed at studying the competition between *A. pintoi* and cocoa plants in limited growth medium (pot), using 10 cm stolon shoots each 4, 2 and 0 shoots per pot. Results showed that *A. pintoi* did not produce allelopatic exudates on restricting cocoa growth. Population of *A. pintoi* had negative effect on cocoa plant growth in the field by reducing fresh trunk weight and dry root weight, even greater negative effect found in cocoa plant grown in limited growth medium by also reducing dry leaf and trunk weight and leaf area.

F30 PLANT GENETICS AND BREEDING

045 HADIPOENTYANTI, E.
Uji ketahanan BBP dan daya hasil hibrida, mutan, dan somaklon. **[Resistance test of vanilla stem rot its yield potency of hybrids, mutant and soma clonal plant]**/Hadipoentyanti, E.; Seswita, D.; Udarno, L.; Tombe, M.; Lukman, W.; Suryatna; Kusnadi. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005; Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 187-197, 3 tables; 16 ref. 633.8/BAL/l bk1

VANILLA PLANIFOLIA; FUNGAL DISEASES; DISEASE RESISTANCE; FUSARIUM OXYSPORUM; HYBRIDS; GENETIC VARIATION; YIELDS.

The main problem of vanilla cultivation in Indonesia is stem rot disease (*Fusarium oxysporum* f.sp. vanilla) causing yield (productivity) decrease. Up to now, there is no vanilla varieties being released as high yielding and resistant vanilla varieties to stem rot disease. A research activity has been conducted including selection of resistancy, hybridization, mutation (irradiation) and induced in vitro mutation. The objective of research was to obtain the vanilla varieties resistant to stem rot disease. In 2005, the research activities were emphasized to evaluate the resistance of 9 hybrids, 4 mutants and 34 somaclones obtained from the previous research to stem rot disease, and evaluated yield potential in field condition. Field experiment was conducted in Sumedang, West Java, and arranged in a randomized block design. The parameter observed were percentage of resistance and plant growth. The results showed that at field condition (Sumedang, the plants were 3 years old), the resistant percentage of hybrids (24.16%), mutants (40.80%) and somaclones (49.29%), while the pathogen population in soil 2.73 x 10^3 propagules/g soil. The hybrids of PH 3, PH 1 and PH 5, mutants PM 1 and PM 4, and the somaclones PS 24 and PS 11 showed better growth than the others. The vegetative growth of observed tested vanillas in the field was varying.

046 JUSUF, M.
Adaptasi dan stabilitas hasil beberapa klon harapan ubi jalar. **Adaptation and yield stability of sweet potato promising clones**/Jusuf, M.; Rahayuningsih, S.A.; Wahyuni, T.S.; Pambudi, S.; Santoso, G.; Restuono, J. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang, 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 114-120, 3 tables; 7 ref.

IPOMOEA BATATAS; CLONES; GENOTYPE ENVIRONMENT INTERACTION; ADAPTATION; CROP PERFORMANCE; YIELDS.

Yield stability analysis for 12 promising clones of sweet potato (*Ipomoea batatas*) were studied across 5 locations i.e. Solok (West Sumatra), Malang and Blitar (East Java), Kuningan (West Java), and Karanganyar (Central Java) during the 2004 dry season and 2004/05 wet season. Field experiments were conducted in a randomized completely block design, with 3 replications, where clones/varieties were treatments and planted in 5 m x 5 m. Yield (fresh root weight) data were analyzed for stability using a regression technique according to Eberhart and Russel (1966) while adaptation analysis followed the

method developed by Finlay and Wilkinson (1963). Results indicated that clones, location and clones x location interaction were significantly different. Yield stability analysis indicated that there were 3 clones/varieties which produce stable yields and had higher average yields than checks, namely MSU 01015-07, MSU 01015-06, MSU 01035-05, and MSU 01015-02 with fresh root yield of 25.1, 24.1, 26.27 and 27.5 t/ha, respectively. These three clones having lower average stability were very susceptible to environmental changes, and specifically adapted to productive environments. Clone MSU 01035-05 had more than average stability and specifically adapted to marginal environments, and had an average yield of 26.3 t/ha.

047 KARUNIAWAN, A.

Kekerabatan genetik populasi tanaman bengkuang (Pachyrhizus erosus) berdasarkan karakter morfologi daun. **Genetic relationships on yam bean (*Pachyrhizus erosus*) population based on leaf morphological traits**/Karuniawan, A.; Wicaksana, N. (Universitas Padjadjaran, Bandung (Indonesia). Fakultas Pertanian). *Jurnal Agrikultura* ISSN 0858-2885 (2008) v. 16(3) p. 207-212, 1 ill., 1 table; 15 ref.

PACHYRHIZUS; POPULATION GENETICS; LEAVES; PLANT ANATOMY.

Yam bean (*Pachyrhizus erosus*) is widely cultivated in Central America, Africa, Asia and Pacific. The objective of the research was to analyse genetic relationships of yam bean originated from Indonesia compared to its ancestor species from Central America. Forty three yam beans consisted of 35 genotypes from Indonesia and eight introduced genotypes from Central America were planted in a complete block design with two replications. Thirteen morphological leaves properties traits were used to analyse the genetic relationships among them. Results showed that yam bean populations originated from Indonesia were closely related to its ancestor species from Central America. Yam beans from Sumatra were different from its relatives from the rest regions of Indonesia.

048 KOERNIATI, S.

Identifikasi sifat tahan tanaman lada terhadap penyakit BPB (busuk pangkal batang) dengan marka RGA (resistance gene analog). **[Identification of resistance character of pepper plant to foot rot disease by using RGA (resistance gene analog) marker]**/Koerniati, S.; Setiyono, R.T.; Utami, D.W.; Manohara, D.; Bustaman, M.; Tasma, M.; Reflinur. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 59-78, 4 ill., 2 tables; Bibliography: p.73-78 633.8/BAL/l bk1

PIPER NIGRUM; FUNGAL DISEASES; DISEASE RESISTANCE; SELECTION; IDENTIFICATION; GENETIC MARKERS.

A quick method for selecting plant material of the black pepper (*Piper nigrum* L.) resistant to foot-rot disease is extremely needed for plant breeding. Development of RGA (resistance gene analog) genetic marker based on PCR was conducted. Traits of resistant genes in *Arabidopsis thaliana* with conserved motif for both structural and its amino acid sequence has been used for primer basic design of nucleotide binding site (NBS) P-loop, kinase2, GLPL and MDHV, and Leucine rich repeat (LRR). From this research activities protocols for DNA isolation and PCR were obtained to amplify RGA of the black pepper. Twelve pairs of RGA primers was designed and applied to amplify RGA fragment (NBS and LRR motifs). Results indicated that RGA of the black pepper was grouped into a Toll/lnterleukin-1 Receptor homology (TNL) section. Resistant trait to foot-rot appeared when RGA fragments (NBS MDHV amplified by primer RGA8 and LRR amplified by primer RGA7) from both parents exist in one plant, and this phenomenon was shown by F1 24 - 2, 13 - 6 and N2BK-1. F1 24 - 2, F1 13 - 6 and female parent (Lampung Daun Lebar/LDL) had 2 fragments of LRR, while male parent Piper hirsutum had a different pattern of fragment. Similar for MDHV fragment, Piper hirsutum had one specific fragment which was different than the other 3 plants. The phenomenon was clearer shown by F1 N2BK-1 plant, which has 2 LRR, fragments originally from both parents Natar2 (has 2 thick LRR fragments) and Besar Kota Bumi (has 2 thin LRR fragments). Based on the results, RGA7 and RGA8 primers were decided to be RGA

primer candidates for future research. Research on inheritance of resistant trait to the foot-rot on the black pepper must be carried out on F2 plants.

049 NUR, A.
Variabilitas genetik galur kedelai toleran kekeringan pada fase kecambah. **Genetic variability of drought tolerant soybean line during the germination phase**/Nur, A.; Suhartina (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 164-171, 5 tables; 20 ref.

GLYCINE MAX; GENETIC VARIATION; PROGENY TESTING; DROUGHT RESISTANCE; GENETIC GAIN; HERITABILITY; POLYETHYLENE; GERMINABILITY.

To support the genotype improvement programs for soybean tolerance to drought stress a rapid method to identify the drought tolerance genotype is needed. Polyethylene glycol 6000 (PEG 6000) is one of the osmotic solutions that is widely used in tolerance screening for drought stress. Hypothetic genetic variability was used as a method for approaching assessment of the genetic variance levels of the tested lines. The experiment was conducted at the Plant Breeding Laboratory, ILETRI from February to April 2005. A completely randomized factorial design, with three replications was used. The first factor was the osmotic solution of polyethylene glycol (PEG 6000) with five concentrations, i.e. 0 bar (control), -3 bar (132.2 g/l), -6 bar (191.9 g/l), -9 bar (237.8 g/l) and -12 bar (276.6 g/l). The second factor consisted of 23 drought tolerant soybean lines. The results showed that the use of polyethylene glycol 6000 as an osmotic solution was effective for testing the drought tolerance of soybean lines. Based on the genetic variance(^s^2g) and standard deviation of genetic variance(^sg), all characters were categorized as broad, except growth rate. The characters having high genetic improvement were shoot fresh weight (20.75%), radical length (28.59%), hypocotyl length (14.40%) and weight of 25 seeds (37.25). Estimated heritability value of all observed characters varied from medium to high. The characters that showed high estimated heritability value, and can be used as early selection characters were weight of 25 seeds (0.97%), radical length (0.81%), shoot fresh weight (0.71%), shoot dry weight (0.61%), and hypocotyl length (0.57%).

050 PRIHATINI, I.
Penggunaan penanda mikrosatelit untuk analisis induk Acacia mangium **Willd. Application of microsatellites marker for parentage analysis of *Acacia mangium* Willd**/Prihatini, I.; Rimbawanto, A. (Pusat Penelitian dan Pengembangan Hutan Tanaman, Yogyakarta (Indonesia)); Taryono. *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 139-148, 3 tables; 22 ref.

ACACIA MANGIUM; MICROSATELLITES; GENETIC MARKERS; SPECIES; GENOTYPES.

Molecular marker has the potential to replace the need for hand-pollination in breeding programs. Breeding arboretum of *Acacia mangium* could be established enabling crosses between selected male and female parents to take place through open pollination. Research was conducted to utilize microsatellite marker for parentage analysis of A. mangium progenies. Parentage analysis was conducted using total genomic DNA of 251 individuals as candidate parents and 296 individuals as progenies. The PCR reactions were carried out using 15 microsatellite (SSR) markers. All of the genotypes were used to determine the pair of parent of each progenies. This research successfully detected the parent pairs of 202 (68.2%) progenies.

051 PURNOMO, J.
Tingkat kehilangan hasil kacang tanah tipe Spanish dan Valencia akibat kekeringan. **Yield losses on groundnut both Spanish and Valencia type due to drought**/Purnomo, J.; Trustinah; Nugrahaeni, N. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul

2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 106-113, 4 ill., 2 tables; 8 ref.

ARACHIS HYPOGAEA; PROGENY TESTING; DROUGHT RESISTANCE; DROUGHT STRESS; HARVESTING LOSSES; GENETIC RESISTANCE; PLANT RESPONSE; PRODUCTIVITY.

In Indonesia groundnut (*Arachis hypogaea*) can be possibly grown in dryland, rainfed lowland or in wetland in the dry season. Drought stress suffered frequently affect groundnut from the mid to final of growth phase due to the shift in climate from rainy to dry season. Yield losses in groundnut due to unfavorable environment could be eliminated by growing drought tolerant varieties. A numbers of promising genotypes including Spanish and Valencia types were evaluated to select the high yielding and drought tolerant genotypes. There was a highly significant response among the genotypes to drought stress, which caused yield losses of 8.3-42.0%. The genotypes of ICGV 86680/L.TBN-93-B-37 (v), K/PI 298115-90-B-16 (v), L.LMG/ICGV 87123-93-B-13 (s), MHS/1697-96-B-29 (s) and Jerapah (s) had less than 20% yield losses. ICGV 88358/G-92-B-34 (s), ICGV 91227 (v); ICGV 882521 LM-92-B-4 (s), K/PI 405132-90-B1-2-57 (v), K/PI 390595/ /K-90-B-54 (v), L.Lam/Jpr-93-B1-133 (s) and G/PI 259747-92-B-28 (v) produced high yield of more than 3.5 t/ha dry pod with 22-42% yield losses.

052 RIMBAWANTO, A.

***Distribusi keragaman genetik populasi Santalum album berdasarkan penanda RAPD.* Genetic diversity and its distribution of *Santalum album* populations revealed by RAPD markers**/Rimbawanto, A.; Widyatmoko, A.Y.P.B.C; Sulistyowati, P. (Pusat Penelitian dan Pengembangan Hutan Tanaman, Yogyakarta (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(3) p. 175-181, 1 ill., 2 tables; 15 ref.

SANTALUM ALBUM; GENETIC VARIATION; GENETIC CORRELATION; POPULATION GENETICS; BREEDING METHODS; GENETIC DISTANCE; RAPD.

Santalum album (sandalwood) is a high value timber native to the Island of Timor, Sumba and Flores, Eastern Indonesia. The aim of this study was to investigate genetic variation and genetic relationship between population to support genetic conservation and breeding program of the species. Leaves of from 17 populations were collected and analyzed using 17 RAPD primers which produced 34 polymorphic loci. The average polymorphic locus for each primer was two. The average genetic diversity within populations was 0.391, while between population was 0.038. Cluster analyses based on population data revealed that the 17 populations were divided into 2 big groups. In general the clustering of the populations did not reveal clear relationship with geographic distribution, however geographically closed populations tent to cluster into small group.

053 RIMBAWANTO, A.

***Keragaman genetik empat populasi Intsia bijuga berdasarkan penanda RAPD dan implikasinya bagi program konservasi genetic.* Genetic diversity of four populations of *Intsia bijuga* revealed by RAPD markers and its implications for the genetic conservation programme**/Rimbawanto, A.; Widyatmoko, A.Y.P.B.C. (Pusat Penelitian dan Pengembangan Hutan Tanaman, Yogyakarta (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(3) p. 149-154, 1 ill., 2 tables; 14 ref.

INTSIA; GENETIC VARIATION; POPULATION GENETICS; GENETIC RESOURCES; RESOURCE CONSERVATION; RAPD; GENETIC MARKERS; GENETIC DISTANCE.

Intsia bijuga (local name merbau) is a high value timber and has been under intensive utilization. The aim of this study is to investigate genetic variation of four populations to provide information for arranging genetic conservation strategy of the species. Leaves of wildling from four populations were collected and analyzed using 15 RAPD primers which produced 77 polymorphic loci. The average polymorphic locus for each primer was 5.1. The average genetic diversity within population was 0.296, while between populations was 0.141. Cluster analyses based on population data revealed that the four populations were

divided into two groups. The first group consisted of Carita and Manokwari, while Ternate and Nabire formed another group. Clustering of Manokwari and Nabire into different group support the separation of Papua into 6 geogenetic regions.

054 RIMBAWANTO, A.
***Keragaman populasi Eusideroxylon zwageri Kalimantan Timur berdasarkan penanda RAPD.* Population diversity of *Eusideroxylon zwageri* in East Kalimantan revealed by RAPD markers**/Rimbawanto, A.; Widyatmoko, A.Y.P.B.C.; Harkingto (Pusat Penelitian dan Pengembangan Hutan Tanaman, Yogyakarta (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(3) p. 201-208, 1 ill., 3 tables; 18 ref.

INTSIA; GENETIC VARIATION; POPULATION GENETICS; GENETIC RESOURCES; RESOURCE CONSERVATION; RAPD; GENETIC DISTANCE; LOCI; KALIMANTAN.

Eusideroxylon zwageri or iron wood (local name) is a high value timber and has been under intensive utilization. The aim of this study was to investigate genetic variation of ulin population in East Kalimantan to assist genetic conservation program of the species, using RAPD markers. Leaves from five populations were used and analyzed using 19 RAPD primers which produced 48 polymorphic loci. The average genetic diversity within population was 0.3564, while between populations was 0.0415. ANOVA also revealed that 96% of the genetic diversity resided within populations, while the remaining was attributed to among population differences. Cluster analyses based on population data revealed that the five populations were divided into two groups. The first group consisted of TN Kutai, Meratus, S. Wain and Semboja, while Lempake was in different group. The information obtained is useful for developing a strategy of ulin conservation.

055 RIYADI, I.
Isolasi protoplas tanaman kacang panjang secara enzimatis. [Protoplast isolation of long bean *(Vigna sinensis* L.*)* by enzymes]/Riyadi, I. (Balai Penelitian Bioteknologi Perkebunan Indonesia, Bogor (Indonesia)). *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(2) p. 62-68, 5 tables; 18 ref.

VIGNA UNGUICULATA UNGUICULATA; PROTOPLASTS; ISOLATION; ENZYMES.

An appropriate technique, kind and optimum concentration of enzyme affected the isolation process and rendement result of plant protoplasts. A research was conducted to enhance the protoplast rendements of long bean (*Vigna sinensis* L.) that was isolated by enzyme cellulase RS and macerozyme R-l0 as single and combination in a solution. Enzyme concentrations used were 2.0-3.0% w/v for cellulase RS and 0.4-0.6% w/v for macerozyme R-l0. Those solutions contained mannitol 25 mM as osmotycum. Isolation process was done on shaker with 50 rpm (rotation per minute) speed in dark room for 3 hours. Results showed that C3 treatment (concentration of cellulase RS enzyme of 3.0% w/v) yielded protoplasts density 17.40 x $l0^5$ protoplasts/g fresh weight of mesophyl and M2 treatment (concentration of macerozyme R-10 enzyme 0.5% w/v) resulted 17.46 x 10^5 protoplasts/g. As a whole, the best treatment was achieved by C2M2 (combination between cellulase RS of 2.5% and macerozyme R-10 enzyme of 0.5% w/v) which resulted protoplasts density 32.67 x 10^5 protoplasts/g fresh weight of mesophyl.

056 SESWITA, D.
***Perbaikan sifat ketahanan terhadap penyakit busuk batang panili.* [Improving resistant characters of vanilla to stem rot diseases]**/Seswita, D.; Hadipoentyanti, E.; Udarno, L.; Tombe, M.; Surachman, D.; Lukman, W.; Zulhisnain; Suryatna; Darmawan, W. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 174-186, 4 tables; 14 ref. 633.8/BAL/l bk1

VANILLA PLANIFOLIA; HYBRIDS; PLANT BREEDING; FUNGAL DISEASES; DISEASE RESISTANCE; AGRONOMIC CHARACTERS; FUSARIUM OXYSPORUM.

The purpose of research is creating vanilla varieties that resistant to stem rot disease. The research activities were focused (1) to obtain plantlets consisting of 30 hybrids, 20 mutants and 20 somaclones at laboratory, and then acclimated at green house for further research; (2) to evaluate the resistancy of 15 hybrids and 35 somaclones obtained from the previous research at greenhouse condition. The research was conducted at Tissue Culture Laboratory and Green house of Plant Genetic Resources and Plant Breeding Division. At laboratory, plant materials used were 30 hybrids, 20 mutants and 20 somaclones. MS with NAA 0.3 mg/l media used for rooted. The experiment was arranged in completely randomized designed. When the plantlets were rooting, they were moved to green house for acclimatization by transplanting them in media with composition of soil, sand and manure (1:1:1). At green house, the resistancy of each tested plant materials was evaluated by observing individual vanilla stem of each treatment. Plant materials tested were 15 hybrids and 35 somaclones. The tested plant materials were inoculated by dipping the plants into conidial suspension of *Fusarium oxysporum* f.sp. vanillae strain F117 for 30 minutes, then the occurrence of necrotic tissue on tested plants were observed, and scored to determine resistance level of the tested hybrids or soma clones. Result of the first experiment in the laboratory showed that, 30 hybrids, 20 mutants and 20 somaclones were obtained after planted in MS + NAA 0.3 mg/l media for rooting, and then transplanted for acclimatization. Evaluation of 15 hybrids and 35 somaclones for stem rot resistance at green house (the second experiment) showed that 1 number of hybrids and 5 number of somaclones resistant to stem rot disease were obtained.

057 SETIYONO, R.T.
Hibridisasi dan seleksi lada hasil persilangan. **[Hybridization and selection of crossbred pepper]**/Setiyono, R.T.; Manohara, D.; Budi M.; Natalia, N.; Ermiati; Nursalam; Darajat, J. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005; Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 15-31, 5 tables; 12 ref. 633.8/BAL/l bk1

PIPER NIGRUM; HYBRIDIZATION; FUNGAL DISEASES; SELECTION; DISEASE RESISTANCE.

Conservation of hybrids pepper was conducted in green house of ISMECRI, Bogor to maintain 300 hybrids pepper numbers by propagating one-node cuttings planted in sand box then transplanted in plastic polybag of 15 cm x 20 cm. Selection of hybrids pepper for resistance to foot rot disease was carried out at green house using in vitro selection method, through upper root by spraying 50 ml pathogen suspension of *Phytophthora capsici* on each plant with concentration of 6 x 10^7/ml. Pathogen suspension of *P. capsici* was sprayed on upper root zone of growing media and then closed. Observation was done by recording died plants since first week until eight weeks after inoculation. The result showed that there were 300 hybrids pepper number which have been multiplied. Of 20 hybrids pepper numbers selected to foot rot disease resistance showed susceptible to foot rot disease.

058 SETIYONO, R.T.
Seleksi lada hibrida terhadap penyakit BPB di daerah endemic. **[Selection of hybrid pepper for foot rot diseases resistance in endemic area]**/Setiyono, R.T.; Manohara, D.; Budi M.; Nursalam; Darajat, J. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 1-14, 7 tables; 11 ref. 633.8/BAL/l bk1

PIPER NIGRUM; HYBRIDS; FUNGAL DISEASES; SELECTION; DISEASE RESISTANCE; GROWTH.

The experiment was conducted in Cahaya Negeri Experiment Farm, ISMECRI (Indonesian Spices and Medicinal Crops Research Institute) in North Lampung and East Lampung from January to December 2005. The experiment consisted of two activities, i.e. (1) Selection of some hybrids pepper for resistance to foot rot disease in Cahaya Negeri Experiment Farm. Selection of 20 hybrids pepper and 2 varieties as check, using randomized block design (RDB), plot size 2.5 m x 22.5 m, consisting of 9 plants, planting distance 2.5 m x 2.5 m, with 3 replications. This experiment represented research of continuation from

year 2003. (2) Selection of some hybrids pepper for resistance to foot rot disease in East Lampung. Selection of 20 hybrids pepper and 2 varieties as check, were arranged in randomized block design (RBD), plot size 2.5 m x 22.5 m, consisting of 9 plants, planting distance 2.5 m x 2.5 m, with 3 replications. This experiment represented research of continuation from year 2004. Result showed that in Cahaya Negeri Experiment Farm until 25 months old plant, there were 8 hybrids pepper which resistant to foot rot disease, i.e. LH 8 - 4; LH 13 - 6; LH 14 - 10; LH 20 - 4; LH 20 - 7; LH N2 x BK (1)/LH 56 - 70; LH 67 - 1; and LH 44 - 9. While In North Lampung with 13 months plant age, there were 11 hybrids pepper which resistant to foot rot disease, i.e. LH 36 - 37; LH 35 - 22; LH 36 - 38; LH 37 - 17; LH 36 - 1; LH 20 - 4 (1); LH 37- 18; LH 24 - 4; LH 36 - 41; LH 35 - 32; and LH 24 - 1 (1).

059 SOEDOMO, R.P.

Seleksi induk tanaman bawang merah. **Parent selection of shallots**/Soedomo, R.P. (Balai Penelitian Tanaman Sayuran, Lembang, Bandung (Indonesia)). *Jurnal Hortikultura* ISSN 0853-7097 (2006) v. 16(4) p. 269-282, 6 tables; 40 ref.

ALLIUM ASCALONICUM; VARIETY TRIALS; EVALUATION; SELECTION; DISEASE RESISTANCE; PEST RESISTANCE; GENETIC VARIATION.

Limiting genetic sources hindered breeding program of shallot. The breeding materials must be selected and evaluated. The objective of this trial was to select and evaluate the phenotype and adaptability of shallot for breeding materials. This experiment was conducted at Tegal Regency, Central Java (approx. 5 m asl), from October to December 2005 (dry to rainy season), at Alluvial soil. The experiment was set up in a randomized block design with 5 replications. The varieties of shallot used in this experiment were Ilokos, Bima Brebes, Bauji, Cokol Hijau, Singkil Gajah, Philipina, Timor, Bethok, Tiron, Kuning, Maja, Bangkok Warso, and Bombay. The results showed that the potential cultivar for breeding materials were Tiron, Bethok and Bima Brebes cultivars, with survival rate of 92.92; 91.2; and 81.54%, respectively; moderate number of bulblet of 9.90; 5.34 and 7.24 bulblet, respectively; moderate number of leaf of 35.50; 26.18; and 21.62, respectively; plant height of 18.42; 27.20; and 23.62 cm, relatively big bulb size, with diameter 24.2/25.4; 23.6/27.6; and 22.4/26.6 mm, respectively; relatively high production with dry bulb per plot 5.970.4; 5.107.0; and 4.915.20 g/6 m^2, respectively; per hole 92.6; 76.6; and 76.7 g, respectively; and per ha: 9.26; 8.51; 8.18 t, respectively. Weight losses was moderate of 18.34; 19.03; and 21.73%, respectively; and resistance of pests and diseases were moderate to good. Based on general phenotype appearance, there were 6 to 10 groups considered as breeding materials.

060 TRUSTINAH

Pengelompokan plasma nutfah kacang tanah varietas lokal dengan teknik peubah ganda. **Grouping of groundnut germplasm of local varieties using principal components**/Trustinah; Kasno, A.; Nugrahaeni, N. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 23-31, 6 tables; 11 ref.

ARACHIS HYPOGAEA; LAND VARIETIES; GERMPLASM COLLECTIONS; AGRONOMIC CHARACTERS; GENETIC MARKERS; DISEASE RESISTANCE; YIELD COMPONENTS.

Grouping of accessions in a germplasm collection using principal components gives the basic information on characteristics of the group and principal attributes required in the bioinformatics system. The study showed that: (1) 148 accessions of local groundnuts were Spanish type (94% and tan colour), and the rest were Valencia type, (2) 64.5% of characteristics of groundnut germplasm for 17 traits/variables, could be explained by into four factors. Factor I, II, III, and IV were called pod and seed size; yield capacity; health of plant; and pod characteristics; respectively. (3) Accessions of local groundnut germplasm were divided into three groups, and pod size identified as the determinator. Group I had 68 accessions (slightly rough pod reticulation, short pods, small pod and seed size); Group II (72 accessions: rough pod reticulation,

short pod, bigger pod and seed size); and Group III (8 accessions: rough pod reticulation, long pods, biggest pod size, and all were Valencia type).

061 UTOMO, C.
***Isolasi gen kitinase dari Trichoderma harzianum dalam rangka pengembangan kelapa sawit tahan ganoderma.* [Isolation of chitinase genes of *Trichoderma harzianum* in developing oil palm resistance to Ganoderma]**/Utomo, C.; Purba, A.R.; Nurhayati, E.; Setiowati, R.D.; Haro, N.D. *Jurnal Penelitian Kelapa Sawit* ISSN 0853-196X (2006) v. 14(1) p. 33-46, 4 ill; 24 ref.

ELAEIS GUINEENSIS; TRICHODERMA HARZIANUM; CHITINASE; PCR; DESIGN; GANODERMA; GENES; GENE BANKS; DISEASE RESISTANCE.

A primer pair designed from the conserved sequences of the four chitinase genes of Trichoderma deposited in GenBank was used to amplify a partial chitinase gene of *Trichoderma harzianum* PPKS. As forward primer was designed as Ktn 1F (5 TCACTCATGTCATCTACTC 3) and reverse primer was designed as Ktn 2R (5 AAAGAGATGAGCTCCTT 3). Polymerase chain reaction (PCR) by using these primer amplified a single PCR product of about 1000 bp for *Trichoderma harzianum* PPKS. Sequencing and confirmation to the GenBank indicated that PCR product was identified as chitinase gene with the homology to *T. reesei* chitinase gene of 97%. Multiple sequence alignment was used to infer a phylogenetic tree and the generated tree showed that *T. harzianum* PPKS clustered to the *T. reesei* and it did not cluster to the *T. harzianum* deposited in GenBank.

F40 PLANT ECOLOGY

062 HERIYANTO, N.M.
***Kajian ekologi dan potensi pasak bumi (Eurycoma longifolia* Jack*.) di kelompok hutan Sungai Manna, Sungai Nasal, Bengkulu.* [Ecological study and potency of pasak bumi (*Eurycoma longifolia* Jack.) at Sungai Manna, Sungai Nasal forests group, Bengkulu (Indonesia)**/Heriyanto, N.M.; Sawitri, R.; Subiandono, E. (Pusat Penelitian dan Pengembangan Hutan dan Konservasi Alam, Bogor (Indonesia)). *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(2) p. 69-75, 5 tables; 14 ref.

DRUG PLANTS; BOTANICAL COMPOSITION; FOREST PRODUCTS; ECOLOGY; SUMATRA.

The study indicated that 88 species found belonged to 29 families. The predominant species were *Shorea parvifolia* (meranti) and *Dipterocarpus costulatus* (keruing). The highest dominance value belonged to second transect (0.0998) and the lowest dominant value was the fourth transect (0.0526). The highest diversity index value belonged to fifth transect (2.28) and the lowest of diversity index value was fourth transect (1.41). The abundance of pasak bumi was different in transect, for trees level it was 2 individuals/ha (first transect and third transect), however, in the second, fourth and fifth transect were none. For belta level, it was 10 individuals/ha (the first transect), 20 individuals/ha (the third transect) and 20 individuals/ha (the fifth transect), while in the second and fourth transect were none. For seedling level it was 280 individuals/ha (the third transect), 60 individuals/ha (the fourth transect) and 100 individuals/ha (the fifth transect), while in the first and the second were none. This intolerant species was adapted in slope and dry areas. The rarity of pasak bumi was not affecting local people because they seldom used for traditional medicine.

F61 PLANT PHYSIOLOGY - NUTRITION

063 WIJANARKO, A.
***Diagnosis status unsur hara pada tanaman kedelai di lahan masam menggunakan metode DRIS.* Diagnosis of nutrient status of soybean crops in acid dryland using DRIS method**/Wijanarko, A.; Taufiq, A.; Kuntyastuti, H. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan,

Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 243-257, 8 tables; 10 ref.

GLYCINE MAX; PLANT NUTRITION; NUTRITIONAL STATUS; NUTRIENT DEFICIENCIES; NUTRITIONAL REQUIREMENTS; LAND IMPROVEMENT; ACID SOILS.

Diagnosis recommendation integrated system (DRIS) is a method used for determining nutrient balances. The first step of DRIS method is determining average nutrient ratio of crops that produces the highest yield. It is used as the norm. This research was done at research sites in Central Lampung and Tulang Bawang. The results showed that the norms of nutrient ratio of P/K, P/Ca dan Ca/K in soybean crop at Lampung were 0.13, 0.24 and 0.57, respectively. The balance nutrient ratio of P/K, P/Ca and Ca/K in soybean crop at Lampung were 0.11-0.16, 0.21-0.27 and 0.48-0.67, respectively. Based on DRIS indices, K and Ca were limiting factors for optimum soybean yield, followed by P at Central Lampung, while at Tulang Bawang, P and K were limiting factors, followed by Ca.

F63 PLANT PHYSIOLOGY - REPRODUCTION

064 SUSILO, A.W.
***Kemampuan menyerbuk sendiri beberapa klon kakao* (*Theobroma cacao* L.). Self-compatibility crosses of several cocoa clones**/Susilo, A.W. (Pusat Penelitian Kopi dan Kakao, Jember (Indonesia)). *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(3) p. 159-167, 2 ill., 3 tables; 9 ref.

THEOBROMA CACAO; SELF COMPATIBILITY; SELF POLLINATION; POLLEN INCOMPATIBILITY; FACTORIES.

Self-compatibility cross in cocoa is a useful criterion in utilizing germplasm collection. Evaluation of self-compatibility crosses on cocoa clones has been carried out in Kaliwining Experimental Station of ICCRI by treating artificial self-pollination. The observed clones were TSH 858, ICS 60, ICS 13, UIT 1, KW 162, KW 165, KW 163, DR 1, DR 2, DR 38, DRC 16, DRC 15, KKM 22, Na 32, DR 38, and Na 33. Self-compatibility crosses were identified by percentage of fruit set evaluated during 6 consecutive weeks after pollination. The results showed that the percentage of fruit set were significantly different among clones in the range of 0-46.34%. Three groups of compatibility of cocoa clones were identified as first, self-incompatible clones of DR 1, Na 32, Na 33; second, partially self-incompatible clones of DR 38, TSH 858, ICS 60, ICS 13, UIT 1, KW 162, KW 165, KKM 22; and third, self-incompatible clones of DR 2, DRC 16, DRC 15, KW 163. Clones which perform self-incompatible and partially self-incompatible furthermore can be used as female parents in the production of hybrids.

H10 PESTS OF PLANTS

065 ASMALIYAH
***Efikasi beberapa jenis insektisida terhadap hama pemakan daun pada tanaman pulai darat.* Efficacy of some types of insecticides for leaf eating pest on pulai darat plantation**/Asmaliyah; Utami, S.; Yudhistira (Balai Penelitian dan Pengembangan Hutan Tanaman, Palembang (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 83-91, 1 ill.; 4 tables; 13 ref.

ALSTONIA; LARVAE; LEAF EATING INSECTS; INSECTICIDES; EFFICIENCY; INSECT CONTROL.

Currently the most crucial problem in pulai plantation which should be solved immediately is pest attack. One of the solution is use of bioinsecticides and chemical insecticide wisely and properly. The purpose of this research was to identify efficacy of some types of insecticides to *C. glauculalis*. The research was conducted in laboratory of forest protection in Forest Research and Development Agency in Palembang and in public forest area of PT. Xylo Indah Pratama, Lubuk Linggau from May until August 2005. The result showed that using all types of insecticides were effective in causing death of *C. glauculalis* in

laboratory scale. Application of microbes insecticides mixture was only effective in minimizing *C. glauculalis* attack at field scale at low attack condition or low population density. *C. glauculalis* attack did not influence growth of pulai of 1 year age during four months observation.

066 BALIADI, Y.
Nematoda parasit pada tanaman palawija di lahan kering Indonesia. **Plant parasitic nematodes of secondary crops (palawija) on dryland in Indonesia**/Baliadi, Y.; Pujiono, H.A. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)); Nakasono, K.; Minagawa, N. Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang, 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 552-561, 4 tables; 20 ref. 633.31/.4-152.7/SEM/p

FOOD CROPS; PLANT NEMATODES; MELOIDOGYNE; PRATYLENCHUS; HETERODERA; DITYLENCHUS; TYLENCHULUS; ROTYLENCHULUS; XIPHINEMA; HELICOTYLENCHUS; IDENTIFICATION; ARID ZONES; INDONESIA.

A field survey to assess the relative importance of nematodes associated with the secondary crops on dryland in Indonesia was conducted in 1994-2005. The identification was done based on the morphological characteristics key and electrophoretic techniques for root-knot nematode. Results of the survey revealed that at least twenty three plant parasitic nematode genera were recovered from 460 soil samples. Eight of the ten were the most important genera of plant parasitic nematodes on a worldwide basis such as: *Meloidogyne*, *Pratylenchus*, *Heterodera*, *Ditylenchus*, *Tylenchulus*, *Rotylenchulus*, *Xiphinema*, and *Helicotylenchus*. The specimens of *Pratylenchus* sp. collected from dryland field in Indonesia were identified as *P. alieni*, *P. zeae*, *P. brachyurus*, and *P. coffeae*. The use of esterase solution enabled a more accurate differentiation of *Meloidogyne* spp. Indonesian root-knot nematodes were identified as *M. incognita*, *M. hapla*, *M. javanica*, *M. graminicola*, and *M. arenaria*. The species *Heterodera zeae*, *Pratylenchus allenni*, *Macrophosthonia ornata*, and *Ditylenchus sp*. were newly recorded for the Indonesian nematode fauna.

067 HERMAN
Analisis faktor-faktor yang menpengaruhi adopsi teknologi pengendalian hama penggerek buah kakao: studi kasus di Sulawesi Barat. **Analysis of factors influencing adoption of technology in cocoa pod borer pest control: a case study in West Sulawesi (Indonesia)**/Herman (Lembaga Riset Perkebunan Indonesia, Bogor (Indonesia)) Hutagaol, M.P.; Sutjahjo, S.H.; Rauf, A.; Priyarsono, D.S. *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(3) p. 222-236, 1 ill., 5 tables; 14 ref.

THEOBROMA CACAO; CONOPOMORPHA CRAMERELLA; PEST CONTROL; INNOVATION ADOPTION; TECHNOLOGY; SUSTAINABILITY; SULAWESI.

Cocoa pod borer is one of the most difficult pests to be controlled, hence it becomes serious threat for sustainable cocoa plantation. The objective of the research was to investigate several factors influencing adoption of innovation technology in pest control by using regression model analysis. The research was carried out in Polewali Mamasa and Mamuju Regency, West Sulawesi during February-March 2006 using survey method. Number of respondents interviewed in the research was 80 people which was selected by using purposive sampling method. The result showed that CPB in West Sulawesi decreased cocoa productivity of 50% (10-90%), caused by less farmers coordination in controlling CPB and the weakness of technology adoption. Factors which influence farmer's knowledge were provision of field training, farmers income and technology simplicity. Factors influencing farmer's attitude were farmer's income knowledge, cultivated cocoa area, provision farmer's group and number of family members. Factors influencing farmer action in PsPSP technology adoption were farmer attitude, farmer income, cultivated cocoa area and availability of extension workers in the area. Government's involvement in accelerating adoption of innovation technology, especially in preparing capable extension workers and provision of subsidized credit for the farmers was inevitable.

068 HULUPI, R.
***Identifikasi ras fisiologi nematoda Radopholus similis* Cobb*. yang menyerang tanaman kopi.* Identification of physiological race nematode, *Radopholus similis* Cobb. that attack coffee trees**/Hulupi, R. (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)). *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(3) p. 213-221, 3 tables; 18 ref.

COFFEA; RADOPHOLUS SIMILIS; PHYSIOLOGICAL RACES; HOST PLANTS; MUSA (BANANAS); CITRUS.

Physiological races of *Radopholus similis* Cobb., the burrowing nematode that attack coffee trees have never been reported yet, while two physiological races have been identified, i.e. banana and citrus races. Banana and citrus are commonly used as the shading trees or crop diversification in coffee plantation. Therefore, both races have to be analyzed whether the same as the race that attacking the coffee plants. Research to investigate the physiological race of *R. similis* Cobb. had been conducted in the screen house of Indonesian Coffee and Cocoa Research Institute, Jember. The experiment was arranged in completely randomized design with three replications, while cross inoculation tests were used as race identification method, by using three isolates from banana, citrus and arabica coffee as the control. Tested host plants were banana Cavendish, 'Ambon Kuning' and 'Raja' varieties, rootstock of citrus Siam from Kintamani and Arabica coffee Kartika 1 variety. The expression of virulence of three nematode isolates against banana, citrus or arabica coffee tested was considered as favorable host, while the most virulent isolate attacked coffee could be decided as physiological race of coffee. Results showed that banana isolate penetrated and attacked the roots of arabica coffee. The isolate of *R. similis* from citrus could not attack both coffee and banana varieties. Therefore, the physiological race of coffee was considered similar with the banana race. It was possible that the physiological race was specific race, but it could attacked banana as other favorable host, however, it could not be proven in this results. Based on this results, the use of *Musa sp*. as intercrop or shade tree in coffee plantation has more risk to nematode attack than that of *Citrus sp.*

069 SRI-SUKAMTO
***Pengaruh suhu penyimpanan terhadap viabilitas Beauveria bassiana* (Bals.) Vuill*. dalam beberapa pembawa.* Effect of storage temperature on *Beauveria bassiana* (Bals.) Vuill. viability on several carriers**/Sri-Sukamto (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)); Yuliantoro, K. *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(1) p. 40-56, 5 ill., 5 tables; 22 ref.

BEAUVERIA BASSIANA; VIABILITY; STORAGE; TEMPERATURE; CARRIER STATE.

One of entomopathogenous fungus types which commonly observed and showed potential as myco-insecticide is *Beauveria bassiana* (Bals.) Vuill. Addition of carrying agent that protects its spores from ultra violet ray is necessary to support effectiveness and pathogenous activity of *B. bassiana*. This study aims at investigating the effect of storage temperature on viability of *B. bassiana* spores on the carrier material. The observation was carried out in the Laboratory of Plant Diseases, Indonesian Coffee and Cocoa Research Institute. The research was arranged in completely randomized design by three factors. The first factor was carrier (C) consisted of C1=rice flour, C2=maize flour and C3=tapioca flour. The second factor was dosage (D) consisted of D1=1 g *B. bassiana* + 1 g carrier; D2=1 g *B. bassiana* + 5 g carrier and D3=1 g *B. bassiana* + 10 g carrier. The third factor was storage temperature (T) consisted of T1=5°C; T2=23°C and T3=29°C. Viability of *B. bassiana* spores was examined by observing development of l00 blastopores which randomly determined under light microscope with 400 times magnification. Observation was conducted in two replicates after the spores of *B. bassiana* were kept in the storage for 2, 4, 8 and 16 weeks. The result showed that by adding 1 g tapioca flour and storage temperature 5°C was potential in keeping viability of *B. bassiana* spores at least for 2 months, because tapioca flour gave better effect than rice and maize flours in keeping the storage and appropriate low temperature. Viability of *B. bassiana* spores decreased with increasing carrier dosage, temperature and duration of the storage, whereas storage at 5°C was found to be a better condition in keeping viability of dry pure *B. bassiana* spores longer than conditions of 23°C and 29°C.

070 TIRTOSUPROBO, S.
Penerapan teknologi pengendalian hama terpadu untuk meningkatkan produksi dan pendapatan usaha tani kapas di Sulawesi Selatan. **Application of integrated pest management (IPM) to increase cotton production and farm income in South Sulawesi**/Tirtosuprobo, S.; Wahyuni, S.A. (Balai Penelitian Tanaman Tembakau dan Serat, Malang (Indonesia)). *Perspektif* ISSN 1412-8004 (2006) v. 5(1) p. 36-45, 1 ill., 3 tables; 40 ref.

GOSSYPIUM HIRSUTUM; INTEGRATED PEST MANAGEMENT; FARMING SYSTEMS; FARM INCOME; PRODUCTION; TECHNOLOGY TRANSFER; SULAWESI.

South Sulawesi Province is the largest cotton areas in Indonesia. One of the constraints that causes low productivity in South Sulawesi is insect infestation causing yield loss by 20-30% of production potential. Under heavy insect infestation, yield loss can reach 100%. To control insect pest and reduce yield loss, it is recommended that the integrated pest management (IPM) technique is implemented, including the planting of maize as trap crops, mulching, and pest monitoring. The implementation of cotton IPM which is based on the non-chemical pest control has been performed for 4 years in Jeneponto, Bulukumba and Bone Regions of South Sulawesi. The IPM technique has been proven to benefit cooperator farmers. This was resulted from higher cotton yield (971-1828 kg seed cotton/ha) and lower insecticide usage (0-0.49 l/ha). The B/C ratio received by cooperator farmers (1.25-1.98) was higher than that by non cooperator farmers (0.08-0.44). Not all of the introduced IPM components could be adopted by farmers. The adoption rate of maize as trap crops was low, ranging from 0-65%. Mulching was moderately adopted by cooperator farmers 34-100%, while pest monitoring component could be adopted by cooperator farmers 35-100%.

071 WIRYADIPUTRA, S.
Keefektifan pestisida nabati daun ramayana (Cassia spectabilis) dan tembakau (Nicotiana tabacum) terhadap hama utama tanaman kopi dan pengaruhnya terhadap arthropoda lainnya. **Effectiveness of biopesticide derived from *Cassia spectabilis* and *Nicotiana tabacum* leaves against the main insect pests of coffee and its effect on other arthropods**/Wiryadiputra, S. (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)). *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(1) p. 25-39, 3 ill., 4 tables; 24 ref.

COFFEA; PEST INSECTS; BOTANICAL PESTICIDES; NICOTIANA TABACUM; CASSIA; HYPOTHENEMUS HAMPEI; PLANOCOCCUS CITRI; ARTHROPODA.

An experiment on the effectiveness of biopesticide made of ramayana (*Cassia spectabilis*) and tobacco leaves (*Nicotiana tabacum*) called as Casnic, on *Hypothenemus hampei* and *Planococcus citri* and its effect on the arthropods population fauna in coffee plantation had been conducted in Pest Laboratory of Indonesian Coffee and Cocoa Research Institute and Bangelan Plantation in Malang. The treatment consisted of three concentration levels of botanical pesticide (15 ml, 30 ml, and 60 ml/l water), *Beauveria bassiana* (100 g spore/ha), metidation spraying (2 ml/l water) and two control treatments (with and without soap). The field experiment was arranged in randomized completely block design (RCBD) with four replications. The results showed that botanical pesticide at the concentration of 30.0 ml stock solution per litre of water and applied four times with monthly interval was effective in controlling coffee berry borer (*Hypothenemus hampei*) and coffee mealy bug (*Planococcus citri*). The effectiveness was not significantly different compared to metidation and *Beauveria bassiana* at the dose of 0.8 l and 100 g formulation/ha/application. Application of botanical pesticide did not show negative effect on the usefull predatory insects and other arthropods population in coffee ecosystem.

H20 PLANT DISEASES

072 ASAAD, M.
[Optimalisasi kondisi polymerase Chain reaction untuk deteksi patogen CVPD pada tanaman jeruk]. **Optimization of polymerase chain reaction conditions for the detection of greening organism in**

citrus plants/Asaad, M. (Balai Pengkajian Teknologi Pertanian Sulawesi Selatan, Makassar (Indonesia)). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 114-120, 8 ill., 15 ref.

CITRUS; PCR; GREENING; PATHOGENS; DNA; IDENTIFICATION.

Objectives of this experiment were to evaluate effects of different PCR condition parameters for GO's detection in citrus plant and to obtain the PCR products that indicated clear and intense bands. A series of optimization experiments on the amplification of GO's DNA were conducted. The PCR conditions optimized were the PCR buffer, total DNA concentration, MgCl2 concentration, dNTP mix concentration, specific primer concentration, Taq DNA polymerase concentration, annealing temperature and number of cycles. The 165 rDNA fragments of greening organism were amplified with the modified PCR technique using a GO-specific primer set. Result indicated that a positive amplification was visible when a reaction mixture containing 10 mg of total DNA was used. The optimal PCR buffer was a standard buffer containing 78 mM Tris-HCl (pH 8.8), 17 mM (NH4)2SO4, 10 mM beta-mercaptoethanol and 200 microgram BSA. The optimal concentrations of MgCl2, dNTP, primer and Taq DNA polymerase were 1.5 mM, 0.2 mM, 0.4 micrometer and 1 unit, respectively. The optimal annealing temperature and number of cycle were 55 ^{o}C and 40 cycles, respectively.

073 BALFAS, R.
Optimalisasi teknik penularan penyakit kerdil pada tanaman lada. **[Optimization of transmission technique of stunted virus disease on pepper plant]**/Balfas, R.; Samsudin; Sukamto; Soesanthy, F. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 124-135, 3 tables; 18 ref. 633.8/BAL/l bk1

PIPER NIGRUM; PLANT DISEASES; PLANT VIRUSES; CUCUMBER MOSAIC CUCUMOVIRUS; FERRISIA VIRGATA; PLANOCOCCUS; APHIS GOSSYPII; DISEASE TRANSMISSION.

Stunted growth disease is one of important disease on black pepper. The disease was caused by piper yellow mottle virus (PYMV) and cucumo mosaic virus (CMV). Mealybugs, *Planococcus minor* and *Ferrisia virgata*, have been previously proved as vectors of PYMV in Indonesia. *Aphis gossypii* was reported as vector of the disease, however, its transmission research on this insect was still limited. Experiments were conducted at laboratory and green house to find out optimal transmission method by mealybugs and to examine the ability of *A. gossypii* in trasmitting the disease. The experiments used three insect species, *A. gossypii*, *P. minor*, *F. virgata*, which were collected from black pepper plants and then reared at laboratory and green house. Each insect was fed on diseased black pepper plant, then transferred to healthy black pepper seedlings. Each plant was treated with 1, 3, 7 and 10 insects. Mechanical transmission was also carried out to indicator plants (tobacco and chenopodium) as well as to black pepper seedlings. Transmission experiment was also conducted using two combinations of the insect. Detection of virus was carried out from treated plants for confirmation. The results showed that high transmission rate were obtained in transmission by *P. minor* and *F. virgata* (up to 100%). However, no symptoms was shown in black pepper seedlings at transmission with *A. gossypii*. Disease symptoms were seen at black pepper inoculated mechanically. The disease samples have been examined by ELISA and they were positive for CMV. Transmission with two species of insect gave lower rate of transmission compared to single species. These experiments have given an optimal rate of stunted disease transmission by mealybugs.

074 HARDANINGSIH, S.
Penyakit tanaman kedelai di lahan masam Lampung dan Sumatera Selatan. **Soybean diseases in acid soil in Lampung and South Sumatra**/Hardaningsih, S. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 571-579, 3 tables; 9 ref. Appendices

GLYCINE MAX; DISEASE SURVEILLANCE; DOMINANT SPECIES; COLLETOTRICHUM DEMATIUM; CORYNESPORA CASSIICOLA; PHAKOPSORA PACHYRHIZI; CORTICIUM ROLFSII; CERCOSPORA SOJINA; DISEASE SURVEYS; ACID SOILS; SUMATRA.

Extensification of soybean to acid soil in Lampung and South Sumatra to increase production of soybean (*Glycine soya* Max.) was done in the recent years. Disease is one of the limiting factors to soybean production in Indonesia. In the early stages of determining the disease management strategy, detail on information the causal agents of the diseases was needed, including symptoms, microscopic morphological characters, alternative hosts, modes of infection, and distribution mechanism of the diseases. Once epidemiology was understood and anticipated, management methods could be determined. Based on observations in Lampung and South Sumatra the major diseases of soybean were rust (*Phakopsora pachyrhizi*), bacterial pustules (*Xanthomonas axonopodis*), anthracnose (*Colletotrichum dematium* var. truncatum), stem blight (*Sclerotium rolfsii*), target spot (*Corynespora cassiicola*), and frogeye leaf spot (*Cercospora soina*). It was concluded that bacterial pustule (*X. axonopodis*), (*C. cassiicola*) and stem blight from other legumes are potential inocula for soybean.

075 LESTARI, E.G.

Perbaikan ketahanan tanaman panili terhadap penyakit layu melalui kultur in vitro. **Improvement of vanilla from wilt disease through in vitro culture**/Lestari, E.G.; Sukmadjaja, D.; Mariska, I. (Balai Besar Penelitian dan Pengembangan Bioteknologi dan Sumberdaya Genetik Pertanian, Bogor (Indonesia)). *Jurnal Penelitian dan Pengembangan Pertanian* ISSN 0216-4418 (2006) v. 25(4) p. 149-153, 3 tables; 28 ref.

VANILLA PLANIFOLIA; FUSARIUM OXYSPORUM; SOMACLONAL VARIATION; EMBRYO CULTURE; IN VITRO CULTURE; DISEASE RESISTANCE.

Vanilla (*Vanilla planifolia* A.) is one of the important industrial plants as a source of farmers' income and state earnings. Product of vanilla plant is commonly used as a flavor in food and beverage industry. However, there is no variety of this plant which is resistant to stem rot and wilt disease caused by *Fusarium oxysporum*. The disease causes 85% plant damage which becomes the main problem in vanilla development. In vitro selection, induction of somaclonal variation, and embryo rescue of crossed product between cultivated and wild species can be applied to obtain vanilla variety resistant to the disease. Application of radiation treatments to the seed regenerant, globular and torpil structure have produced several somaclones which had morphological variation. Inoculation using *F. oxysporum* conidia strain FI17-109-GV-0201 1 and then planting in disease endemic field of Sukamulya, Sukabumi produced 23 resistant somaclones. In vitro selection in MS medium enriched with fusaric acid 15-75 mg/l and then repeated with 75 mg/I obtained resistant clones. Cross selection by using MS medium enriched with 50% filtrate also produced resistant somaclones. The same results were observed in crossing *V. planifolia* and *V. albida* resulted resistant plants in endemic field.

076 NASRUN

Penyakit layu bakteri pada nilam dan strategi pengendaliannya. **Bacterial wilt disease on patchouli and its control strategy**/Nasrun (Kebun Percobaan Balai Penelitian Tanaman Obat dan Aromatik, Solok (Indonesia)) Nuryani, Y. *Jurnal Penelitian dan Pengembangan Pertanian* ISSN 0216-4418 (2007) v. 26(1) p. 9-15, 1 ill., 1 tables; Bibliography p. 13-15

POGOSTEMON CABLIN; PSEUDOMONAS SOLANACEARUM; SYMPTOMS; BIOLOGICAL CONTROL; INTEGRATED CONTROL.

Bacterial wilt disease is one of the most serious diseases on patchouli plant in West Sumatra, North Sumatra, and Nanggroc Aceh Darussalam (NAD). The disease is caused by Ralstonia solanacearum and reduces patchouli production of 60-80%, which becomes a constraint in increasing patchouli productivity. The pathogen can be controlled by using tolerant varieties such as Sidikalang, cultural method (fertilizer application, organic matter, and mulch), biological control (*Pseudomonas fluorescens* and *Bacillus spp.*),

botanical pesticide (lemon grass), chemical control (bactericide), and preventing pathogen spreading from infected area to non-infected area. Bacterial wilt disease should be controlled integratedly by combining various control techniques.

077 NGATIMAN

Penyakit bercak daun pada tanaman ekaliptus. **Attack of leaf spot disease on eucalyptus**/Ngatiman (Balai Penelitian dan Pengembangan Kehutanan Kalimantan, Samarinda (Indonesia)); Anggraeni, I. *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(3) p. 183-191, 2 ill., 3 tables; 12 ref.

EUCALYPTUS UROPHYLLA; SPOTS; PATHOGENS; SPHAEROPSIS; SYMPTOMS; DISEASE TRANSMISSION; IDENTIFICATION.

In forest plantation area of PT. Surya Hutani Jaya, Sebulu, Kutai Kartanegara Disrict, 3 and 5 years old *Eucalyptus urophylla* plantation had been attacked by leaf spot disease. The attack caused defoliation and severe damage to the plantation. The objective of the study was to identify pathogen, symptom and percentage of attack to *E. urophylla* plantation. Study was conducted in the field to observe symptom and intensity and continued in laboratory of forest protection in Forest and Nature Conservation Research Development Centre, Bogor to identify the pathogen. Identification was made by matching and comparing the characteristic found through macroscopic and microscopic identification with characteristics shown in the references. Result of identification showed that leaf spot on 3 and 5 years old *E. urophylla* was caused by *Macrophoma sp.*, form-family Sphaeropsidacea. For 3 years old plantation, percentage of attack was 57.46% with intensity of 7.08% mean while for 5 years old plantation, percentage of attack was 40.15% with intensity of 4.61%.

078 NOVERIZA, R.

Deteksi ketahanan panili terhadap busuk batang panili dengan induksi FoNP. **[Detection method of vanilla resistance to stem rot diseases by using FoNP induction]**/Noveriza, R.; Tombe, M.; Taufik, E.; Karyani, N.; Zulhisnain. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 198-208, 3 tables; 24 ref. 633.8/BAL/l bk1

VANILLA PLANIFOLIA; FUNGAL DISEASES; FUSARIUM OXYSPORUM; DISEASE RESISTANCE; INDUCED RESISTANCE; PATHOGENS; ENZYME ACTIVITY.

Studies to detect the occurrence of induced-resistance on vanilla against stem rot disease were conducted by inoculated vanilla stem with non-pathogenic isolate of Fusarium oxysporum. The study was carried out in laboratory and glass house of ISMECRI from January to December 2005. The study consisted of three activities, (1) Detecting the presence of enzyme accumulation and disease intensity of induced-resistance vanilla stem clone 1 and 2. The vanilla cutting stems were inoculated with various combination of formulated non pathogenic Fusarium (Bio-FOB): Bio-FOB EC, Bio-FOB WP then grown on Organic-FOB. Fungicide or water treatments were used as comparison and control. (2) Hypersensitive response of vanilla stem cell was tested by counting number of dead cell after the stem was soaked in (a) Bio-FOB, (b) Bio-FOB, then soaked in conidial suspension of pathogenic isolates (F117) subsequently, and (c) Soaked only in conidial suspension of pathogenic isolates (F117). Around 100 cells were observed for each treated vanilla stem and number of necroses/dead cell was counted. (3) The effect of induced-resistance vanilla exudates as substance of anti-fungi was tested by collecting the exudates of vanilla stems that had been treated by inoculating with (a) FoNP, (b) F117, (c) FoNP then F117, and (d) water as control. The effect of vanilla exudates were tested on germination percentage and the occurrence of germ tube long of Fusarium conidia. The results indicated that disease severity was higher in vanilla clone 2 than clone 1, and peroxidase enzyme activity was higher on vanilla inoculated with FoNP than the control one. Number of dead cell was lower on vanilla treated by FoNP than those of F117. The exudates of induced resistance vanilla stem increased percentage of germinated conidia of F117 isolate from 14 to 21%. The mechanisms involved in induced resistance vanilla against vanilla stem rot disease were reflected by increasing

peroxidase enzyme activity and phytoalexin accumulation in induced-resistance vanilla stems. However, further study is still needed to prove the occurrence of phytoalexin accumulation in vanilla stems.

079 PRASETYO, A.E.
***Studi jamur penyebab penyakit busuk buah pada kelapa sawit (Elaeis guineensis* Jacq*) di berbagai daerah ketinggian tanam.* [Study on fungus causing fruit bunch rot disease on oil palm at different altitudes]**/Prasetyo, A.E.; Susanto, A.; Rambe, A.R. (Pusat Penelitian Kelapa Sawit, Medan (Indonesia)). *Jurnal Penelitian Kelapa Sawit* ISSN 0853-196X (2006) v, 14(1) p. 11-19, 2 tables; 18 ref.

ELAEIS GUINEENSIS; MARASMIUS; PLANT DISEASES; ALTITUDE; ISOLATION; SPECIES.

Marasmius fruit bunch rot disease, caused by *Marasmius palmivorus* is the most common disease seen in palm 3-9 years of age and in the older palm. Its incidence is very variable. The fungus or closely-related species was not cause serious problem. The samples of the disease on this research took from various oil palm estates in North Sumatra with different altitude of above sea level. The locations of the samples were in PTPN IV Bah Jambi estate (368 m on above sea level); PTPN IV Bah Birung Ulu estate (831 m asl) and Aek Pancur Research Estate (50 m asl). The disease intensities from the heaviest attack to the slightest are Bah Birung Ulu estate (33-34%), Bah Jambi estate (11-12%) and Aek Pancur estate (0.88-1%), respectively. In the research, many fungi have been isolated from fruit bunch rot tissues, namely *Marasmius* sp.; *Sclerotium* sp.; *Rhizoctonia* sp.; *Fusarium* sp.; *Aspergillus* sp.; *Ceratocystis* sp.; and *Penicillium* sp.

080 SALEH, N.
***Tingkat ketahanan empat varietas unggul kacang tanah terhadap infeksi cowpea mild mottle virus.* [Resistance level of four groundnut improved varieties to cowpea mild mottle virus infection]**/Saleh, N.; Baliadi, Y. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)); Candrawati, M.; Hadiastono, T.; Rasminah, S.; Hadi, M. Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 499-510, 5 ill., 7 tables; 12 ref.

ARACHIS HYPOGAEA; HIGH YIELDING VARIETIES; DISEASE RESISTANCE; VIROSES; INFECTIOUS DISEASES; INFECTION; DISEASE TRANSMISSION; YIELD COMPONENTS.

Cowpea mild mottle virus (CMMV) is one of the limiting factors in increasing groundnut production in Indonesia. Research aimed at evaluating resistance degree, critical period and yield losses of four groundnut improved varieties was carried out at the ILETRI greenhouse on July 2004 until February 2005. Experiments were laid out using factorial randomized block design replicated four times. The first factor was groundnut varieties (Domba, Bison, Sima and Kancil), and the second factor was the age of plant inoculation (1, 2, 3 and 4^{th} weeks after planting). Parameters observed were incubation period, disease intensity, plant growth, yield and yield components of diseased plants compared to healthy ones. These were used to evaluate the resistance index following the method of Castillo *et al*. (1978 cit. Rahardjo, 2003). The results showed that variety Kancil was relatively resistant to CMMV infection followed by Bison, Sima and Domba. The critical period for Kancil and Bison varieties was three weeks after planting, while for Sima and Domba varieties it was at two weeks after planting. CMMV infection reduced seed weight by 7.6% to 66.4%, depending on the infection time. CMMV infection at a young stage caused higher yield losses compared to late infection.

081 SARAGIH, Y.S.
***Isolasi dan identifikasi spesies Fusarium penyebab penyakit layu pada tanaman markisa asam.* Isolation and identification of Fusarium species causing wilt disease on passion fruit plant**/Saragih, Y.S.; Silalahi, F.H. (Kebun Percobaan Tanaman Buah, Berastagi (Indonesia)). *Jurnal Hortikultura* ISSN 0853-7097 (2006) v. 16(4) p. 336-344, 3 ill., 3 tables; 16 ref.

PASSIFLORA EDULIS; FUSARIUM; WILTS; IDENTIFICATION; ISOLATION.

Fusarium wilt disease was the main constraint in passion fruit productivity that spread in Indonesia, especially in some main production areas such as North Sumatra and South Sulawesi. The objectives of this research were: (1) to find out Fusarium species that caused wilt disease on passion fruit, and (2) to find out the characteristic of Fusarium species that have been obtained. The experiment was conducted in Berastagi Fruits Plant Research Farm, from October 2004 until February 2005. The results showed that from 20 isolates taken from 5 villages (Salit, Aji Nembah, Tongkoh, Suka Dame, and Regaji) there were 8 distinct colors of culture on PDA. There were Group 1 (Violet), Group 2 (Brown stripped white), Group 3 (Pale orange), Group 4 (Brown), Group 5 (Thin white), Group 6 (Pink), Group 7 (Thick white), and Group 8 (Pale yellow). Result of continuously identification on CLA (carnation leaf agar) media of 8 colors of culture from PDA, there were found 4 species of fusarium that caused wilt disease on passion fruit plant, i.e. *Fusarium oxysporum*, *F. solani*, *F. tricintum* and *F. poae*.

082 SATRIA-DARSA, J.
***Komponen tumbuh dan hubungan di antara komponen tumbuh jeruk rough lemon terinfeksi CVPD (Citrus Vein Phloem Degeneration) yang diberi zat pengatur tumbuh asam naftalen asetat.* Growth components and their relationships of citrus RL (Rough Lemon) infected by CVPD treated with NAA (naphthalene acetic acid)**/Satria-Darsa, J. (Universitas Padjadjaran, Bandung (Indonesia). Fakultas Pertanian). *Jurnal Agrikultura* ISSN 0858-2885 (2008) v. 16(3) p. 213-218, 6 tables; 7 ref.

CITRUS; GROWTH; VIROSES; PLANT GROWTH SUBSTANCES; NAA.

An experiment was carried out to improve the growth of citrus rough lemon (*Citrus jambhiri* Lush) infected by CVPD by application of plant growth regulator naphthalene acetic acid (NAA). The treatments were four NAA concentrations, i.e. 0 mg/l, 20 mg/l, 40 mg/l, and 60 mg/l, applied twice, firstly when the second cycle shoots (shoot-2) were in an active growing phase, and secondly when they reached maximum growth. The growth components observed were leaf dry weight, shoot dry weight, leaf size, and stem dry weight. The citrus plants of about 18 month old were cultivated in polybag under glass-house conditions. The results showed that all of growth components of shoot-2 were not affected by NAA application at various concentrations. However the coefficient of correlation and the coefficient of determination among growth components revealed that in general, NAA application increased the dependency of shoot-2 on shoot-1. The closest relationships were shown by the shoots received NAA 60 mg/l.

083 SUPRIADI
***Optimalisasi deteksi virus penyakit kerdil.* [Optimalization of detection method of stunted disease virus on pepper plant]**/Supriadi; Sukamto; Hartati, S.Y.; Balfas, R.; Karyani, N.; Swastika, G.; Sulyo, Y. Laporan teknis penelitian Balai Penelitian Tanaman Rempah dan Obat tahun 2005. Buku 1/Laba, I W.; Hobir; Trisilawati, O.; Rosman, R.; Wahyuno, D.; Wulandari, S.; Hermanto; Taufik, E. (eds.) Bogor (Indonesia): Balittro, 2006 p. 113-123, 1 table; 18 ref. 633.8/BAL/l bk1

PIPER NIGRUM; DISEASE RESISTANCE; PLANT DISEASES; CUCUMBER MOSAIC CUCUMOVIRUS; PLANT VIRUSES; ELISA; PURIFICATION.

Stunted disease has been spreaded to almost all pepper plantations through out Indonesia. Two types of viruses are found in diseased plant, i.e. CMV (cucumber mosaic virus) and PYMV (piper yellow mottle virus). PYMV is transmitted by insect vector namely *Planococcus sp*. and *Ferrisia virgata*, whereas CMV is transmitted mechanically, and possibly by vector *Aphis gossypii*. This study was aimed at finding out method for detecting the viruses. This study was conducted in laboratory and green house of the Indonesian Spices and Medicinal Research Institute in collaboration with Bogor Agricultural University. Detection method of viruses were using serology and polymerase chain reaction (PCR). Mechanical transmission was also carried out to indicator plants (tobacco and chenopodium) as well as to black pepper seedlings. The result showed that CMV was transmitted mechanically from black pepper showing mosaic

to healthy *Nicotiana benthamiana* plants. The leaf extract of black pepper and *N. benthamiana* plants showed mosaic symptoms in enzyme linked immuno assay (ELISA) and tissue printing methods reacted positively with polyclonal antisera of cucumber mosaic cucumovirus (CMV)-pepper from Indonesia. PYMV DNA was amplified from black pepper plant showing chlorotic or mosaic symptoms by the primer pair Badna-T (5'-CAC CCC CGG GCC AM GCT CTG ATA CCA-3') and SCBVR1 (5'-CTC CTT CAT CTC CTC AAG AAG-3'). Durability of the detection methods need to be tested by using different disease symptoms associated with stunted virus. This study implied that it was possible to detect CMV and PYMV by using developed methods, i.e. serology for CMV and PCR for PYMV, which means that checking healthy black pepper plant propagation need to be implemented before distributed to farmers.

084 YUSNAWAN, E.
Keefektifan Ampelomyces quisqualis yang ditumbuhkan pada suhu dan berbagai media terhadap penyakit embun tepung kacang hijau. **Effectiveness of *Ampelomyces quisqualis* Ces grown in temperatures and various media against powdery mildew on mungbean**/Yusnawan, E.; Hardaningsih, S. (Balai penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang, 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 483-490, 2 ill., 3 tables; 15 ref.

VIGNA RADIATA RADIATA; MILDEWS; AMPELOMYCES; HYPERPARASITES; CULTURE MEDIA; TEMPERATURE; MYCELIUM; FUNGAL SPORES; BIOLOGICAL CONTROL.

Ampelomyces quisqualis Ces. is one of potential hyperparasitic fungi that can be used to control powdery mildew. The objective of this research was to determine the best combination of temperature and media for mycelial growth and conidial production of *A. quisqualis* in laboratory. A subsequent experiment was carried out in the greenhouse to determine the conidial concentration for effective suppression of powdery mildew. The laboratory experiment was designed in factorial completely randomized with seven replications. The greenhouse experiment was designed in completely randomized design with five replications. The interaction between temperature and medium influenced the mycelial growth and conidial production of *A. quisqualis*. PDA2 incubated under both 27^{o}C and 30^{o}C was the best medium to grow mycelia. Colony diameters of 14.64 mm and 14.21 mm were produced during 12-days respectively. PDA1 and PDA2 incubated at 27^{o}C were the best treatments for producing conidia, 5.51x10^{6}/ml and 5.39x10^{6}/ml after 12 days, respectively. *A. quisqualis* application suppressed the development of powdery mildew on leaves inoculated with conidial concentration of 10^{6}/ml. Pycnidia produced were 121.6 and 117.8 per 2 x 2 mm^{2}, respectively.

H60 WEEDS AND WEED CONTROL

085 HIDAYATI M.
Produksi bawang merah (Allium ascalonicum* L.*) akibat pemberian herbisida oxyfluorfen dan pupuk kandang. **[Effects of oxyfluorfen herbicide and farmyard manure on the yield of shallot]**/Hidayati M. (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 145-150, 1 ill., 4 tables; 11 ref.

ALLIUM ASCALONICUM; HERBICIDES; OXYFLUORFEN; ORGANIC FERTILIZERS; FARMYARD MANURE; YIELD COMPONENTS; DIMENSIONS; WEED CONTROL.

This experiment was aimed at identifying effects of oxyfluorfen herbicide dosage and animal manure on the yield of shallot and its yield components, tuber weight loss and harvest index. The experiment was done at the Research and Development Experimental Station of P.T. Syngenta, Cikampek, West Java using a randomized block design with two factors. The first factor was three dosage levels (0, 2 or 3 l/acre) of oxyfluorfen, while the second factor was four levels of manure application (0, 10, 20 or 30 t/acre). Results showed that the treatments did not interact one to another in affecting the parameters observed. Application of oxyfluorfen at 2 l/acre and animal manure at 10 t/acre effectively increased yield

and yield components of shallot and its harvest index. The highest yield index value (85.3%) and the least tuber weight loss (13.5%) were obtained at oxyfluorfen application of 2 l/acre.

086 JATMIKO, S.Y.
***Teknik penyampuran herbisida sebagai alternatif pengendalian gulma pada kacang tanah di lahan tadah hujan.* [Herbicide mixing technique as an alternative for weed control on groundnut (*Arachis hypogaea*) in rainfed land]**/Jatmiko, S.Y.; Ichwan, A. (Loka Penelitian Pencemaran Lingkungan Pertanian, Jakenan (Indonesia)) Widoto. Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang, 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 466-473, 1 ill., 3 tables; 19 ref.

ARACHIS HYPOGAEA; WEED CONTROL; CONTROL METHODS; HERBICIDES; MIXING; DOMINANT SPECIES; YIELDS; RAINFED FARMING.

Efforts were required to increase peanut productivity in dryland and rainfed lowland because of limited fertile land. Rainfed lowlands in Central Java covers about 293.600 ha. The main constraints in Tuban-East Java, a peanut production centre were weed infestation, and lack of P and N nutrient. The aim of this research was to determine the optimal dose of tank mixture herbicide as an alternative weed control on peanut (*Arachis hypogaea* L.). The research was conducted at Jakenan experimental site on light textured Inceptisol soil. A randomized completely block design (RCBD) was used with three replications. There were 10 treatments that is, 8 treatments of chemical weed control, mechanical weed control and unweeded control. The results indicated that the dominant weeds of peanut crops based on SDR rank were *Paspalum distichum* (L.), *Lugwigia octovalvis* (Jacq.) Raven, *Polytrias amarura* (Buese) O.K., *Cyanotis axillaris* (L.) Sweet, and *Echinochloa colonum* (L.) Link. Application of a tank mixture of Klomazone 500 ml and Sulfentrazone 750 ml/ha, provided a higher dry pod weight than mechanical weed control.

J11 HANDLING, TRANSPORT, STORAGE AND PROTECTION OF PLANT PRODUCTS

087 YULIANINGSIH.
***Seleksi jenis bunga untuk produksi mutu minyak mawar.* Selection of roses for producing good quality of rose oil**/Yulianingsih; Amiarsi, D.; Tahir, R. (Balai Penelitian Tanaman Hias, Cianjur (Indonesia)); Sabari S.D. *Jurnal Hortikultura* ISSN 0853-7097 (2006) v. 16(4) p. 345-348, 3 tables; 10 ref.

ROSA; FLOWERS; VARIETIES; SELECTION; ESSENTIAL OILS; CHEMICAL COMPOSITION; DISTILLING; PRODUCTION; QUALITY.

Roses flower is potential for producing rose essential oil for product diversification and for increasing its added value which usually just used as cutflower and grave yard flower. The objective of this research was to determine kinds of rose varieties (Local Red Rose, Local White Rose, Americana Beauty, and Holland Red Rose) for producing good quality and quantity of concrete/absolute. Rose flowers were extracted by dipping flower into hexane solution for 12 hours. Ratio of flower and solvent was 1:2. Solution was harvested by filtering and manual pressing. Solution was vacuum evaporated to produce concrete, from which absolute would be produced by dissolving in ethanol 96% followed by vacuum evaporation. Observations were done on rendement of concrete and absolutes, refraction index, and chemical composition of absolutes. The experiment was arranged in a factorial completely randomized design with 3 replications. The results showed that Americana Beauty variety gave the highest rendement of concrete and absolutes of rose i.e. 0.14% and 0.06%, respectively. The highest refraction index was found in Local White Rose (1.45-1.47). The specific components in absolute rose oil were phenyl ethyl alcohol, citronellol, and geraniol, while methyl eugenol was a dominantly found in absolute oil of Americana Beauty Roses.

K10 FORESTRY PRODUCTION

088 MINDAWATI, N.
Pengaruh penanaman beberapa jenis pohon hutan terhadap kondisi kesuburan tanah Andosol. **Effect of some forest and species plantation to condition of Andosols soil fertility**/Mindawati, N.; Kosasih, A.S.; Heryati, Y. (Pusat Penelitian dan Pengembangan Hutan Tanaman, Yogyakarta (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(3) p. 155-164, 5 tables; 10 ref.

AGATHIS DAMMARA; PINUS OOCARPA; SHOREA; ALNUS NEPALENSIS; TOONA; CASUARINA; KHAYA; ACACIA CRASSICARPA; SOIL FERTILITY; SOIL CHEMICOPHYSICAL PROPERTIES; FOREST STANDS; ANDOSOLS.

Development of industrial forest plantation should take a high consideration on soil fertility, because fertile soil make good growth and produce timber and others well. A study to obtain information on the effects of plantation of *Agathis loranthifolia*, *Pinus merkusii*, *Shorea platyclados*, *Alnus nepalensis*, *Toona sureni*, *Casuarina junghuhniana*, *Khaya anthotheca* and *Acacia cassicarpa* on soil properties (chemistry, physic and biology) on the forest floor was conducted in Andosol soil at research forest of Cikole, West Java. Under the investigated stands of six years old, sample soil were taken in 3 points, mixed for analyzed of soil chemical and biological properties. Composite soil were taken at the depth of 0 cm-15 cm and 15 cm-30 cm by ring sample for analyzed of soil physical properties. The results showed that pH under the investigated stands were classified as acid, except *S. platyclados* was very acid. Soil organic matter and macro nutrients contents, also cation exchange capacity were classified very low, not different with control. All of the investigated stands gave a stabilize effect to soil condition. Soil texture after planting were silty clay loam, except *Toona sureni* was clay. On the other hand all of the investigated stands gave a good effect of bulk density, porosity and available water. The stands gave a good effect to increase amount of microorganisms, total fungi and respiration in the soil that finally gave a good effect to soil fertility.

089 MINDAWATI, N.
Pengaruh frekuensi pemeliharaan tanaman muda terhadap pertumbuhan meranti di lapangan. **Effect of tending frequency on growth of shorea sapling at field**/Mindawati, N.; Heryati, Y. (Pusat Penelitian dan Pengembangan Hutan Tanaman, Yogyakarta (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 63-71, 5 tables; 9 ref.

SHOREA; CULTIVATION; GROWTH; SOIL CHEMICOPHYSICAL PROPERTIES; FIELDS.

Meranti (*Shorea spp.*) is known in the international wood trading as an important tropical wood. The development program of the forest plantation of Tengkawang will not succeed without tending process of sapling. The research of kind and frequency of tending to sapling was conducted in the Haurbentes Research Forest, Jasinga, West Java. Randomized completely design was used in this research, with two types of tending i.e. intensive tending and less intensive tending until three years old. The results showed that the intensive tending significantly influenced the mean of height and diameter of *S. stenoptera* which were 3.19 m and 3.64 cm and *S. mecistopteryx* 3.43 m and 3.76 cm. Work capability of the development of Shorea plantation, starting from land preparation, planting and intensive tending for three years were employed of 66 work man days/ha. Otherwise in less intensive tending were employed of 56 work man days/ha. Soil and cover crops condition within an area of intensive tending have a good result, according to soil pH, N total, available P, cation exchange capacity (CEC) and important value index (IVI) compared to less intensive tending.

090 RAMADHANIL
Tree diversity in primary forest of the Lore Lindu National Park Central Sulawesi (Indonesia)/ Ramadhanil (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 151-157, 2 ill., 4 tables; 36 ref.

FOREST TREES; BIODIVERSITY; SPECIES; SILVICULTURE; FOREST PLANTATIONS; NATIONAL PARKS; SULAWESI.

This study was design to evaluate trees diversity in primary forest around the Lore Lindu National Park, Central Sulawesi. Trees (dbh ≥ 10 cm) were recorded in four plots (0.25 ha each, 50 m x 50 m) in four different locations: Kalabui 1, Bulu Lonca, Kalabui 2 and Kolewuri. Identification of voucher and additional herbarium specimens was done in the fields and at the Herbarium Celebence, Tadulako University, Palu and Herbarium Bogoriense, Bogor. Results showed that, in total, there were 113 species recorded which belong to 49 families. In each of the 0.25 ha plot, 51-63 tree species (dbh ≤ 10 cm) belonging to 20-29 families were found. The predominant species in plot Kalabui 1 were *Palaquium quercifollium* (de Vriese) Burck (Sapotaceae), *Chionanthus laxiflorus* Blume (Oleaceae) and *Dysoxyllum densiflorum* Miq. (Meliaceae). *Castanopsis accuminatisima* (Blume) Rehder and *Lithocarpus celebicus* (Miq.) Rehder (both are Fagaceae) and *Ficus trachypison* (Moraceae) were the major tree species found in Bulu Lonca, Kalabui 2 and Kolewuri, respectively. This submontane forest was dominated by Fagaceae, Sapotaceae, Meliaceae and Lauraceae tree families. The tree abundance (tree/ha) was 592 for Kalabui 1, 616 for Bulu Lonca, 600 for Kalabui 2 and 424 for Kolewuri. The basal area (square meter/ha) was found the highest in Kolewuri (80.2), followed by Kalabui 1 (58.4), Bulu Lonca (52.0) and Kalabui 2 (36.3). The Shannon-Whiener index in this submontane forest was moderately high (3.4-3.7). Some tree species were found to be endemic to Sulawesi such as *Horsfieldia costulata*, *Pandanus sarasinorum*, *Neonauclea ventricosa*, *Beilschmidia gigantocarpa*, *Pigafetta elata*, *Pinanga aurantiaca*, *Mussaendopsis celebica*, *Neonauclea intercontinentalis*, etc.

091 SANTOSO, B.
Variasi pertumbuhan jati muna hasil okulasi. **Growth variation of bud grafting of muna teak**/Santoso, B.; Wardani, B.W. (Balai Penelitian dan Pengembangan Kehutanan Sulawesi, Makassar (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(3) p. 165-173, 3 tables; 16 ref.

TECTONA GRANDIS; GRAFTING; BUDS; VEGETATIVE PROPAGATION; ROOTSTOCKS; SEEDLINGS; GROWTH; DIAMETER.

The objectives of this research were to determine percentage of survival bud grafting variation of height and diameter growth at 3 months ages seedling of muna teak (*Tectona grandis* L.) seedlots. Complete randomized design was applied in this research with 60 seedlots and 75 replications. This study was carried out during September to November 2005 in Moroangin, Enrekang Regency, South Sulawesi which located at altitude about 200 m above sea level, with the average rainfall per year 1.250 mm, the temperature range of 26^{o}C - 32^{o}C and the humidity range of 64%-92%. The results showed that average bud grafting percentage was 35.53%. The range of seedling growth was 10.50 cm - 40.35 cm in height and 3.85 mm - 7.40 mm in diameter.

092 SAWITRI, R.
Pengaruh pengelolaan hutan produksi terhadap keragaman jenis plasma nutfah perairan. **[Effect of production forest management on the diversity of aquatic germplasm]**/Sawitri, R.; Iskandar, S. (Pusat Penelitian dan Pengembangan Hutan dan Konservasi Alam, Bogor (Indonesia)). *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(2) p. 76-82, 4 tables; 8 ref.

FOREST PRODUCTS; FOREST MANAGEMENT; BIODIVERSITY; FISHES; PLANKTON; GERMPLASM; LOGGING; COASTAL WATERS.

Management of forest production by application of reduced impact logging (RIL) created crown opening by 13.3%, which was smaller compared with conventional logging (CNV) that caused crown opening by 19.2%, and provided significant influence to water biodiversity. Availability of nutrient and essential minerals was better in RIL that was supported by high soluble residual or 95% higher and low velocity of river flow or 50% of surrounding CNV water. This physical condition showed significant difference to N

and P ratio (N/P ratio) in RIL and CNV or 77.5 and 51.3. These values showed high content of nitrate of the water and it was in oligotropic type condition. Diversity index of plankton in RIL was 1.754 and in CNV was 1.682 with each population density was 12,916 and 7,222 individuals/liter. The number of plankton had positive correlation with N/P ratio (r = 0.9). In water catchments study area, 28 fish species belonged to 20 genera and 8 families were found. The dominant families were Cyprinidae 57.14%, Bagridae 17.14%, and Anguillidae 7.14%. Most endemic fish species of Borneo were also found in both RIL and CNV water, however species with high relative frequency and density were found higher in RIL water.

093 SUMADI, A.
Pemodelan penduga volume pohon pulai darat. **Estimation modelling of pulai darat tree volume**/Sumadi, A.; Azwar, F.; Muara, J. (Balai Penelitian dan Pengembangan Hutan Tanaman, Palembang (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 73-81, 1 ill. 6 tables; 10 ref.

ALSTONIA; DIAMETER; MODELS; VOLUME.

Tree volume estimation model of pulai darat (*Alstonia angustiloba*) developed by PT. Xylo Indah Pratama which is located in Musi Rawas Region, South Sumatra Province compiled pursuant to one independent variable of tree diameter variable and two independent variable of tree diameter and height variable. Selection for the best model pursuant to the level given of determination coefficient value (R2), standard error (Se), mean deviation (SR), and aggregative deviation (SA). The best tree estimation model based on one independent variable of diameter variable is the equation of V = 0.0795 - 0.0127 D + 0.000751 D2 with R2 (94.80%), Se (3.11%), SR (1.91%), and SA (0.02%). The best tree estimation model based on two independent variable of diameter and height variable is the equation of V = -0.0769 + 0.0093 H + 0.00885 D - 0.000102 D2 + 0.000045 D2H - 0.00100 DH with R2 (96.30%), Se (2.69%), SR (1.49%), and SA (0.33%). The estimation of tree volume model with two independent variables, have higher accuracy by increasing R2 (1.5%), decreasing Se (0.42%), and decreasing SR (0.43%), but increasing SA (0.31%).

094 ULFA, M.
Pengaruh inokulasi cendawan mikoriza arbuskula pada tanaman pulai di lahan bekas tambang batubara. **Effects of arbuscular mycorrhizae fungi inoculation to pulai at ex coal mining**/Ulfa, M.; Waluyo, E.A.; Martin, E. (Balai Penelitian dan Pengembangan Hutan Tanaman, Palembang (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 101-106, 1 ill. 1 table; 20 ref.

ALSTONIA; VESICULAR ARBUSCULAR MYCORRHIZAE; INOCULATION; FIELDS; GLOMUS ETUNICATUM.

Study on effect of arbuscular mycorrhizae fungi (AMF) *Glomus etunicatum* inoculation to pulai (*Alstonia sp.*) at ex coal mining area was carried out at Dumping Area Pit Tiga, Bangko Timur, PT. Bukit Asam, Tanjung Enim, South Sumatra, for 9 months. This research consisted of two treatments, *Glomus etunicatum* inoculation and varied seedling media, arranged in randomized block design with three replications. Growth parameters observed were height, diameter and survival percentage. The result showed that at field, pulai (*Alstonia sp.*) growth relatively did not show any differences in height and diameters among treatments. *Glomus etunicatum* inoculation influenced life survival at ex coal mining area which shown by almost 100% survival percentage of pulai (*Alstonia sp.*). *Glomus etunicatum* did not influence growth of pulai at field due to plant biochemical process, such as nitrogen availability and accumulation of organic matter that was not well decomposed. It caused sporulation and colonization of AMF did not work well.

L01 ANIMAL HUSBANDRY

095 SWACITA, I B.N.
Kajian tentang berat relatif beberapa organ visceral itik bali. **Study on the relative weight of several visceral organs in bali ducks**/Swacita, I B.N.; Suardana, I W. (Universitas Udayana, Denpasar

(Indonesia). Fakultas Kedokteran Hewan). *Jurnal Veteriner* ISSN 1411-8327 (2006) v. 7 (4) p. 169-174, 3 ill., 4 tables; 9 ref.

DUCKS; SPECIES; OFFAL; BALI.

The products of slaughtered ducks can generally be divided into two components, carcass and noncarcass components. Offal is a non-carcass component which is frequently used as the source of food as it has advantages of high quality and cheap price compared with meat. The quality of carcass and non-carcass components of an animal is closely related to several factors such as genetic, species, meals, and environmental factors. In this study, 40 healthy ducks originated from 4 districts in Bali were used to study the weights of the offal components such as liver, heart and kidney relative to their live weights. The data obtained from this study was analyzed by analysis of variance and proceeded by Duncan test if a significant difference was observed in ANOVA test. The average weights of liver, heart and kidney relative to the live body weight of bali ducks were 3.13-3.61%, 0.75-0.84% and 0.52-0.96%, respectively. The result indicated that bali ducks is potential to be used as the source of meat beside its use as eggs producer.

L02 ANIMAL FEEDING

096 BINTANG, I A.K.
Pengaruh penambahan beta-xilanase dan beta-glukanase terhadap performans ayam broiler. **[Effect of betha-xylanase and betha-glucanase on broiler chickens performance]**/Bintang, I A.K.; Sinurat, A.P.; Ketaren, P.P. (Balai Penelitian Ternak, Bogor (Indonesia)). *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 92-96, 2 tables; 16 ref.

BROILER CHICKENS; ANIMAL PERFORMANCE; RATIONS; FEED ADDITIVES; ENZYMES; CARCASSES.

A study was conducted to evaluate the effect of enzyme supplementation on the performances of broiler chickens. One hundred and twenty five day old chicks (DOC) were allocated into five dietary treatments with 5 replications. Each replication had 5 DOC. The treatments were control, control + 0.02% betha-xylanase, control + betha-glucanase at three levels (0.05; 0.10 and 0.20%). The treatments were carried out in a randomized block design. Parameter measured were feed intake, live weight gain and feed conversion ratio (FCR) at 3 and 5 weeks old; while carcass, internal organ, abdominal fat, thickness of intestine, and mortality were observed only at 5 weeks old. The results showed that enzyme supplementation did not significantly ($P>0.05$) affect feed intake and live weight gain of chicks at 3 weeks old, but the FCR of enzyme supplementation was significantly ($P<0.05$) better as compared with the control. FCR of chicks fed with betha-glucanase tended to be better than that of the betha-xylanase supplementation ($P>0.05$). The enzyme addition did not significantly ($P>0.05$) affect all parameters recorded at 5 weeks old chickens. It was concluded that the best treatment for chicks at 3 weeks old was 0.05% betha-glucanase supplementation. This treatment improved 7.55% FCR as compared to the control.

097 PASARIBU, T.
Efektivitas bioaktif lidah buaya (Aloe vera barbadensis) pada ayam petelur di tingkat peternak komersial **Effectiveness of *Aloe vera barbadensis* bioactives on laying hens on commercial farmers**/Pasaribu, T.; Sinurat, A.P.; Purwadaria, T. (Balai Penelitian Ternak, Bogor (Indonesia)). *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 85-91, 3 tables; 25 ref.

LAYER CHICKENS; RATIONS; FEED ADDITIVES; EGG PRODUCTION; QUALITY; ALOE BARBADENSIS; ANTIBIOTICS; FEED CONSUMPTION.

A field trial was conducted to study the effectiveness of dry gel (DG) *Aloe vera* as a feed additive for laying hens in commercial farms. The trial was consisted of two treatments, i.e. farmer ration containing antibiotic of zinc bacitracin at 0.5 g/kg as control and the feed containing DG equal to 1.0 g/kg. Each

treatment had two replications with 504 Loghman laying hens. The hen day production (percentage HD), egg weight, feed consumption, feed conversion ratio (FCR), egg quality comprising yolk colour, albumin and yolk weight, egg shell weight and thickness, and mortality were observed for 24 weeks. The results showed that feed consumption, percentage HD, egg weight, FCR, yolk colour, albumin weight, yolk weight, egg shell weight, and egg shell thickness were not significantly different (P>0.05) between the control and DG treatment, except for the haugh unit (HU). Thus, it can be concluded that *Aloe vera* bioactives has the same effectiveness as antibiotic as a feed additive at the level of commercial farms.

098 POETRI, E.

Pengaruh penambahan daun lamtoro dan daun gamal terhadap konsumsi, substitusi dan kecernaan pakan pada domba betina yang mendapatkan pakan dasar jerami jagung. **[Effects of adding *Leucaena leucocephala* and *Gliricidia sepium* leaves on feed intake, substitution and digestion of ewes receiving a basal diet of corn stover]**/Poetri, E.; Marsetyo (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 209-213, 2 tables; 15 ref.

EWES; ZEA MAYS; STRAW; FEED ADDITIVES; LEUCAENA; GLIRICIDIA; SUPPLEMENTS; FEED INTAKE; DIGESTIBILITY; BODY WEIGHT.

This experiment was done to examine effects of adding *Leucaena leucocephala* or *Gliricidia sepium* leaves on feed intake, substitution and digestion in ewes receiving a basal diet of corn stover. Fifteen ewes with a mean ± SE initial body weight (BW) of 23 ± 31 kg were randomly divided into 3 groups of 5 animals to receive one of the following dietary treatments: corn stover ad libitum (P0), P0 + *Leucaena leucocephala* (P1) or P0 + *Gliricidia sepium* (P2) leave. The supplements were given daily at 2% of the animal BW on dry matter basis. The experiment lasted for 4 weeks: 3 weeks for adaptation and 1 week for data collection. Drinking water was freely available to animals throughout the experiment. Results showed that the addition of *L. leucocephala* or *G. sepium* leaves significantly (P<0.01) reduced the basal diet intake, from 4.04% BW for P0 to 2.14 and 2.09% BW for P1 and P2, respectively, without affecting the total intake. On the other hand, the treatments increased the feed dry matter digestibility from 57.2% (P0) to 64.4% (P1) and 65.3% (P2). The rates of substitution due to addition of *L. leucocephala* and *G. sepium* were 0.47 and 0.48, respectively.

099 PUASTUTI, W.

Bungkil kedelai terproteksi cairan batang pisang sebagai pakan imbuhan ternak domba: in sacco dan in vivo. **Banana stem juice protected soybean meal as feed supplement to sheep: in sacco and in vivo**/Puastuti, W.; Mathius, I W.; Yulistiani, D. (Balai Penelitian Ternak, Bogor (Indonesia)). *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 106-115, 3 ill., 6 tables; Bibliography: p. 114-115

SHEEP; SOYBEAN MEAL; BANANAS; STEMS; RATIONS; SUPPLEMENTS; IN VITRO; IN SACCO EXPERIMENTATION.

Protein with low resistance of rumen degradability must be protected, which part of its protein could reach post-ruminal and able to supply amino acids for ruminant. The experiment was conducted to obtain the best ratio of soybean meal with banana stem juice as feed supplement protecting protein. Rumen degradability using rumen fistulated sheep were evaluated in sacco at incubation times of 0, 2, 4, 6, 12, and 24 hours. The best ratio in the in sacco experiment was used for further in vivo experiment. Fifteen growing lambs with average live weight of 18.6 ± 2.2 kg were grouped according to body weight in trial with a simple randomized design. Three treated rations were R0=control diet with 0% protected soybean meal, R50=diet with 50% protected soybean meal and R100=diet with 100% protected soybean meal. All diets were iso nitrogen and iso energy (CP 18% and TDN 75%). Diet consisted approximately 30% king grass and 70% concentrate. The experimental diets were offered for 12 weeks. The result from in sacco experiment showed that the best ratio between soybean meal and banana stem juice was 2:1 w/v (R2). This mixture had the highest rumen undegradable dry matter and protein. Result from in vivo experiment showed that substitution of protected soybean meal did not affect consumption and intake and digestibility

of dry matter, intake and digestibility of crude protein. The intake and digestibility of dry matter, intake and digestibility of crude protein, pH value, NH3-N, total bacteria, purin and total VFA in rumen fluid were not affected by feed supplement. The same average body weight at the beginning of study resulted same body weight at the end of study. The ADG of R50 and R100 (138.1 and 122.2 g) were respectively not different with the control, R0 (120.9 g). It was concluded that soybean meal and banana stem juice 2:1 w/v was the best ratio, but as feed supplement with high resistant rumen degradable protein can not produce higher growth rate than the control group.

100 RAHAYU, R.
Kualitas fisik dan komponen kimia daging domba lokal jantan yang diberi ransum pada berbagai tingkat energi. **[Effects of various energy level of rations on the physical and chemical properties of mutton from local rams]**/Rahayu, R. (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 209-213, 7 tables; 5 ref.

RAMS; MEAT PERFORMANCE; CARCASS COMPOSITION; PROXIMATE COMPOSITION; RATIONS; ENERGY VALUE.

The objective of this experiment was to study physical and chemical properties of mutton from local rams receiving rations differing in energy contents. The experiment was done in the experimental farm of Department of Animal Science, University of Tadulako for 8 months and was designed with a completely randomized design. There were 3 energy levels tested, namely 9, 11 and 13 MJ/kg, each of which was replicated 5 times. Results were analyzed with an analysis of variance which showed that the treatment affected ($P<0.05$) water and fat contents of the mutton. However, the treatment did not affect the ash and protein contents of the mutton, its cooking lost or tenderness.

101 ROHAENI, E.S.
Pengkajian integrasi usaha tani jagung dan ternak sapi di lahan kering Kabupaten Tanah Laut, Kalimantan Selatan. **[Assessment of integrated maize-cattle integrated farming systems on dryland of Tanah Laut Regency, South Kalimantan]**/Rohaeni, E.S.; Amali, N.; Sumanto; Darmawan, A.; Subhan, A. (Balai Pengkajian Teknologi Pertanian Kalimantan Selatan, Banjarbaru (Indonesia)). *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian* ISSN 1410-959X (2006) v. 9(2) p. 129-139, 8 tables;16 ref.

BEEF CATTLE; ZEA MAYS; INTEGRATION; FARMING SYSTEMS; COMPOSTS; BYPRODUCTS; CULTIVATION.

This assessment is aimed at analyzing integrated cattle and corn farming systems on dry land of Sumber Mulia Village, Pelaihari Subdistrict, Tanah Laut District. Integrated farming system that has been introduced are corn planting, cow manure fermentation and livestock technology. Introduction of corn planting focused on utilization of fine compost as basal fertilizer, fermentation technology which change the feces to fine compost used probiotic and utilization of corn cob fermentation as ruminant complete feed. The assessment involved livestock and 3 ha corn planting area. The farmers consisted of 2 groups, i.e. cooperator group (integrated system), and control (non integrated system). The assessment used 20 cattle/group of respondent. Record were taken on corn yield, side product of maize plant (leaf, stem and cob), body weight, feces utilization as fine compost which can reduce 7.55% cost for imported chicken feces from other village. Side product of corn used for ruminant feed is leaf, stem and cob which could be used as an alternative ruminant feed especially on dry season. Leaf and stem yield is about 12.9 t/ha, cob yield 1 t/ha, cattle feces production is about 5 kg/cattle/day. Total income from integrated corn (3 ha) and cattle (20 heads) farming systems was Rp 9,763,000 and Rp 9,747,800/season and provide R/C value about 1.32, meanwhile R/C value of non integrated farming system about 1.18. It means integrated corn and livestock farming systems could increase farmer's income of 78.16% per season compared to non integrated farming systems.

102 SIMANIHURUK, K.

***Pengaruh taraf kulit buah markisa* (*Passiflora edulis* Sims f. edulis Deg) *sebagai campuran pakan kambing kacang: 1. Konsumsi, kecernaan dan retensi nitrogen.* Effect of passion fruit *(Passiflora edulis* Sims f. edulis Deg.*)* hulls level as kacang goat feed component: 1. Intake, digestibility and nitrogen retention**/ Simanihuruk, K. (Loka Penelitian Kambing Potong, Sei Putih (Indonesia)) Wiryawan, K.G.; Ginting, S.P. *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 97-105, 4 ill., 2 tables; 25 ref.

GOATS; RATIONS; PASSION FRUITS; PEEL; CHEMICAL COMPOSITION; FEED CONSUMPTION; DIGESTIBILITY; NITROGEN RETENTION; FEEDS.

To study the effect of utilization of passion fruit (*Passiflora edulis* Sims f. edulis Deg.) hulls as feed component on consumption, digestion and nitrogen retention in kacang goats, a trial was conducted using 20 young kacang goats (average initial body weight 23.73 ± 2.16 kg). The experiment was arranged in completely randomized design consisting of 4 diets and 5 replications. Animal were randomly allocated into 4 diets (0, 15, 30, 45% of passion fruit hulls). Each diet contained 2550 KCal/kg metabolism energy and 14% crude protein. The feeding level was set at 3.8% of body weight based on dry matter. The results showed that average dry matter intake, nutrient digestibility, and nitrogen retention were not affected by level of passion fruit hulls (P>0.05), although nutrient digestibility and nitrogen retention tended to decrease with the increasing level of passion fruit hulls. It was concluded that passion fruit hulls can be used till 45% in the diet.

103 ZURAIDA

***Kuantitas dan kualitas nutrisi pakan orang utan di Pusat Reintroduksi Orang utan, Wanariset Samboja-Kalimantan Timur.* [Quantity and quality of feed nutrient for orang utan (*Pongo pygmaeus*) at Wanariset Samboja, East Kalimantan (Indonesia)]**/Zuraida (Pusat Penelitian dan Pengembangan Hutan dan Konservasi Alam, Bogor (Indonesia)). *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(1) p. 34-39, 2 ill., 5 tables; 6 ref.

MONKEYS; FEEDS; PROXIMATE COMPOSITION; PROTEIN; QUALITY; FEED INTAKE; KALIMANTAN.

Orangutan (*Pongo pygmaeus*) was an endangered species with a decreasing population gradually. To overcome the problem, reintroduction was a good conservation program. This was done through rehabilitation that aim at increasing the adaptability of orangutan which were adapted to human environment, so that they can survive in their natural habitat. The nutrient adequacy for orangutans while staying in the reintroduction center was very important before they were released into natural habitat. Therefore, the objectives of this study were to find out the kinds of daily feed consumption, nutrient contents and nutrient intake of orangutans at Wanariset Samboja by measuring the average daily nutrient intake of individual orangutans. Data were obtained from eight samples of orangutans in individual cages containing a male and a female at the age of two years old, and three males and three females at the age of four years old. The data of feed consumption were recorded three times daily, namely, morning, noon, evening in terms of feed amount and types, then converted into the nutrient values based on table of nutrient contents listed in standardized table. The differences in nutrient intake based on sex and age were obtained by Duncan analysis. The results of the study showed that the daily nutrient intake of 8 orangutans during 24 hours was more than energy expenditure in the cage. Total energy used for 24 hours by female and male orangutans at the age of two years old were 692.57 and 739.60 calories, respectively, whereas the energy used by orangutans at the age of four years old were 1088.84 and 945.57 calories, respectively. Calories consumed from feed at the age of two years for female and male were 1042.10 and 1066.60 calories respectively while at the age of four years for female and male were 1402.03 and 1227.40 calories respectively. According to the above data energy consumed from feed was more than energy expenditure. It was concluded that feeding consumption given at Wanariset Samboja was adequate.

L10 ANIMAL GENETICS AND BREEDING

104 BEBAS, W.
Pengaruh frekuensi dan waktu inseminasi terhadap fertilitas telur ayam kampung yang diinseminasi dengan semen ayam hutan hijau. **Effect of frequency and insemination times on the egg fertility of the domestic fowl inseminated with the semen of green jungle fowl**/Bebas, W. (Universitas Udayana, Denpasar (Indonesia). Fakultas Kedokteran Hewan). *Jurnal Veteriner* ISSN 1411-8327 (2006) v. 7(4) p. 163-168, 2 tables; 10 ref.

CHICKENS; EGGS; IN VITRO FERTILIZATION; TIME; ARTIFICIAL INSEMINATION.

This study was carried out to investigate the effect of frequency and insemination times on the egg fertility of the domestic fowl (*Gallus domesticus*) inseminated with the semen of green jungle fowl (*Gallus varius*). The experimental design used in this study was a completely randomized factorial design with 3 types of insemination times (Tl: 2 hours after sunrise, T2: 4 hours after sunrise, T3: 8 hours after sunrise) and 3 types of insemination frequencies (Fl: once a week, F2: double dosages (two days successively), F3: twice a week), and 5 domestic fowls were used in each subunit treatment. The data obtained in this study were analyzed by ANOVA and if a significant difference was found among treatments, the analysis was proceeded with Duncan multiple range test. The result showed that there was significant effects of insemination times on fertility (P<0.01), i.e. 66.32%, 46.41% dan 36.74% to 8 hours after sunrise, 2 hours after sunrise, and 4 hours after sunrise respectively. Insemination frequencies showed significant effects on fertility as well (P<0.01). Fertility on double dosage was 53.72%, twice a week was 57.49%, and once a week was 47.25%, respectively.

105 DIWYANTO, K.
Aplikasi teknologi inovatif sexing dalam program inseminasi buatan dan usaha cow-calf operation. **Application of sexing technology in the artificial insemination program and cow calf operation**/Diwyanto, K. (Pusat Penelitian dan Pengembangan Peternakan, Bogor (Indonesia)); Herliantien. *Wartazoa* ISSN 0216-6461 (2006) v. 16(4) p. 171-180, 2 ill., 4 tables; 26 ref.

COWS; CALVES; SEX DIAGNOSIS; ARTIFICIAL INSEMINATION; CROSSBREEDING.

To enhance cattle productivity and production, especially to support the cow calf operation, it is a need to have an application on innovative technology, such as spermatozoa sexing. The technology is more relevant nowadays due to the one of priority program in artificial insemination is to increase genetic quality of cattle in Indonesia. Artificial Insemination Institute in Singosari had produced and commercialized thousands of straw with good results. The quality of frozen semen from those sexing sperm was very good, indicated with more than 40% rate of motility. By August 2006, 33 male calves out of 47 animals from the Y frozen semen (70.21%) and 29 female calves out of 30 animals from the X frozen semen (96.66%). The results showed that S/C reached 1.71 and CR for 56.45% for its sexing frozen semen, which means these results are equal to the success of artificial program with unsexing frozen semen.

106 IMRON, M.
Viabilitas demi embrio sapi in vitro hasil splitting embrio segar dan beku. **Viability of bovine demi embryo after splitting of fresh and frozen thawed embryo derived from in vitro embryo production**/Imron, M. (Balai Embrio Ternak Cipelang, Bogor (Indonesia)); Boediono, A.; Supriatna, I. *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2007) v. 12(2) p. 118-123, 3 ill., 4 tables; 20 ref.

BEEF CATTLE; IN VITRO; EMBRYO SPLITTING.

In vivo embryo production was limited by number of donor, wide variability respond due to superovulation program and also immunoactivity of superovulation hormone (FSH). Splitting technology could be an alternative to increase the number of transferable embryos into recipient cows. Splitting is done with cutting embryo becoming two equal pieces (called demi embryo) base on ICM orientation. The

objective of this research was to determine the viability of demi embryo obtained from embryo splitting of fresh and frozen thawed embryo. The results showed that demi embryos which performed blastocoel reexpansion 3 hours after embryo splitting using fresh and frozen thawed embryos were 76.9 and 76.2% respectively. Based on existence of inner cell mass (ICM), the number of demi embryos developed with ICM from fresh and frozen thawed embryos were not significantly different (90.6 and 85.7% respectively). The cell number of demi embryo from fresh embryos splitting was not different compared with those from frozen thawed embryos (36.1 and 35.9 respectively). These finding indicated that embryo splitting can be applied to frozen thawed embryos with certain condition as well as fresh embryos.

107 SARTIKA, T.
Ayam nunukan: karakter genetik, fenotipe dan pemanfaatannya. **Nunukan chicken: genetic characteristics, phenotype and its utilization**/Sartika, T. (Balai Penelitian Ternak, Bogor (Indonesia)); Sulandari, S.; Zein, M.S.A.; Paryanti, S. *Wartazoa* ISSN 0216-6461 (2006) v. 16(4) p. 216-223, 2 ill., 5 tables; 12 ref.

CHICKENS; GENETICS; PHENOTYPES; ANIMAL MORPHOLOGY; EGG PRODUCTION; KALIMANTAN.

Nunukan chicken is a local chicken from East Kalimantan which spreads out in Tarakan and Nunukan Islands. The chicken has a specific buff color and Columbian type feather and also has very late feathering (VLF) trait. The Nunukan cocks and hens have no wing and tail primary feather; the tail feathers are short and fragile. The VLF trait is known to have association with a K gene on the Z chromosome. The chicken is efficient in protein metabolism. Sulfur amino acids (cystine and methionine) that needed for feather growth, could be utilized for meat and egg production. The egg production of Nunukan chicken was better than that the kampung chicken. The average of hen day, hen house and peak production of Nunukan chicken was 45, 39.1 and 62%, respectively, while the kampung chicken was 35.9, 30.9 and 48%, respectively. Based on genetic analysis, the external genotype characteristic of the Nunukan chicken is ii ee ss IdId pp. It means that the phenotype appearance of the Nunukan chicken was columbian and gold feathering type, yellow and white shank color and single comb type. This phenotype is similar to Merawang chicken. The genetic introgression of the Nunukan chicken is affected by the Rhode Island Red with the genetic introgression value of 0.964.

L20 ANIMAL ECOLOGY

108 YAMIN, M.
Respon ayam pedaging terhadap bahan atap, alas dan kepadatan kandang yang berbeda. **[Response of broiler chicken to type of roof, floor and different densities]**/Yamin, M. (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 186-191, 3 tables; 15 ref.

BROILER CHICKENS; BODY WEIGHT; FEED INTAKE; FEED CONVERSION EFFICIENCY; POULTRY HOUSING; ROOFS; FLOORS; STOCKING DENSITY; RAW MATERIALS.

This experiment was aimed at studying body weight changes, feed intake and conversion rates in broiler chicken raised on different environmental conditions. Two hundred and eight of Strain Arbor Acres SR 707 day old chicks were used and allocated to experimental treatments based on a 2x2x2x4 split plot completely randomized experimental design. The factors consisted of 2 types of roof materials (sago palm or zinc), 2 types of roof (platform raised wood or sawdust-covered floor) and 2 bird densities (5 or 7 birds/0.5 m^2). Results showed that the body weight changes of the birds were highly significantly higher for the raised at platform floor than for the litter floor and significantly higher for the density of 5 birds/0.5 m^2 than for 7 birds/0.5 m^2. Feed intake was also significantly higher for the platform raised floor than for the sawdust-covered floor and was highly significantly in the sago-roofed than in the zinc-roofed houses or for the density of 5 birds/0.5 m^2 than for 7 birds/0.5 m^2. Feed conversion rate was lower at temperature of platform floor than that of litter floor.

L53 ANIMAL PHYSIOLOGY - REPRODUCTION

109 RIZAL, M.
Peranan beberapa jenis gula dalam meningkatkan kualitas semen beku domba garut. **Role of various sugars in improving frozen semen quality of garut ram**/Rizal, R. (Universitas Pattimura, Ambon (Indonesia). Fakultas Pertanian) Herdis; Boediono, A.; Aku, A.S.; Yulnawati. *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 123-130, 3 tables; Bibliography: p. 128-130

RAMS; SEMEN; QUALITY; SUGARS; SPERMATOZOA.

Ram spermatozoa are sensitive to extreme changes in temperature during the freeze-thawed process. The present study was conducted to examine the effects of addition of various sugars in tris extender on sperm cryosurvival of garut ram. Semen was collected using an artificial vagina from three mature rams once a week. Immediately after initial evaluation, semen was divided into five parts and diluted with tris extender (control), tris extender + 0.4% dextrose, tris extender + 0.4% raffinose, tris extender + 0.4% trehalose, and tris extender + 0.4% sucrose, respectively. Semen was loaded into 0.25 ml mini straw with the concentration of 200 million or 800 million motile spermatozoa per ml. Semen was equilibrated at 5 ^{o}C for three hours, then frozen and stored in liquid nitrogen for seven days. Quality of processed-semen including percentages of motile spermatozoa (MS), live spermatozoa (LS), intact acrosome cap (IAC), and intact plasma membrane (IPM) were evaluated after dilution, equilibration, and thawing, respectively. Data were analyzed using completely randomized design with five treatments and six replications. Means were compared significant difference test at 0.05 significant level. Results of this research showed that there was no significantly difference ($P>0.05$) between treatments for all sperm quality parameters after dilution and equilibration. Mean percentages of post thawing MS, LS, IAC, and IPM for dextrose (54.00; 68.00; 66.60, and 57.83%), raffinose (50.00; 64.33; 61.80, and 61.75%), trehalose (50.83; 65.67; 61.40 and 57.75%), and sucrose (49.00; 66.80; 58.50 and 58.50%) were significantly ($P<0.05$) higher than control (40.83; 52.67; 54.60, and 49.40%), respectively. In conclusion, addition of 0.4% dextrose, raffinose, trehalose or sucrose in tris extender were effective in improving frozen semen quality of garut ram.

110 RIZAL, M.
Peranan betha-karoten dalam mempertahankan daya hidup spermatozoa semen cair domba garut. **[Role of betha-karotene in maintaining sperm viability of chilled-semen of garut ram]**/Rizal, M. (Universitas Pattimura, Ambon (Indonesia). Fakultas Pertanian). *Jurnal Veteriner* ISSN 1411-8327 (2006) v. 7(4) p. 148-156, 3 tables; 25 ref.

SHEEP; SEMEN; CELL MEMBRANES; CAROTENOIDS; SPERMATOZOA; CHEMICAL COMPOSITION; QUALITY.

The purpose of this research was to evaluate the quality of chilled-semen of garut ram which was diluted with tris extender buffer supplemented with the various concentration of betha-carotene. The semen was collected weekly by using artificial vagina from four mature garut rams. After initial evaluation, the semen was divided into three parts and diluted with tris extender (control), tris extender + 0.0125% (Kt0.0125), and tris extender + 0.025% (Kt0.025) betha-carotene, respectively. Extended-semen were stored in refrigerator at 5^{o}C. The quality of chilled-semen including motility, live sperm, and intact plasma membrane (IPM) was evaluated daily for five days. Results indicated that the addition of betha-carotene did not give a significant ($P<0.05$) effect on the motility, life sperm, and IPM for five days stored in refrigerator at 5^{o}C. In conclusion, addition of betha-carotene is unable to improve the quality of chilled-semen of garut ram.

111 RUSDIN
Pengaruh induksi cairan folikel sapi terhadap non return rate dan angka konsepsi domba ekor gemuk (Ovis aries). **[Effects of bovine follicular fluid induction on non return and conception rates of fat tailed sheep]**/Rusdin; Ridwan (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 181-185, 2 tables; 11 ref.

SHEEP; INDUCED OVULATION; REPRODUCTIVE PERFORMANCE; BIRTH RATE; PREGNANCY.

This experiment was designed to investigate responses of fat tailed sheep on the bovine follicular fluid induction. Twenty four fat tailed dams with body weight of 20-25 kg were used as experimental animals while 4 fat tailed rams were used for mating. A completely randomized design was employed to allocate the following 4 bovine follicular fluid injection levels (ml/animal): 0 (P0), 3.5 (P1), 7 (P2) and 10.5 (P3). Each treatment was repeated 6 times. An analysis of variance showed that the treatment did not affect ($P>0.05$) the rate (percent) of oestrus, but it significantly affected ($P<0.01$) the intensity of the oestrus. Least significant difference test indicated that P2 was the best treatment in increasing the intensity of oestrus. There was no difference among other treatments in affecting the intensity of oestrus.

112 WATTIMENA, J.
Pengaruh serum domba estrus dan serum domba bunting terhadap produksi embrio domba in vitro. **Effect of estrus and pregnant sheep serum on in vitro ovine embryo production**/Wattimena, J. *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 116-122, 3 tables; Bibliography: p. 120-122

SHEEP; PMSG; MATURATION; FERTILIZATION; IN VITRO; EMBRYONIC DEVELOPMENT.

The aim of this research was to observe the influence of estrus sheep serum (ESS) and pregnant sheep serum (PSS) on in vitro ovine embryo development. The research was carried out in Animal Reproduction Laboratory, Faculty of Animal Husbandry, Padjadjaran University. Oocyte and ovary of local sheep were collected from slaughter house. Maturation, fertilization and embryo culture media were supplemented with 10, 15 and 20% ESS or PSS, respectively. Results showed that supplementation of 20% ESS had significantly ($P<0.05$) better maturation rate than those of 10-20% PSS (79.98% vs 58.89-68.97%). However, increasing ESS into 15-20% did not affect the maturation rate (71.86-74.98%). Therefore, 10% estrus sheep serum (ESS) could be used as an alternative serum in the ovine maturation media. The supplementation of ESS or PSS did not significantly increase the fertilization rate and in vitro ovine embryo development; however, it was suggested to add 10% pregnant sheep serum (PSS) at in vitro ovine embryo culture.

113 YULNAWATI
Penggunaan medium CR1aa untuk produksi embrio domba in vitro. **Use of CR1aa for ovine in vitro embryo production**/Yulnawati (Pusat Penelitian Bioteknologi-LIPI, Bogor (Indonesia)); Setiadi, M.A.; Boediono, A. *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 131-136, 2 tables; 28 ref.

SHEEP; ANIMAL EMBRYOS; SEX DIAGNOSIS; IN VITRO; CULTURE MEDIA; MATURATION; FERTILIZATION; EMBRYONIC DEVELOPMENT.

This study aimed at investigating the capacity of CR1aa as a simple medium for maturation, fertilization and culture of ovine embryo in vitro. Oocytes were collected by slicing method in phosphate buffer saline (PBS) supplemented with 5% fetal bovine serum (FBS) and 100 IU/ml penicillin streptomycin. Oocytes were matured in tissue culture medium (TCM)-199 as control or CR1aa as treatment medium. Both maturation medium were supplemented with 10% fetal bovine serum (FBS), 10 IU/ml follicle stimulating hormone (FSH), 10 IU/ml luteinizing hormone (LH), 1 microgram/ml estradiol and 100 IU/ml penicillin streptomycin. Oocytes were incubated in 5% CO_2 incubator, 38 ^{o}C for 24 hours. Matured oocytes were fertilized in BO or CR1aa medium, supplemented with 2.5 mM caffeine benzoate and 20 microgram/ml heparin. After 18 hours/in in vitro fertilization, oocytes were cultured in TCM-199 or CR1aa medium, both supplemented with 5% FBS, 5 microgram/ml insulin and 100 IU/ml penicillin streptomycin. Results showed that the highest maturation rate was found in TCM-199 medium (73.27%) and significantly different ($P<0.05$) from CR1aa (52.88%). Fertilization rate in CR1aa medium (67.59%) was higher ($P<0.05$) than that in BO medium (52.94%). Furthermore, there was no significant difference ($P>0.05$)

between cleavage rate of ovine embryos in TCM-199 and CR1aa medium (39.45% vs 50.94%). In conclusion, optimum result on ovine in vitro embryo production can be achieved from a combination of TCM-199 as maturation medium and CR1aa as fertilization and culture medium.

L70 VETERINARY SCIENCE AND HYGIENE – GENERAL ASPECTS

114 SUARTHA, I N.
Perbandingan antara metode PEG-ammonium sulfat dan PEG-kloroform untuk ekstraksi dan purifikasi IgY kuning telur. **Comparison of PEG-ammonium sulphate and PEG-chloroform methods for the extraction and purification of IgY from egg yolk**/Suartha, I N. (Universitas Udayana, Denpasar (Indonesia). Fakultas Kedokteran Hewan); Wibawan, I W.T.; Mayasari, R.S. *Jurnal Veteriner* ISSN 1411-8327 (2006) v. 7(4) p. 157-162, 2 ill., 14 ref.

EGG YOLK; EXTRACTION; PURIFICATION; POLYETHYLENE; AMMONIUM SULPHATE; DISEASE CONTROL.

Two methods of IgY extraction from egg yolk, polyethyleneglycol (PEG)- combined with ammonium sulfate (P-A) and PEG combined with chloroform (P-C), were compared. Both methods were cheap and simple to perform. In P-A method, egg yolk was firstly dissolved in 3.5% PEG solution (W/V), and followed by protein precipitation using ammonium sulphate. In P-C method, protein in the yolk was firstly precipitated by PEG and followed treatment with chloroform to resolve the lipid component. The recovery rate of IgY by using P-A methods was 53.40% (W/V) and by P-C method was 50.48%. The presence of IgY was confirmed by sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE). Two protein bands with molecular weigt 65 kDa for IgY heavy chain and 30 kDa for IgY light chain were detected by SDS-PAGE. The result of this study indicated that P-A method is slightly better than P-C method in extracting the IgY from yolk.

115 SUDARISMAN
Pencegahan penyakit virus pada hewan dengan vaksin mucosal. **Mucosal vaccine for prevention of viral disease in animal**/Sudarisman (Balai Penelitian Veteriner, Bogor (Indonesia)). *Wartazoa* ISSN 0216-6461 (2006) v. 16(4) p. 181-189, 1 ill., 4 tables; 38 ref.

ANIMALS; VIROSES; ANIMAL VIRUSES; DISEASE CONTROL; VACCINES; IMMUNIZATION.

The major obstacle in combating infectious viral diseases in animals is the lack of effective vaccines. A large number of viral pathogens are mucosaly transmitted and must cross mucosal barriers to infect the host. The mucosal surfaces of the gastrointestinal and respiratory tracts represent the principal portals of entry for most animal viral pathogens. Current inactivated viral vaccines administered by intramuscular injection elicit primarily circulating antibodies. The best defense against these predominantly mucosal viral pathogens would be vaccines capable inducing both systemic and mucosal immunity which is a cost effective disease prevention tool. For most viral pathogens, induction of mucosal immunity appears most appropriate based on the routes of infection. The effectiveness of vaccine delivery to mucosal surfaces including respiratory tract may be most useful for prevention of the upper ways where secretory antibody is most important for protection against viral infection. Most external mucosal surfaces are replete with organized follicles and scattered antigen-reactive or sensitized lymphoid elements, including B cells, T lymphocytes, T cell subsets, plasma cells and a variety of other cellular elements involved in the induction and maintenance of immune response. Thus, a better understanding of the mucosal immune system is needed before effective mucosal vaccines can be developed.

116 SUDARISMAN
Tingkat efikasi berbagai vaksin IBR inaktif yang dibuat dari virus isolat lokal pada sapi perah di Kabupaten Bandung yang diuji dengan uji serum netralisasi. **Efficacy of various IBR inactivated vaccines prepared using local virus isolates on dairy cattle in Bandung municiple evaluated by**

serum neutralisation test/ Sudarisman (Balai Penelitian Veteriner, Bogor (Indonesia)). *Jurnal Veteriner* ISSN 1411-8327 (2006) v. 7(4) p. 139-147, 1 ill., 4 tables; 17 ref.

DAIRY CATTLE; BOVINE HERPESVIRUS; ADJUVANTS; VACCINES; IMMUNIZATION.

Various inactivated BHV-l vaccines with different composition of virus contents, adjuvants, inactivants and diluter were examined for their immune response in dairy cattle. The virus used in this study was a local isolate. As the quality of IBR vaccine is critically determined by the use of suitable adjuvant, inactivants and the total of virus, a study was conducted to evaluate the best composition of inactive vaccines for the induction of stable immune respon in cattle. The evaluation of immune response was conducted by serum neutralization test (SNT) both on vaccinated animals and unvaccinated animals. The study was carried out in Bandung District, West Java Province using dairy cattle owned by local farmers. The results showed that different vaccine compositions produced different serological reactions in both vaccinated and control animals. Vaccine with composition number 8 consisted of IBR virus, adjuvant Quil-A, SPAN 80, Tween-20 and paraffin induced the most stable antibody response, although its immune response was relatively lower than other vaccine preparation.

L73 ANIMAL DISEASES

117 ADI, A.A.A.M.
Potensi virus newcastle disease sebagai agen anti-kanker pada manusia. **Potency of newcastle disease as a human anticancer agent**/Adi, A.A.A.M. (Universitas Udayana, Denpasar (Indonesia). Fakultas Kedokteran Hewan); Astawa, N.M. *Jurnal Veteriner* ISSN 1411-8327 (2006) v. 7(4) p. 175-180, 18 ref.

HUMAN DISEASES; NEOPLASMS; NEWCASTLE DISEASE VIRUS; ANTINEOPLASTIC AGENTS.

Newcastle disease virus (NDV) cause severe diseases in many species of birds, resulting in significant economic losses in the poultry industry worldwide. NDV is classified as a member of the family Paramyxoviridae. The genome comprises a single strand (ss) negative sense RNA of 15.186 Kb, that coding mainly for six genes (3'-NP-P-M-F-HN-L-5'). This virus has two opposite sites based on the importance, from point of view poultry industry, this virus is very harmful, have to eradicate promptly for deleting fatal loses. The other site of NDV is become very useful due to its advantage as a promising human anticancer agent if compare with other oncolytic virus such as mump, measles, sendai virus, herpes simplex and rabies virus. The advantages of NDV that attracted and inspired many researchers about NDV as an anticancer agents were: tumor selective replication properties, less chance to adapt to mammalian host and showed strong immunostimulating properties in cancer patients and has never caused severe side effect or viremia in human.

118 CHOTIAH, S.
Pengaruh proses freeze drying dan penyimpanan pada suhu kamar terhadap viabilitas dan patogenisitas plasma nutfah mikroba Pasteurella multocida. **[Effect of freeze drying process and preserving in a vacuum at room temperature on viability and pathogenicity of veterinary microbe germplasm of *Pasteurella multocida*]**/Chotiah, S. (Balai Besar Penelitian Veteriner, Bogor (Indonesia)). *Buletin Plasma Nutfah* ISSN 1410-4377 (2006) v. 12(1) p. 40-44, 1 table; 10 ref.

PASTEURELLA MULTOCIDA; FREEZE DRYING; PRESERVATION; TEMPERATURE; VIABILITY; GERMPLASM; RATS; PATHOGENICITY.

The effect of freeze-drying process and preserving in a vacuum at room temperature against viability and pathogenicity of veterinary microbe germ plasm of *Pasteuerella multocida* BCC 2331 was investigated at Balitvet. The aim of this study was to find out the most effective and efficient conservation method. As much as 5.2 x 10^{11} colony forming unit (CFU)/ml of bacteria suspension in 7.5% glucose serum as the preservation medium being pathogenic in mice with LD50 of 9.8 CFU/ml was freeze dried then stored at

room temperature (±27°C) until the study was completed. Viability and pathogenicity test were done immediately after the process, 1 and 2 months after storage. The results showed that there were viability decreases of 1.3 x 10^2 CFU/ml and 8.2 x 10^2 CFU/ml due to the effects of the process, one month and two-month storage, respectively. The decrease of pathogenicity on mice were shown by the increase of LD50 amounting log 1, log 2, and log 3 a day after the process, one month and two-month storage respectively.

119 MURTINI, S.

***Penetapan rute dan dosis inokulasi pada telur ayam berembrio sebagai media uji khasiat ekstrak benalu teh (Scurrula oortiana).* Study of inoculation route and dosage levels on embryonated chicken eggs as media for testing tea mistlestoe *(Scurrula oortiana)* extract activity**/Murtini, S.; Satrija, F.; Malole, M.B.M. (Institut Pertanian Bogor (Indonesia). Fakultas Kedokteran Hewan); Murwani, R. *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 137-143, 1 ill., 2 tables; 18 ref.

CHICKENS; EGGS; ANIMAL EMBRYOS; SEX DIAGNOSIS; PLANT EXTRACTS; TOXICITY; INOCULATION; DOSAGES.

Tea mistlestoe extract (*Scurrula oortiana*) has cytotoxic activity which is potential to be used in preventing viral induced chicken tumor. The following study was designed to evaluate the effects of different inoculation routes, dosage levels, and strains of embryonated chicken eggs as media for testing the tea mistlestoe extract (*Scurrula oortiana*) antiviral activity. Proper inoculation route was examined by inoculation of the extract at dose level of 0.2 mg/egg into embryonated layer eggs via allantoic cavity, chorio-allantoic membrane, and yolk sac. Effect of dose level of tea mistlestoe extract on embryo development was examined in groups of embryonated broiler eggs inoculated with the extract at 0.02, 0.2, 2, 20, or 200 mg/egg. Inoculation of tea mistlestoe extract into allantoic cavity was the safest procedure as indicated by the absence of embryos mortality, and faster embryo growth compared to those of chorio-allantoic membrane and yolk sac-inoculated eggs. The extract induced different growth effects when inoculated into embryonated layer or broiler eggs. Administration of the extract at dosage levels between 0,02-200 mg/egg reduced significantly the weight of broiler embryoes, but not the relative weights of liver, heart and spleen. Administration of similar dosage in layer embryoes did not cause any significant difference in the embryoes weight. This study suggested that the study of antiviral activity of tea mistlestoe extract in embryonated chicken eggs should be carried out on embryonated eggs of layer breeds and the extract should be inoculated via allantoic cavity.

120 NATALIA, L.

***Kerbau rawa di Kalimantan Selatan: Permasalahan, penyakit dan usaha pengendalian.* Swamp buffalo in South Kalimantan: problem, disease and control**/Natalia, L.; Suhardono; Priadi, A. (Balai Besar Penelitian Veteriner, Bogor (Indonesia)). *Wartazoa* ISSN 0216-6461 (2006) v. 16(4) p. 206-215, 1 ill., 2 tables; 41 ref.

WATER BUFFALOES; ANIMAL DISEASES; DISEASE CONTROL.

In recent years, several studies have been carried out to evaluate and investigate the important diseases of swamp buffaloes (*Bubalus carabanensis*) in Kalimantan. More attention has been focused on the case of acute infectious diseases and sudden death in the buffaloes. Fasciolosis black disease, acute enteritis, especially fatal enterotoxaemia, Haemorrhagic septicaemia, and trypanosomiasis (Surra), are some of the important diseases found in these animals. Black disease caused by toxigenic *Clostridium novyi* occurs in the presence of the organism in the liver and the degree of liver fluke *Fasciola gigantica* infestation. In regions where black disease is enzootic, *C. novyi* can be isolated from livers of normal healthy animals. In Hulu Sungai Utara District, South Kalimantan, the prevalence of fasciolosis caused by *Fasciola gigantica* in swamp buffalo was 77% in 1991. A gross sudden change in diet due to seasonal changes could induce rumen and intestinal stasis, which provide a favourable environment for the rapid proliferation of commensal toxigenic *Clostridium perfringens* in the small intestine. Subsequent absorption of the toxin produced through the gut wall and its generalized dissemination culminated in a fatal enterotoxaemia. Haemorrhagic septicaemia (HS) is an acute, fatal disease affecting swamp buffalo, and caused by

Pasteurella multocida B : 2. The swamp buffalo is particularly susceptible for HS, and the reported greatest losses of swamp buffalo in Kalimantan due to HS is recorded in 1980s. The clinical signs of surra in swamp buffalo were also found in certain areas in Danau Panggang area, Hulu Sungai Utara District. Vaccination is the accepted method for controlling black disease, enterotoxaemia and HS. Multi component vaccine, alum adjuvant containing at least 5 types of clostridial toxoids and *P. multocida* B2 bacterin have been used and provide good protection to the animals. Control and treatment of liver fluke infestation is advisable. Vaccination is recommended annually and should be carried out regularly. In these days, the farmers concern about the availability of the grass in the Danau Panggang area. The primary feed grass (*Oryza sativa* forma spontanea L), of the swamp buffalo were not sufficient in the low-tide season. The over population of *Pomacea canaliculata* (golden snail), a pest for lake vegetations, was thought to be responsible for this phenomena. Growing forages as the source of animal feed may be an option to improve the current performance of the swamp buffalo in the area.

121 POERNOMO, S.
***Phage typing dan uji sensitivitas terhadap berbagai antibiotika dari isolat Salmonella enteritidis asal Indonesia.* Phage typing and sensitivity test to antibiotics of *Salmonella enteritidis* isolates from Indonesia**/ Poernomo, S.; Priadi, A.; Natalia, L. (Balai Penelitian Veteriner, Bogor (Indonesia)). *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 157-166, 3 tables; 28 ref.

SALMONELLA ENTERITIDIS; ANTIBIOTICS; CHICKENS; PROTEIN ISOLATES; INDONESIA.

Salmonella enteritidis (SE) is frequently implicated in disease outbreaks such as human food poisoning. Phage typing have been proved to be a valuable and sensitive tool in the control of SE infections. The ability of phage to distinguish varieties among apparently identical serotypes led to the development and acceptance of phage typing as a significant epidemiological procedure. To determine the epidemiological pattern of SE, phage typing of 53 SE isolated from various sources in Indonesia during 1991-1999, has been conducted using 16 typing phages of phage typing scheme of SE obtained from the International Collaborating Center for Enteric Phage Typing, Central Public Health Laboratory, Colindale, UK. The lyse blood isosensitest was then used to test the sensitivity of the Salmonella isolates to antibiotics. The phage typing results obtained that of 53 Salmonella isolates there were one S. infantis, one S. berta, and 46 SE phage type 4, 2 SE phage type 7 (from chicken and water), 1 SE phage type 6 (from chicken) and 2 SE phage type 1 (from chicken). SE phage type 4 isolates comprised of 2 isolates from human, 19 isolates from chicken (young and adult), 17 isolates from day old chicks, 4 isolates from fluff, 2 isolates from chicken meat, 1 isolate from poultry farm water, 1 isolate from dog organ. These findings indicated that contaminated chicken appeared to be the sources of human and dog for SE infection. The results of sensitivity test of the isolates to antibiotics showed that most of the Salmonella isolates from Indonesia were resistant to the antibiotics tested.

122 SETYA, R.
***Pengendalian penyakit antraks: diagnosis, vaksinasi dan investigasi.* Control of anthrax disease: diagnosis, vaccination and investigation**/Setya, R.; Natalia, L. (Balai Besar Penelitian Veteriner, Bogor (Indonesia)). *Wartazoa* ISSN 0216-6461 (2006) v. 16(4) p. 198-205, 1 ill., 1 table; 27 ref.

RUMINANTS; MANKIND; BACILLUS ANTHRACIS; ANIMAL DISEASES; ZOONOSES; DISEASE CONTROL; DIAGNOSIS; VACCINATION.

Anthrax is a bacterial disease caused by *Bacillus anthracis* attacking both animal and human (zoonosis). The disease is normally associated with domestic livestock such as sheep, goats, and cattle, but humans are also infected due to exposure or consuming infected animals. The control of anthrax in humans and animals involves developing a diagnostic method for *B. anthracis* detection and confirmation of anthrax, prevention by vaccines, and disease investigation. Rapid and more accurate diagnosis techniques for anthrax should be developed for improving the conventional method used in Indonesia. Vaccines are effective against anthrax. Current anthrax vaccine used in Indonesia is spores vaccine produced from a non-encapsulated, toxigenic, Sterne strain 34F2 of *B. anthracis*. The use of this vaccine occasionally

causes local pain, necroses at the inoculation site, subcutaneous oedema and occasionally death of the animal. Several vaccines have been developed recently such as subunit vaccine, anthrax vaccine absorbed (AVA), that contains a protective antigen (PA) component of the anthrax toxin as the major protective immunogen and is usually used in humans. In endemic areas of anthrax, outbreaks still routinely occur almost yearly. Monitoring of the epidemiological patterns of the disease has to be carried out by field investigation.

123 SUPARTIKA, I K.E.
***Sensitivitas dan spesifisitas uji immunoperoksidase tak langsung untuk mendiagnosa penyakit jembrana pada sapi bali saat demam.* Sensitivity and specificity of indirect immunoperoxidase technique used for diagnose of jembrana disease of bali cattle during febrile phase**/Supartika, I K.E.; Budiantono, A.; Dharma, D.M.N. (Balai Besar Veteriner Denpasar (Indonesia)). *Buletin Veteriner* ISSN 0854-901X (2007) v. 14(70) p. 21-26, 1 ill., 4 tables; 9 ref.

BEEF CATTLE; ANIMAL DISEASES; DIAGNOSIS.

An attempt to provide a quick, accurate and cheap diagnosis of jembrana disease using indirect immunoperoxidase technique had been carried out on 30 samples of peripheral blood mononuclear cells (PBMC) from bali cattle clinically non-infected and 40 samples PBMC from Bali cattle infected with jembrana disease (JD). Then the sensitivity and specificity of indirect immunoperoxidase technique for JD were analyzed. The result showed that the diagnostic sensitivity and specificity of indirect immunoperoxidase technique were 100% and 76.66%, respectively. It is recommended that indirect immunoperoxidase technique is suitable for routine diagnoses of JD.

124 TARIGAN, S.
***Vaksinasi kambing dengan ekstrak segar Sarcoptes scabiei menghasilkan kekebalan parsial.* Vaccination of goats with fresh extract from *Sarcoptes scabiei* confers partial protective immunity**/Tarigan, S. (Balai Penelitian Veteriner, Bogor (Indonesia)). *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 144-150, 4 ill., 20 ref.

GOATS; VACCINATION; SARCOPTES SCABIEI; EXTRACTS.

Protective immunity has been known to develop in animals infested with *Sarcoptes scabiei*. However, our previous attempt to induce protective immunity in goats by vaccination with fractions of soluble or insoluble mite proteins had been unsuccessful. Degradation or denaturation of protective antigens occurred during vaccine preparation was suggested as one possible cause of the failure. In this study, mite proteins that used to immunise animals were prepared rapidly in order to prevent protein degradation or denaturation. About 150 mg of freshly isolated mites were rapidly homogenised, centrifuged then separated into supernatant and pellet fractions. Twenty eight goats were allocated equally into 4 groups. Group-1 goat was vaccinated with the whole mite homogenate supernatant, group 2 with the supernatant, group 3 with the pellet, and group 4 with PBS (unvaccinated control). Vaccination was conducted three times, with three-weeks interval between vaccinations, using Quil A as adjuvant, and each vaccination using fresh mite homogenates. One week after the last vaccination, all animals were challenged with approximately 2000 live mites. The severity of lesions, scored from 0 (no lesions) to 5 (more than 75% infested auricle affected), were determined one day, two days, then every week after challenge. Mite challenge caused the development of skin lesions in all animals. No significant differences between vaccinated and unvaccinated animals were observed in regards to the severity of lesions. However, the mite densities in vaccinated animals were significantly lower (P=0.015) than those in unvaccinated control. This study indicated that the protective antigens of *S. scabiei* were liable to degradation or denaturation and exist in a very low concentration or have very low antigenicity. This implied isolation of the protective antigens by the conventional approach, fractionation of the whole mite proteins and testing each fractions in vaccination trials, was seemingly inappropriate for *S. scabiei*.

125 WIEDOSARI, E.
Aktivitas antioksidan dari Fasciola gigantica yang diisolasi dari domba ekor tipis dan merino. **The activities of antioxidant enzymes extracted from *Fasciola gigantica* infecting thin-tailed and merino sheep**/ Wiedosari, E. (Balai Penelitian Veteriner, Bogor (Indonesia)). *Jurnal Ilmu Ternak dan Veteriner* ISSN 0853-7380 (2006) v. 11(2) p. 151-156, 3 tables; 25 ref.

SHEEP; FASCIOLA GIGANTICA; SUPEROXIDE DISMUTASE; ANTIOXIDANTS; ENZYMES; DISEASE RESISTANCE.

Previous studies shown that Indonesian thin tailed (ITT) sheep are more resistant to *Fasciola gigantica* infection than merino sheep. This difference could be mediated by intrinsic defense enzymes of the parasite. Certain enzymes are known to be crucial in parasite survival against host-derived immune responses. Some of them were measured to identify if any comparative differences between the enzyme activities of the parasites from the two hosts (ITT and merino sheep) could account for the mechanisms of parasite resistance to killing by the merino host and susceptibility to killing by the ITT host. Parasites were extracted from the liver of infected ITT and merino sheep and superoxide dismutase (SOD), glutathione S-transferase (GST) and catalase (CAT) enzyme activities were assayed. SOD and GST levels were found to be higher in parasites isolated from merino than those of ITT sheep ($P<0.05$), CAT activity was not detected in any of the parasites. There was significantly higher eosinophils ($P<0.05$) in the ITT sheep peritoneal cells. These results suggested that SOD dan GST were important molecules in determining susceptibility in Fasciola-infected merino sheep and resistance in Fasciola-infected ITT sheep.

N20 AGRICULTURAL MACHINERY AND EQUIPMENT

126 GATOT S.A.F.
Peningkatan kinerja pengering chip ubi kayu. **Performance improvement of cassava chip dryer**/Gatot S.A.F; Tastra, I K. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 603-612, 5 ill., 2 tables; 9 ref.

CASSAVA; DRIED PRODUCTS; CUTTING; DRYING; DRYERS; EQUIPMENT PERFORMANCE; APPROPRIATE TECHNOLOGY; TECHNICAL PROPERTIES.

Drying service system has not well developed, resulting in low bargaining power of the farmer. The quality of cassava chip prepared using traditional drying method is normally low, causing a low price. Therefore, appropriate drying technology is needed. The drying method with rack system, which covered with transparent plastic, and combined with a dryer unit (temperature 75-80^{o}C 3 hours), could shorten the drying time as the water content decreased from 63.7% wet basic (wb) to 12.0% wb (the quality standard) in three days. While the traditional drying method could decrease the water content from 63.7% wb to 16.7% wb due to climate disturbances (rain and cloudy). Also, the dried chips had better quality (white colour). However the low capacity of the drier (50-100 kg of fresh roots) was not beneficial for drying service purposes. Therefore, the drier performance is still need to be improved through a combination of rack system with a dryer unit provided by the drying service with regard to increase the capacity to 0.5-1.0 ton fresh roots. This would give profit to both the farmer and the drying service business.

127 WIDYOTOMO, S.
Optimasi mesin sangrai tipe silinder horizontal untuk penyangraian biji kakao. **Optimizing of a horizontal cylinder type cocoa roaster for dried cocoa cotyledon roasting**/Widyotomo, S.; Sri-Mulato; Suharyanto, E. (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)). *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(2) p. 136-58, 13 ill., 4 tables; 23 ref.

COCOA BEANS; POSTHARVEST EQUIPMENT; ROASTING; QUALITY; EQUIPMENT TESTING.

The secondary process of cocoa is one of the promising alternatives to increase the added value of dried cocoa beans. On the other hand, the development for secondary cocoa process requires an appropriate technology that is not available yet for small or medium scale business. Cocoa roaster is a basic equipment to produce good and competitive secondary cocoa products for chocolate industry. The Indonesian Coffee and Cocoa Research Institute has, therefore, designed and tested a horizontal cylinder type roaster for drying cocoa cotyledon. The cylinder has 405 mm diameter, 520 mm long and is rotated by a 1 HP (0.75 kW), 220 V, single phase and 1400 rpm electric motor. Assisted with a gear reducer, the final cylinder rotation is adjusted at approximately 6 rpm. The heat for roasting process is generated from kerosene burner. At the end of roasting, the roasted beans are cooled down by ambient air inside a cooling platform by natural air flow. The raw material used in this optimizing test was dried fine cocoa cotyledon. Field tests showed that the optimum performance of the roaster was 7 kg dried fine cocoa cotyledon loaded with roasting temperature 120 ^{o}C and 25.57 kg/h optimum capacity. The organoleptic test showed that score of aromatic, flavour, acidity, bitterness, astringency and burnt were 4.8, 5.2, 5.4, 5.2, 4.8 and 0.8 with 10 scale, also 4.2 with 5 scale for preference level. The roasting time was 15-25 minutes to obtain 2.5-3% final water content which depend on roasting temperature and cocoa cotyledon loaded.

128 WIDYOTOMO, S.
***Optimasi mesin sortasi biji kopi tipe meja konveyor untuk meningkatkan kinerja sortasi manual.* Optimation of a table conveyor type grading machine to increase the performance of green coffee manual sortation**/ Widyotomo, S.; Sri-Mulato; Suharyanto, E. (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)). *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(1) p. 57-75, 15 ill., 2 tables; 10 ref.

COFFEE BEANS; POSTHARVEST EQUIPMENT; GRADING; CONVEYERS; QUALITY; ECONOMIC ANALYSIS.

Coffee consumers request a good quality of green coffee to obtain a good coffee cup taste. Defective beans e.g. black bean, brown bean and broken bean are associated to low coffee quality which give negative effects to final taste. To meet the standard export requirement, coffee beans have to be graded before being traded. Until now, grading process is generally carried out manually. The method gives better product, so the grading cost is very expensive about 40% of total processing cost. Meanwhile, shortage of skill workers is a limiting factor of the process. Therefore, improving the manual sorting by providing machine for grading of green coffee is good alternative to reduce the grading cost. Indonesian Coffee and Cocoa Research Institute has designed a table conveyor type grading machine to improve the performance of the manual grading productivity and consistent quality and reduce the grading cost. The conveyor belt has a dimension of 5700 mm of length, 610 mm of width and 6 mm of thickness. The rotating of belt conveyor powered by an electro motor 3 HP, 3 phase and 1420 rpm. The result showed that the optimum capacity of grading machine was 390 kg/hour reached when the speed 16 rpm and 3 kg/m2 of green beans on belt conveyor with productivity 1870 kg/man-day compared to the productivity full manually process 743 kg/man-day. Percentage of product in outlet 1 was 4.2% as broken beans, 0.26% as brown beans, 0.68% as one hole in beans and 0.61% as more than one hole in beans. Percentage of product in outlet 2 was 39.54% as broken beans, 4.23% as brown beans 7.19% as black beans, 4.47% as one hole in beans and 4.43% as more than one hole in beans. Cost of grading process per kg of green coffee is Rp 20,-.

P01 NATURE CONSERVATION AND LAND RESOURCES

129 MULYANI, A.
***Potensi sumber daya lahan untuk pengembangan jarak pagar (Jatropha curcas* L.*) di Indonesia.* Land resource potential for *Jatropha curcas* development in Indonesia**/Mulyani, A. (Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian, Bogor (Indonesia)); Allelorung, D. *Jurnal Penelitian dan Pengembangan Pertanian* ISSN 0216-4418 (2006) v. 25(4) p. 130-138, 8 tables; 22 ref.

JATROPHA CURCAS; LAND RESOURCES; LAND SUITABILITY; LAND USE; INDONESIA.

Jatropha (*Jatropha curcas* L.) has became prime commodity because of its potential as biofuels source. There are many plants that are potential for the production of biofuels, including oil palm, coconut, jatropha, kapok seeds, canola, and rapeseed (for biodiesel), and cassava, sugar cane, and sago (for bioethanol). Jatropha has long been known as a medicinal and oil producing plant. Recently, there are communities as well as investors interested in developing jatropha. Therefore, it is important to inform potential areas for developing the plants, from the perspective of land suitability, climate, and environment. To meet that purpose, a map of jatropha suitability at 1:1,000,000 scale has been developed based on Land Resource Map, Agricultural Spatial Planning Map, as well as Climate Resource Map at 1:1,000,000 scale. The land suitability evaluation revealed that 49.50 million ha of land was suitable for jatropha. The land suitability could be divided into highly suitable (S1), moderately suitable (S2), and marginally suitable (S3) with areas of 14.30, 5.50, and 29.70 million ha, respectively. For the national development planning, the jatropha suitability map should be overlaid with the recent land use map, because parts of the suitable lands have been used for other commodities or for non-agricultural uses. The most potential land for jatropha development seems to be located in the 12.40 million ha of abandoned land and 3.10 million ha of grassland. About 1 million ha of the Imperata grasslands distributed in 13 provinces have been identified for agricultural suitability at 1:50,000 scale. This land resource information could be used to accelerate the delineation of jatropha development areas at the more detail scale.

P10 WATER RESOURCES AND MANAGEMENT

130 HAFIF, B.

Prediksi ketersediaan air dan kebutuhan irigasi suplemen untuk optimasi pertumbuhan kedelai pada MT2 di Provinsi Lampung. **Prediction of water availability and requirement for supplementary irrigation to optimize soybean growth in the second cropping season in Lampung Province**/Hafif, B.; Erythrina; Zaini, Z. (Balai Pengkajian Teknologi Pertanian Lampung, Bandar Lampung (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 341-349, 7 tables; 8 ref.

GLYCINE MAX; WATER AVAILABILITY; SUPPLEMENTAL IRRIGATION; WATER REQUIREMENTS; CLIMATE; GROWTH; PRODUCTIVITY; SUMATRA.

Prediction of water availability and requirement for supplementary irrigation to optimize soybean growth in the second cropping season was analyzed based on climate characteristics such as precipitation, temperature, humidity, wind speed, and solar radiation. Climate data were recorded by automatic weather stations, which were installed in some representative areas of Lampung Province. In addition prediction of the required of the supplementary irrigation, also aimed at determining potential areas for soybean development based on water availability. The analysis indicated that crop coefficient of soybean (Kc) among the assessed areas was quiet different. Rather low values was occurred in Sumber Jaya, and Palas. If the water sufficiency is used as a reference for soybean development areas, Banjit (North Lampung) and Sumber Jaya (West Lampung) had the most potential. Meanwhile, in Manggala (Tulang Bawang), Taman Bogo (East Lampung) and Natar (South Lampung), irrigation was needed to optimize soybean growth in the second season. In the area water will be necessary in the middle and late phase of growth. The areas around Blambangan Umpu (23.5 mm/10 days), Kota Bumi (100.8 mm/10 days), Central of Tulang Bawang (50.1 mm/10 days), and Palas (34.3 mm/10 days) were areas requiring plenty of supplementary irrigation for soybean in the second season. This condition should be anticipated because water deficit generally occures at the middle phase causing unproductive soybean growth due to water availability 60% below the requirement.

131 HARIJANTO, H.

Studi tentang laju angkutan sedimen pada Sungai Miu Kabupaten Donggala. **[Study on rates of stream flow discharge and suspended sediment load in Miu River, Donggala Regency (Indonesia)]**/Harijanto, H. (Universitas Tadulako, Palu (Indonesia). Fakultas Pertanian). *Jurnal Agroland* ISSN 0854-641X (2006) v. 13(2) p. 158-162, 2 ill., 1 table; 9 ref.

SULAWESI; WATERSHEDS; RIVERS; WATERFALLS; SEDIMENT WATER INTERFACE; WATER LEVELS.

This experiment was carried out at the upper stream of Miu River and intended to study rates of stream flow discharge and suspended sediment load. The rate of suspended sediment load was measured by taking sample of river water and, at the same time, asserting the rate of stream discharge. The relationship between the rate of stream flow discharge and that of suspended sediment load was analyzed using a suspended sediment rating curve. Results indicated that the rate of stream flow discharge in the Miu River varied from 4.725 to 10.249 m^2/s and so did the rate of suspended sediment load from 1.117 to 9.429 g/s. Rates of stream flow discharge and that suspended sediment load were positively correlated with a correlation coefficient of 0.76.

P33 SOIL CHEMISTRY AND PHYSICS

132 PURWANINGRAHAYU, R.D.
Hubungan tingkat kadar air tanah dengan pemberian bagas dan KCl terhadap pertumbuhan dan hasil kacang hijau. **Effect of soil moisture content and combination of bagas and KCl application on the growth and yield of mungbean**/Purwaningrahayu, R.D.; Radjit, B.S. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang, 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 258-269, 7 tables; 22 ref.

VIGNA RADIATA RADIATA; SOIL WATER CONTENT; BAGASSE; POTASH FERTILIZERS; POTASSIUM CHLORIDE; APPLICATION RATES; GROWTH; SOIL CHEMICOPHYSICAL PROPERTIES; YIELD COMPONENTS.

Appropriate planting water and fertilizer management are needed for mungbean in the first or second planting season after rice. The experiment aimed at determining the effect of soil moisture and combination of bagas + KCl application on the growth and yield of mungbean, and was conducted in the greenhouse of ILETRI during the rainy season of 2004/2005 (November-January). A factorial completely randomized design was used with three replications. The first factor was soil moisture at (1) field capacity, (2) 75% field capacity and (3) controlled waterlogging (controlled waterlogging with water level in the box 15 cm below soil surface in the polybag). The second factor was combination of bagas + KCl application: (1) control (no bagas + no KCl), (2) bagas 10 t/ha, (3) bagas 10 t/ha + 100 kg KCl/ha and (4) 100 kg KCl/ha. The result indicated that plant dry matter and water use efficiency were affected by interaction between soil moisture and combination of bagas + KCl application. The mungbean growth and yield was affected by soil moisture. Controlled waterlogging increased yield by 47% compared to that of plants at the field capacity. Higher seed yield of plant under controlled waterlogging was due to higher plant dry matter produced followed by higher number of pods. The application of bagas 10 t/ha increased soil moisture by 24% compared to field capacity.

133 WIJANARKO, A.
Karakteristik sifat kimia dan fisika tanah Alfisol di beberapa lokasi di Jawa Timur dan Jawa Tengah. **Characteristic of soil physical and chemical properties of Alfisols at some location at East Java and Central Java**/Wijanarko, A.; Sudaryono; Sutarno (Balai Penelitian Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 229-242, 13 tables; 16 ref.

JAVA; SOIL CHEMICOPHYSICAL PROPERTIES; LUVISOLS; SOIL STRUCTURE; SOIL TEXTURE; CATIONS; ION EXCHANGE CAPACITY.

Soil that has long been used without conservation techniques decreases in a physical and chemical soil fertility, resulting in low productivity. Alfisols present in agroclimates and geographic conditions that can accelerate the soil becoming marginal. The objective of this research was to study the characteristic of soil physical and chemical properties of Alfisols at some locations in East and Central Java. The result of this research showed that soil pH range from acid to neutral, C-organic content was low, the status of available P was very low to moderate, base cations (K, Ca and Mg) were low to very high, CEC was moderate to very high and status of micro elements were high. Based on Munsell colour chart, the colour of this Alfisols was reddish brown to dark red with low soil strength (<3.75 kg F/cm^2), the soil structure varied from granular to columnar and the soil class texture was from sandy clay loam to clay.

P34 SOIL BIOLOGY

134 NINGSIH, R.D.

Tanggap tanaman kacang tunggak terhadap inokulasi rhizobium dan asam indol asetat pada tanah Ultisol. **Response of cowpea to rhizobium inoculation and indole acetic acid (IAA) in the Ultisols**/Ningsih, R.D. (Balai Pengkajian Teknologi Pertanian Kalimantan Selatan, Banjarbaru (Indonesia)); Anas, I. Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 362-374, 1 ill., 5 tables; 18 ref.

VIGNA UNGUICULATA; INOCULATION; RHIZOBIUM LEGUMINOSARUM; IAA; ROOT NODULATION; NUTRIENT UPTAKE; PLANT RESPONSE; APPLICATION RATES; YIELD INCREASES; ACRISOLS.

Symbiosis of crop legumes with rhizobacteria represents efficient system of N2 fixation through nodulation of the legumes root. Some rhizobacteria have been known as stimulating growth of some crops through their phytohormones (IAA = indole acetic acid). The aims of this study were to determine the effects of rhizobium inoculation and indole acetic acid (IAA) application on crop growth, nodulation, N and P uptake of cowpea on the Ultisols. The greenhouse experiment used a completely randomized design (CRD) with four replications. The treatments were as follows: (1) Without inoculation (control), (2) 100 ppm N, (3) 0.4 ppm IAA, (4) Inoculation with rhizobium 1004 10^6, (5) Inoculation with rhizobium 1004 10^6 + IAA, (6) Inoculation with rhizobium RD20 10^4, (7) Inoculation with rhizobium RD-20 10^6, (8) Inoculation with rhizobium SNI-2 10^6, (9) Inoculation with rhizobium SNI-2 10^6 + IAA. Results of the experiment indicated that inoculation with rhizobium and IAA application increased crop growth, nodulation, and nutrient uptake of cowpea. Inoculation with rhizobium 1004+IAA and SNI-2 increased dry weight of shoots by 45.7% and 38.4% compared to the control. Rhizobium SNI-2, 1004 dan RD-20 (10^6) increased number of nodules 23.1x, 13.8x, and 7.5x, respectively, and the dry weight of nodules 35.1x, 21.3x and 19.1x, respectively compared to the control. Applying IAA increased number and dry weight of nodules by 9.3x and 22.9x compared to the control. Application of IAA and inoculation with rhizobium 1004 increased the dry weight of nodules by 66.6% compared to the control. Application of IAA and inoculation with rhizobium increased N uptake by 59.4% and 48.2-129.2% compared to the control.

135 OMON, R.M.

Pengaruh suhu dan lama penyimpanan tablet mikoriza terhadap pertumbuhan setek meranti merah. **Effect of temperature and storage duration of mycorrhizae tablet to growth of red meranti cuttings**/Omon, R.M (Loka Penelitian dan Pengembangan Satwa Primata, Samboja (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 129-138, 2 ill.; 5 tables; 26 ref.

SHOREA; CUTTINGS; MYCORRHIZAE; TEMPERATURE; STORAGE; DURATION; GROWTH.

The effect of temperature and storage duration of mycorrhizae tablet on the growth of red meranti (*Shorea parvifolia*) cuttings was investigated in the laboratory and greenhouse of Primate Research and

Development Institute, East Kalimantan. The objective of this experiment was to obtain information of temperature and storage duration of mycorrhizae tablet which is optimal to produce planting stock of cuttings quality in nursery. Two temperatures and six storage durations were tested in the experiment. The experiment was arranged as a factorial completely randomized design with three replications. The results showed that three months storage duration of mycorrhizae tablet has given significant effect on survival percentage (90%) height growth (5 cm), number of leaves (5 pieces), dry weight (0.28), and percentage of root mycorrhizae colonization (88%), compared to other storage durations after 6 months observation. Temperature and interaction between temperature and storage duration did not give significant effect on percentage of survival, height growth, number of leaves, dry weight and percentage of root mycorrhizae colonization of *S. parvifolia* cuttings. As a plan and strategy in providing high quality *S. parvifolia* cuttings in nursery, it is recommended that mycorrhizae tablet optimally stored until 3 months under the temperature of 4^oC or 20^oC is still allowed to be inoculated to *S. parvifolia* cuttings.

136 SOEDARJO, M.
***Estimasi densitas dan efektivitas rhizobium endogen lahan kering Alfisol pada tanaman kedelai.* [Estimation of cell density and effectiveness of endogenous rhizobia from upland soils on soybean]**/Soedarjo, M.; Sucahyono, D. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 431-440, 7 tables; 15 ref.

GLYCINE MAX; RHIZOBIUM; DENSITY; INDIGENOUS ORGANISMS; MICROBIAL PROPERTIES; ROOT NODULATION; DRY FARMING; LUVISOLS.

The use of biofertilizers, such as rhizobium, can increase N availability to plants. A preliminary glasshouse study was carried out to determine the cell density and effectiveness of endogenous rhizobia from upland soils on soybean. Our present study indicated that, in general, upland Alfisol soils in East Java had relatively low density of endogenous rhizobium. Ineffectiveness dan effectiveness of endogenous rhizobium varied in upland soils. The effectiveness of endogenous rhizobium was comparable to commercial rhizobial inoculum.

137 YASSIR, I.
***Relationship between arbuscular mycorrhizae fungi potency and soil properties in marginal land.* Hubungan potensi antara cendawan mikoriza arbuskula dan sifat-sifat tanah di lahan kritis**/Yassir, I.; Omon, R.M. (Loka Penelitian dan Pengembangan Satwa Primata Samboja (Indonesia)). *Jurnal Penelitian Hutan Tanaman* ISSN 1829-6327 (2006) v. 3(2) p. 107-115, 1 ill.; 3 tables; 22 ref.

MARGINAL LAND; VESICULAR ARBUSCULAR MYCORRHIZAE; SOIL CHEMICOPHYSICAL PROPERTIES.

The research on relationship between arbuscular mycorrhizal fungi (AMF) with chemical and physical soil characteristics on marginal land were conducted in Samboja Lestari rehabilitation area at Km.35, East Kalimantan. The objective of the research was to know correlation between physical and chemical characteristics and AMF potential on marginal land. The experiment used a single method based on topography and floristic composition. Each condition of the topography (hill top, slope and valley) were sampled by provided of 5 sample plots, each 10 m x 10 m. Within these plots there were randomly smaller plot of 1 m x 1 m with three replications. Therefore, the total number of observation plots were 3 x 5 x 3 = 45 plots. The results showed that the general soil condition in this area is poor with the soil pH (4.32), organic-C (2.15%), N total (0.13%), available P (498 ppm), available K (0.44 me/g) and CEC (8.99 me/100 g). The density of spores potency is good, with the number of spores 1288-2321/50 g soil in dry season and during the wet season 1274-2163 spores/50 g soil, from the genera Glomus, Acaulospora and Gigaspora. While correlation between AMF potency and soil physical and chemical is depended on

available P. There was a negative correlation between the number of spore and available P, which is indicated by number of spores which were decreasing by increasing available P in the soil.

P35 SOIL FERTILITY

138 SANTOSO, B.
***Pemberdayaan lahan Podsolik Merah Kuning dengan tanaman rosela (Hibiscus sabdariffa* L.*) di Kalimantan Selatan.* Development of yellow red podzolic land for roselle plantation in South Kalimantan**/Santoso, B. (Balai Penelitian Tanaman Tembakau dan Serat, Malang (Indonesia)). *Perspektif* ISSN 1412-8004 (2006) v. 5(1) p. 1-12, 7 tables; 37 ref.

HIBISCUS SABDARIFFA; VARIETIES; SOIL IMPROVEMENT; LIMING; ORGANIC FERTILIZERS; INTERCROPPING; PODZOLS; KALIMANTAN.

Roselle (*Hibiscus sabdariffa* L.) is a fiber crop producing raw material for paper industry (pulp). The development of roselle in yellow red podzolic (YRP) land is potential. However, the problems in YRP land is also complicated, particularly soil infertility. Soil improvement through application of lime (CaCO3), organic materials, and utilization of roselle promising lines resistant to YRP soil are good to solve the problems. The lime (CaCO3) derived from agriculture lime can increase soil pH, netralize Al and Fe, and increase base value of the soil. The lime dosage for YRP soil in South Kalimantan is 1.5 t/ha. Besides, the lime has residual effect for three years. The organic material derived from blotong and chicken manure have the same effect with that of CaCO3 but slower. The advantage of organic matter is they improve soil chemical characteristics, as the results from microorganism activities. It needs 3-5 t/ha organic materials to improve soil chemical characteristics. The roselle promising lines which are resistant to Al and Fe are Hs 53a, Thay 146-H, and CPI 115357. The production of dry fiber in the YRP soil after the condition is improved increased from 1 t/ha up to 2.65-2.87 t/ha. Beside, intercropping roselle with maize increased farmers' income from Rp 5,400,000 to Rp 7,858,000 or Rp 2,458,000/ha. The results showed that the utilization of YRP soil for roselle plantation implemented with the improvement of soil chemical characteristics, intercropping roselle and maize can increase farmers' income in South Kalimantan.

139 SUKRISTIYONUBOWO
***Keseimbangan hara pada usaha tani lahan sawah.* Nutrient balances for wetland rice farming**/ Sukristiyonubowo (Balai Penelitian Tanah, Bogor (Indonesia)). *Jurnal Sumber Daya Lahan* ISSN 1907-0799 (2007) v. 1(4) p. 1-14, 5 tables; Bibliography p.10-14

ORYZA SATIVA; WETLAND RICE; NUTRIENT AVAILABILITY; SOIL FERTILITY; FERTILIZER APPLICATION; APPLICATION RATES; FARMING SYSTEMS.

Studies on nutrient balances in agriculture farming systems including wetland rice cultivation were aimed at refining agricultural farming/wetland rice management in order to make it more profitable and sustainable with less negative impact to the environment. In practice, they were aimed at improving recommended fertilizers application rate regarding agronomical, economical and environmental aspects. By definition, nutrient balances are the differences between inputs and outputs. The nutrients originating from fertilizers, returned crop residues, irrigation, rainfall, and biological nitrogen fixation are classified as input. Whereas, nutrient losses through removal harvested biomass (all nutrients), erosion (all nutrients), leaching (mainly nitrate, potassium, calcium and magnesium), fixation (mainly phosphate), and volatilization (mainly nitrogen and sulphur) are considered as output. However, the balances assessment could also be constructed from the simple parameters, as the complete nutrient balances were complicated. Research on nutrient balances can be developed at different scales, i.e. (1) plot, (2) field, farm or catchments area, (3) district, province, and (4) country, and for different purposes. Many studies indicated

that nutrient analyses from various commodities at plot, farm, district, province, and national levels, is characterized by a negative nutrient balance. This is also found to be the case for wetland rice production including terraced paddy field system in Indonesia. At the farm level, the deficits ranged from 24 to 86 kg N/ha/season, 4 to 11 kg P/ha/season, and 60 to 86 kg K/ha/season. At the district level, the negative balances varied from 13 to 3,282 t N/yr/district, from 241 to 470 t P/yr/district, and from 287 to 3,692 t K/yr/district. To reach sustainable and profitable wetland rice cultivation, application of 200-250 kg urea/ha/ season, 100 kg TSP/ha/season, and 200 kg KCl/ha/season should be recommended.

P36 SOIL EROSION, CONSERVATION AND RECLAMATION

140 FIRMANSYAH, M.A.
Prediksi erosi tanah Podsolik Merah Kuning berdasarkan metode USLE di berbagai sistem usaha tani: studi kasus di Kabupaten Barito Utara dan Gunung Mas. **[Prediction of Red Yellow Podsolic soil erosion based on USLE (universal soil loss equation) method in different farming system: case study in North Barito and Gunung Mas Regencies]**/Firmansyah, M.A. (Balai Pengkajian Teknologi Pertanian Kalimantan Tengah, Palangkaraya (Indonesia)). *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian* ISSN 1410-959x (2007) v. 10(1) p. 20-29, 8 tables; 15 ref.

ORYZA SATIVA; ZEA MAYS; ARACHIS HYPOGAEA; ELAEIS GUINEENSIS; HEVEA BRASILIENSIS; FARMING SYSTEMS; EROSION; SOIL CONSERVATION; PODZOLS; KALIMANTAN.

The universal soil loss equation (USLE) method is generally used to predict the soil erosion. The aim of this study was to apply this method to predict the erosion rate of soil in RYP (red yellow podzolic or Ultisols) on different of farming systems (FS), i.e. upland rice-cassava, rice-corn-peanut, oil palm, and rubber with low capital. The soil samples used were taken from different precipitation location, i.e. North Barito Regency and Gunung Mas Regency in Central Kalimantan Province. The results indicated that the soil loss in RYP in North Barito is higher than that in Gunung Mas. The land use of food crops farming systems without soil conservation can decrease the sustainability time of soil from 250 years to 38 years on upland rice - cassava in North Barito. This indicated that the land use of estate crop farming systems was in line with the sustainability program. The improvement of soil conservation by building up the bench terrace can support the sustainability of soil in RYP on different food crops farming systems.

141 SIREGAR, H.
Social-economic reasons to soil conservation: an econometric analysis on cross-sectional Lore Lindu data/ Siregar, H. (Institut Pertanian Bogor (Indonesia)). *Jurnal Agro Ekonomi* ISSN 0216-9053 (2006) v. 24(1) p. 1-20, 11 tables; 15 ref. Appendices

SULAWESI; SOIL CONSERVATION; SOCIOECONOMIC ENVIRONMENT; ECONOMIC ANALYSIS; NATIONAL PARKS.

Soil conservation plays critical role on agricultural sustainability. The aims of this study were to analyze factors affecting farmers' decision to conserve or not to conserve their farming land and to evaluate simultaneously effects of such decision on their output. The study used data gathered from samples of wetland rice farmers in surrounding area of the Lore Lindu National Park (LLNP). There were only 13.5% of the farmers undertaking soil conservation. Soil conservation was found to be an endogenous variable, implying that farmers' decision to conserve (or not to conserve) depended on numbers of factors. Among these factors, the significant ones were quantity of output produced, the perceived quality of farmland, farmer's family size, and farmer age. Using the instrumental variable approach, it was found that the decision of whether or not to carry out soil conservation affected the output significantly. This output was also affected by acreage and, to a lesser significance level, by the amount of credit. The government was recommended to establish clear boundaries of the LLNP, proper land rights issue, and improve access to micro-credit in order to promote sustainable agricultural practices.

P40 METEOROLOGY AND CLIMATOLOGY

142 RIAJAYA, P.D.
Sebaran curah hujan sebagai dasar penetapan waktu tanam kapas pada lahan sawah sesudah padi di Lamongan, Jawa Timur. **Rainfall distribution as the base to determine cotton planting time on the rice field in Lamongan, East Java**/Riajaya, P.D. (Balai Penelitian Tanaman Tembakau dan Serat, Malang (Indonesia)). *Perspektif* ISSN 1412-8004 (2006) v. 5(1) p. 26-35, 2 ill., 2 tables; 26 ref.

GOSSYPIUM HIRSUTUM; RAIN; PLANTING DATE; IRRIGATION WATER; LOWLAND; RICE FIELDS; JAVA.

Rainfall is a determining factor in cotton production on rice field and dry areas. Rainfall analysis is determined based on rainfall data in the long period, to estimate the probability of having certain amount of rainfall from January to December in Lamongam (Mantup District), East Java as one of indicator for successful cotton development in East Java. By recognizing rainfall distribution during planting season, the need for irrigation water can be determined. Total rainfall of 200-250 mm/month occured during the rainy season from November to April with 60% of probability. Moreover, rainfall <50 mm/month occured during the dry season from May to October with 60% of probability. Cotton planting should be done as soon as possible, or a week after rice harvesting (early March). Rice should be planted early rainy season in November or December. When the total rainfall is greater than 500 mm over the growing season, the need for additional irrigation water is only about 100 mm, which can be applied 2 times. Water from a nearby shallow well was used for watering. The additional irrigation can be taken from the wells near the location. The need for irrigation water will increase if the cotton and soybean planting is delayed. The use of wells and embung is recommended to supply the additional irrigation water during dry season, and crop management, plant density and mulching are also recommended to reduce evaporation.

Q04 FOOD COMPOSITION

143 MISNAWI
Pengaruh konsentrasi alkali dan suhu koncing terhadap cita rasa, kekerasan dan warna permen cokelat. **Effects of alkali concentration and conching temperature on flavour, hardness and colour of chocolate**/ Misnawi; Wahyudi, T. (Pusat Penelitian Kopi dan Kakao Indonesia, Jember (Indonesia)); Selamat, J.; Putriani, N. *Pelita Perkebunan* ISSN 0215-0212 (2006) v. 22(2) p. 119-135, 9 ill., 2 tables; 19 ref.

COCOA BEANS; CHOCOLATE; COLOUR; FLAVOUR; ALKALI METALS; PARTICLE SIZE; TEXTURE; TEMPERATURE; FIRMNESS; FOOD ADDITIVES.

Alkalization is an addition of alkali into cocoa mass to improve product quality in terms of flavour and colour appearance. Sodium bicarbonate and potassium bicarbonate are usual to be added into cocoa cotyledon prior to roasting. A study has been carried out to evaluate the effects of alkalization proceeded upon conching on chocolate sensory properties, hardness and colour. Response surface methodology design at alkali concentrations of 1-15 g/kg and conching temperature of 40-80 ^{o}C have been used in the study. Parameters evaluated were sensory properties, particle size, hardness and colour. Results of the study showed that alkali concentration significantly influenced aroma, overall preference, particle size and hardness; meanwhile, conching temperature showed significant influence on aroma, taste, appearance, overall preference and texture of chocolate. Alkali concentration and conching temperature showed interactively influenced aroma and overall preference. A good quality of chocolate could be found at alkali concentration of 8-15 g/kg and conching temperature of 74-80^{o}C.

144 NURDJANNAH, N.
Perbaikan mutu lada dalam rangka meningkatkan daya saing di pasar dunia. **Improvement of pepper quality to increase the competitiveness in the world market**/Nurdjannah, N. (Balai Besar Penelitian

dan Pengembangan Pascapanen Pertanian, Bogor (Indonesia)). *Perspektif* ISSN 1412-8004 (2006) v. 5(1) p. 13-25, 1 ill., 4 tables; 38 ref.

PEPPER; QUALITY; PROCESSING; ECONOMIC COMPETITION; PROCESSING; WORLD MARKETS.

Indonesia is one of the biggest pepper producing countries. Most of the products are exported in the form of black and white pepper, and only a small amount in the form of ground pepper and pepper oil. The competition of pepper commodity in the world market becomes more stringent because the demand is relatively balanced with the supply. Moreover, the consumers ask for more stringent condition of products, especially quality assurance, hygienic and healty aspects. Besides, there are new producing countries which increase the pepper production very fast. Indonesia has conducted some efforts to improve the quality of pepper, such as good processing technology. The improved processing technology has been implemented, but it has not done correctly and integratedly with other aspects, so that the results are unsatisfactory. Some producing countries have already anticipated this condition by improving the quality of pepper products from the farmer level. The succeess in improving quality in these countries has been achieved because the improvement is done at all levels, from pepper berries production, processing until marketing and its organization. The improvement of pepper quality cannot be done only by improving the processing technology, but it should also include other aspects, from pre harvest, postharvest to marketing, and distribution. Moreover, an organization is needed to organize all aspects involved in order to maintain the consistency and sustainability of pepper production and quality.

145 RATNANINGSIH

Studi pendahuluan sifat voskoelastis umbi ubi jalar ungu menggunakan model Simplified Maxwell-Kelvin dan Degenerated Maxwell. **[Preliminary study of viscoelastic properties of sweet potato using Simplified Maxwell-Kelvin and Degenerated Maxwell models]**/Ratnaningsih; Tastra, I K. (Balai Penelitian Tanaman Kacang-kacangan dan Umbi-umbian, Malang (Indonesia)). Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang, 25-26 Jul 2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 593-602, 7 ill., 2 tables; 10 ref.

SWEET POTATOES; TUBERS; ELASTICITY; MOISTURE CONTENT; CRUDE FIBRE; POSTHARVEST TECHNOLOGY; MODELS; HEALTH FOODS.

Lack of information on viscoelastic properties of sweet potato with high anthocyanin content is one constraint to improve its quality. Therefore, it is imperative to study the viscoelastic properties of sweet potato to improve its quality. This information is important in optimizing the postharvest processing system of sweet potato. Sweet potato accession MSU 03016-19 with moisture content 64.5% w.b. and fibre content 2.7% d.b. was used in this experiment. The measurement of sweet potato viscoelastic was conducted using a Rheometer (Model EZtes/ CE, Merk Shhimadzu) at operation speed of 50 mm/min, based on the SMK (Simplified Maxwell-Kelvin) and DM (Degenerated Maxwell) models that combining three elements (parameters) of spring (K) and dasphot (C). The values of sweet potato viscoelastic parameters using SMK model were K1= 30.563 N/mm (SD = 3.944); K2= 86.375 N/mm (SD= 8.292) and C1= 488.607 N-s/mm (SD= 42.974), respectively. While using DM model the values of sweet potato viscoelastic parameters were K3 = 22.493 N/mm (SD= 2.624); K4= 8.042 N/mm (SD= 1.435) and C2= 33.608 N-s/mm (SD= 5.827), respectively. Both SMK and DM models had coefficient determination (R2) of >0.98. In conclusion, the viscoelastic properties of sweet potato can be studied using SMK model or DM model. It was suggested to study further the effects of different moisture content on the viscoelastic parameters of the sweet potato.

Q60 PROCESSING OF NON-FOOD OR NON-FEED AGRICULTURAL PRODUCTS

146 AMIARSI, D.

Pengaruh jenis dan perbandingan pelarut terhadap hasil ekstraksi minyak atsiri mawar. **Effect of kinds and composition of solvent on the yield of rose essential oil**/Amiarsi, D.; Yulianingsih (Balai

Penelitian Tanaman Hias, Cianjur (Indonesia)); Sabari S.D. *Jurnal Hortikultura* ISSN 0853-7097 (2006) v. 16(4) p. 356-359, 1 table; 10 ref.

ROSA; FLOWERS; ESSENTIAL OILS; EXTRACTION; DISTILLING.

The objective of the study was to find out the best kind and composition of solvent for extraction of rose essential oil with good quality and quantity of concrete and absolute. The treatments were extraction by dipping flower in 3 kinds of solvent (hexane, petroleum ether, and isobuthyl ketone) with composition of flower-solvent (1:1, 1:2, and 1:3) for 12 hours. Solution was separated by filtering and manual pressing. Extracting process was vacuum evaporated to produce concrete. Concrete was dissolved in ethanol 96% and then vacuum evaporated to obtain absolute rose essential oil. Observations were done on the yield of concrete and absolute, refraction index of absolute, and the composition of essential oil. The experiment was arranged in a factorial completely randomized design with 3 replications. The results indicated that the highest concrete and absolute rendement was obtained by methyl isobuthyl ketone solvent with composition of flower-solvent 1:3, i.e. 1.35% and 0.74%, respectively. Rose essential oil showed good quality with refraction index of 1.49 and 6 components of rose essential oil were identified, i.e. phenyl ethyl alcohol, citronellol, geraniol, methyl eugenol, alpa-pinena, and beta-pinena.

Q70 PROCESSING OF AGRICULTURAL WASTES

147 PURWATI, S.
Potensi dan alternatif pemanfaatan limbah padat industri pulp dan kertas. **Potency and utilization alternatives of pulp and paper industry solid waste**/Purwati, S.; Soetopo, R.S.; Setiadji; Setiawan, Y. (Balai Besar Pulp dan Kertas, Bandung (Indonesia)). *Berita Selulosa* ISSN 0005-9145 (2006) v. 41(2) p. 67-79, 12 tables; 21 ref.

PULP; PULP AND PAPER INDUSTRY; SOLID WASTES; WASTE MANAGEMENT; WASTE UTILIZATION; USES.

Set of problems in solid waste management faced by pulp and paper industry enhance various investigations to be carried out in finding out effective and efficient solid waste management. Solid waste utilization is one of alternatives in environmental management which is required to be developed due to the economic values obtained and the creation of healthy and clean environment. An assessment to know the characteristics of hazardous pollutant identified in the solid waste of pulp and paper industry was carried out. The assessment of potency and the utilization feasibility of sludge waste from wastewater treatment plant and ash waste from power boiler to be a high value product was also studied both the technical aspect and the environmental risk. Results showed that the characteristics of sludge waste from wastewater treatment plant and ash waste from power boiler and incinerator were not identified as hazardous waste and based on TCLP and on-waste testing results, it can be piled in the light landfill category. Sludge waste from wastewater treatment plant had potency to be utilized as compost without causing the pollution indication into soil and soil water. Other utilization as boiler fuel had also prosperous potency, yet the design of equipment to handle the high water content was required to be considered. Ash waste from power boiler could also be utilized as clay mixture in brick making. The quality of brick product was fulfilling Indonesian national brick quality standard and it was safe for environment.

148 SETIAWAN, Y.
Pembentukan lumpur granul dalam pengolahan air limbah pemutihan pulp dengan reaktor up-flow anaerobic sludge blanket (UASB). **Granular sludge formation in treating of bleaching effluent by up-flow anaerobic sludge blanket (UASB) reactor**/Setiawan, Y.; Purwati, S.; Kristaufan J.P.; Soetopo, R.S. (Balai Besar Pulp dan Kertas, Bandung (Indonesia)). *Berita Selulosa* ISSN 0005-9145 (2006) v. 41(2) p. 58-66, 7 ill., 2 tables; 12 ref.

PULP; PULP AND PAPER INDUSTRY; WASTEWATER; WASTEWATER TREATMENT; EQUIPMENT.

UASB reactor has not used yet by pulp and paper industries in Indonesia in treating their wastewater caused by granular sludge must be imported and needs high skill in the operation. To anticipate the more stringent of effluent standard and implementation of adsorbable organic halides (AOX) as a key parameter, UASB reactor has a good prospect to be used in treating pulp and paper wastewater. In the beginning of experiment, UASB reactor was operated with the hydraulic retention time (HRT) of 3 days and OLR of 0.10-0.23 kg COD/m^3 day for 141 days. UASB reactor was then operated with the HRT of 19 hrs and OLR of 0.80 - 3.25 kg COD/m^3 day for 287 days. Since day 288th, UASB reactor was operated in the HRT of 12 hrs and OLR of 1.92-5.0 kg COD/m^3 day. In this condition, micronutrient solution in the amount of 1 ml/l was added into feed wastewater of UASB reactor to accelerate the growth of granular sludge. Concentration of parameters such as COD, BOD, TSS, pH, and adsobable organic halides (AOX) were analyzed. Sludge characteristic was tested and observed by Light Optical Microscope Leica DMLM and S4E and scanning electron microscope (SEM) Philips FEI Quanta 200. Settling rate of granular sludge was also measured. The result showed that on the HRT of 12 hrs and the OLR of 1.92-5.0 kg COD/m^3 day with the up-flow velocity of 0.16 m/hr, treatment system by UASB reactor could reduce COD of 34.23-90.28% (average of 67.41%) and AOX of 59.65-70.12% (average of 67.93%). The addition of micronutrient solution in the amount of 1 ml/l had significant effect to the growth of microorganism and the granular sludge formation. The formed granular sludge had black-brownies color, VSS/SS ratio of 0.72, diameter up to 2 mm, specific gravity (sg) of 1.12, and high settling rate of 54.6 m/hr. Bacterial population content of the granular sludge consisted of filament bacteria (*Methanotric sp.*) with diameter of 1-2.94 micrometer and coccus bacteria (Methanosarcina) with diameter of 2-29 micrometer. These bacteria were very useful and have a role in sludge granulation and reduction of organic compounds.

149 SOETOPO, R.S.
Karakteristik vermikompos dari limbah padat IPAL industri kertas. **Characteristics of vermicompost made from solid waste of paper mill waste water treatment plant**/Soetopo, R.S.; Purwati, S. (Balai Besar Pulp dan Kertas, Bandung (Indonesia)). *Berita Selulosa* ISSN 0005-9145 (2006) v. 41(2) p. 80-89, 3 ill., 8 tables; 14 ref.

ZEA MAYS; COMPOSTS; PULP; PULP AND PAPER INDUSTRY; SOLID WASTES; WASTEWATER; WASTEWATER TREATMENT; WASTE MANAGEMENT; WASTE UTILIZATION; USES.

The influence of the vermicompost produced from solid waste of paper mill wastewater treatment plant to corn vegetation have been investigated. Solid waste was obtained from paper mill using wastepaper as raw materials. Experiment was carried out in a laboratory scale, initiated by solid waste characterization including the determination of macronutrients and heavy metals. Vesmicomposting was done in solid waste treatment variation. The best vermicompost was obtained from solid waste medium with sawdust as a mixed material at 40% v/v. Observation of compost effect to corn vegetation was focused on corn harvesting result, heavy metal content and acute toxicity test. The result showed that the vermicompost generally contains total heavy metals higher than those of commercial vermicompost from domestic waste, but lower than standard of compost according to SNI and those in some other countries (USA, Europe Union and Australia) except nickel. The vermicompost effect up to 33 ton/ha to vegetative and generative growth of corn was good. The heavy metals content in the corn grain harvested from the land fertilized by vermicompost of 33 ton/ha was lower than the Dirjen POM No 03725/B/SK/VII/89 standard. Acute toxicity test on corn grain showed that its concentration was higher than 15,000 mg/kg body weight, and practically can be classified as non toxic.

T01 POLLUTION

150 HADI, A.
Emisi gas rumah kaca dari pertanaman kedelai di lahan sub-optimal Kalimantan Selatan. **Greenhouse gas emissions from soybean planting in sub-optimal marginal land in South Kalimantan**/Hadi, A. (Universitas Lambung Mangkurat, Banjarbaru (Indonesia). Fakultas Pertanian); Inubushi, K. Peningkatan produksi kacang-kacangan dan umbi-umbian mendukung kemandirian pangan, Malang , 25-26 Jul

2005/Suharsono; Makarim, A.K.; Rahmianna, A.A.; Adie, M.M.; Taufiq, A.; Rozi, F.; Tastra, I K.; Harnowo, D. (eds.) Bogor (Indonesia): Puslitbangtan, 2006 p. 381-389, 2 ill., 2 tables; 12 ref.

GLYCINE MAX; CULTIVATION; POLLUTANTS; NITROUS OXIDE; METHANE; CARBON DIOXIDE; SLOW RELEASE FERTILIZERS; MARGINAL LAND; KALIMANTAN.

This research aims at elucidating the rate of greenhouse gas emissions and seeking options for mitigation on soybean planting in marginal soil. Seasonal nitrous oxide (N_2O), methane (CH_4) and carbon dioxide (CO_2) emissions from forest, paddy field and soybean-paddy rotation were measured in Hulu Sungai Utara District, South Kalimantan. Cow manure, urea, urea + dicyandiamide or slow release fertilizer LP-30 (hereafter referred to as KS, KSU, KSUD and KSLP-30, respectively) were incorporated at the rate of 60 kg N/ha to an Ultisols in Pelaihari District, South Kalimantan. Gas samples were taken and used for determining N_2O, CH_4 and CO_2. Results showed that soybean field acted as a source of greenhouse gas emissions. Its global warming potential was higher (341.996 mg equi CO2-C/m2/y) than that of paddy field. The lowest N_2O was obtained in KSUD plot (62.2 mg N_2O/m2/crop season), followed by KS plot (341.4 mg N_2O/m2/crop season) and KSU plot (2,636.8 mg N_2O/m2/crop season). The highest N_2O emission was obtained from KSLP-30 plot, with cumulative emission reached 4,403.3 mg N_2O/m2/crop season. This suggested that dicyandiamide application was the most effective mitigation in reducing greenhouse gas emission from soybean fields.

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