1st International Conference
Sustainable Tropical Land Management

ABSTRACT BOOK
FOREWORD

Agriculture as the main driver of economic development in tropical countries faces a big challenge to feed 40% of the world population who lives in it. With the abundance of sunshine and the low range of temperature difference, farmers are able to grow crops all the year round. Tropical countries are also characterized by high population density, and hence a pressure to use the land intensively, including the erosion prone sloping land and less suitable lands. With the intensive use, tropical agriculture is prone to land degradation.

Equatorial regions have been suffering from climate change in the form of higher temperature, longer dry season, higher intensity rainfall, more frequent flooding, landslides, destructive cyclones, as well as more frequent event of El Niño Southern Oscillation. These have led to agricultural vulnerability. Crop failures may occur due to lack of ability and/or knowledge of agricultural actors to implement adaptation actions and it may threaten food security, not only at the national, but also at the regional level. Adapting tropical land management to climate change and combating land degradation are crucial to increase resilience of agricultural systems and maintain food security.

Adaptation actions to climate change and control measures to land degradation are requiring appropriate technologies. Bridging farmers to the tropical agricultural land management technologies is a big challenge. Those technologies may have already been created but still in the shelves and there is an urgent need to unboxing and disseminating these technologies, and change them to innovations such that they are practicable by farmer. Meanwhile research and development on land management have been progressing in the tropics and these need to be communicated and in turn published in scientific journal and or proceedings.

Indonesian Center for Agricultural Land Resources Research and Development (ICALRRD) on behalf of the Indonesian Agency for Agricultural Research and Development (IAARD) invites international experts to share their knowledge on several interesting topics regarding tropical land management to the event of The 1st International Conference on Sustainable Tropical Land Management, which will be held on 16-18 September 2020 Jakarta time through virtual way. This conference calls for qualified papers, which will be published in a proceeding of a reputable internationally indexed publisher.

A number of 228 abstract papers were received. The abstracts were reviewed by reviewers whose background and expertise fit with theme. The oral presentation will be presented according to sub themes which consists of (1) Land use, land suitability, and risk mappings – the relationship with agricultural sustainability, (2) Soil, water, and crop management and the socio-economic dimensions, (3) Adaptation and mitigation to climate change, (4) Soil quality assessment: morphological, physical, biological, chemical and geological aspects to support agricultural sustainability, and (5) Digital and precision agriculture.
CONTENTS

Theme 1: Land use, land suitability, and risk mappings – the relationship with agricultural sustainability (LULS) ................................................................. 1

Theme 2: Soil, water, and crop management and the socio-economic dimensions (SWCM) ..... 29

Theme 3: Adaptation and mitigation to climate change (CC) ........................................... 53

Theme 4: Soil quality assessment: morphological, physical, biological, chemical and geological aspects to support agricultural sustainability (SQA) ............................. 80

Theme 5: Digital and precision agriculture (DPA) ......................................................... 108
Theme 1: Land use, land suitability, and risk mappings – the relationship with agricultural sustainability (LULS)

Tidal peat soils on the coral limestone environment in Numfor and Supiori Islands, Papua Province

R A Gani, P A Barus and Sukarman
Indonesian Center for Agricultural Land Resources Research and Development, Bogor, West Java, Indonesia
E-mail: ganisoil79@gmail.com

Abstract. Tidal peatlands in Numfor and Supiori Island, Papua are unique and specific because they formed in tidal on the coral limestone environment. This study was to know characteristics and carbon stocks of tidal peat soils in both islands. The soil morphological characteristics were described sampled from each horizon for analysis in laboratory. Carbon stocks estimation was done by multiplying peat thickness, area, bulk density, and C-organic content in each soil map unit. Peat thickness varied from shallow to deep (50 - <300 cm). Substratum layer were solid coral limestone (lithic contact). The C-organic ranged from 23.03 - 46.99% and the bulk density ranged from 0.12 to 0.36 g cm$^{-3}$. Carbon stock average in each soil map unit were 1,151 - 1,314 tons ha$^{-1}$. Generally, tidal peat soils in the coral limestone environment had acidity ranging from very acidic to very alkaline (pH H$_2$O 4.9 - 7.3), very high soil salinity (8.32 – 22.3 dS$^{-1}$), base saturation reaching >100%, and total sulfur ranging from 2.27 to 8.77%. All alkaline cations content was very high with the order of cation dominance being Na$^{+}$Ca$^{2+}$Mg$^{2+}$K. The high Na and Ca content can be exchanged due to brackish water enrichment and dissolution of coral limestone.

An early investigation of spatial correlation between sentinel-2 based rice growth stages maps with satellite-based precipitation data to support digital agriculture development in Indonesia

F Ramadhani$^{1,2}$

$^{1}$ Geoscience, Massey University, Palmerton North, New Zealand
$^{2}$ Indonesian Agroclimate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
E-mail: fadhlullah.ramadhani@gmail.com

Abstract. Sustainability of rice production has so far been a critical issue in ensuring food security. The production of rice paddy, which relies heavily on the availability of water, needs to be monitored
The automated monitoring of the rice growth phase of Sentinel-2 has been introduced since the end of 2019 for 7.4 million hectares of rice fields in Indonesia. However, the rice monitoring system needs to be coupled with other information such as precipitation to enhance user usage. In this analysis, the spatial correlation between the floods and the vegetative stages of the rice monitoring maps and the precipitation data from CHIRPS was investigated. Correlation and linear regression analysis were conducted with the two datasets for more than 455 regencies in Indonesia on a monthly basis between December 2019 and May 2020. The result shows that 88 regencies have a high correlation, 40 regencies have a high $R^2$. On the other hand, there are 171 regencies have no correlation, and 269 regencies have the lowest $R^2$ value. These early-stage results show an opportunity to combine two datasets to produce early warning systems in a timely and accurate manner directly to the stakeholders or the farmers using cloud computing.

The effect of biofertilizers consortia formulation of methane-utilizing bacteria on rice yield and methane emissions

E Pratiwi¹, J Purwani¹, L R Widowati¹ and Husnain²

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Indonesian Center for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: ettypratiwi@yahoo.com

Abstract. Methane is one of the greenhouse gases that contributes to climate change. Paddy fields were the main source of atmospheric methane, more than 90% of methane is released from rice fields into the atmosphere. One mitigation for reducing methane emissions is by applying methane-utilizing bacteria that can reduce about 80% of methane emissions in the rice fields. In addition, these bacteria have the potential as biofertilizer. The purpose of this study was to determine the effect of consortia of methane-utilizing bacteria on the rice yield and methane emissions. This research was carried out in paddy fields in Bogor, West Java, Indonesia. The experimental design for this field experiment was a factorial randomized design with 2 factors, i.e.: (i) the dose of inorganic fertilizer (P1 = 50%, P2 = 75%, P3 = 100%), and (ii) bacterial consortia formulation (M0 = without bacteria, M1 = formula 1, M2 = formula 2, M3 = formula 3). Each formula contained a combination of Mycobacterium senegalense, Providencia stuartii, Rhizobium rhizoryzae, or Bacillus methylotrophicus. The application of biofertilizers consortia formulation of methane-utilizing bacteria increased the efficiency of inorganic fertilizer by 25% and increased grain yield productivity by 13.57%. The combination of bacterial strains can also increase nutrient uptake of NPK and reduce methane emissions by up to 36%.

Pedogenic processess of carbonate rocks in the tropical region as a key for sustainable soil management
A Ahmad¹, M Farida² and C Lopulisa¹

¹ Department of Soil Science, Faculty of Agriculture, Universitas Hasanuddin, 90245 Makassar, Indonesia,
² Department of Geology, Faculty of Engineering, Universitas Hasanuddin, 90245 Makassar, Indonesia

E-mail: asmitaahmad@yahoo.com

Abstract. Carbonate rocks composed of minerals calcite, dolomite, aragonite, siderite, etc. provide a nutrient supply for the soil and plants cultivated. The characteristics of carbonate rocks which are easily dissolved by rain water cause the rate of soil formation in the tropics to run faster than other regions. Efforts to maintain the available nutrients on the soil are very important in management. This research aims to study the pedogenic processes of carbonate rocks in the tropics as a key for sustainable soil management. Five carbonate rock samples and 23 soil samples were analyzed from soil cultivated as paddy fields. Carbonate rocks contain many fossils of Foraminifera as a characteristic of the marine depositional environment in the transition zone, and some calcite minerals fill cavities in the rock body, as a marker of recrystallization reaction which releases some calcium and carbon dioxide into the soil. Increased soil depth decreases soil organic matter content from 5% to 2%, soil pH ranges from 5.72 to 6.81, but calcium (Ca) content is only in the moderate range (6-8%). Calcium and soil organic matter categorized as moderate level as indicating the release of CO₂ from the host rock which is not bound by soil organic matter and released into the air as a gas that can increase the effect of greenhouse gas so as to cause climate anomalies in the study area, where the highest rainfall in this region can reach 4739 mm/year while the lowest reached 1950 mm/year over the past 10 years. The release of CO₂ gas into the air must be inhibited by the addition of organic matter through the immersion of crop residues to the soil, so that sustainable land use can be maintained and the greenhouse gas effect can be inhibited.

Land Suitability for Agricultural Development in Jayapura Regency, Papua

A Malik¹, W Siska² and S H Adi³

¹ Central Java Assessment Institute for Agricultural Technology, Semarang, Indonesia
² Indonesian Center for Agricultural Technology Assessment and Development, Bogor, Indonesia
³ Indonesian Agroclimate and Hydrology Research Institute, Bogor, Indonesia

E-mail: widiasiska82@gmail.com

Abstract. Agricultural development planning requires site-specific land resources data to assess the crop-land suitability. This research conducted land resources inventory and evaluation for agricultural development in 1,421,400 hectares of study area in Jayapura Regency, Papua, in 2015. This research utilized tabular and spatial analysis for the crop-land suitability evaluation. Satellite imageries based land resources data were spatially overlapped to generate land units as bases for crop-land suitability assessment. Analysis results showed that there was about 654,217 hectares in the study area was suitable for agricultural development. Land suitability evaluation for food crops in the area also showed 268,433 hectares were suitable for lowland paddy, 426,008 hectares for
maize, and 329,966 hectares for soybean. Furthermore, land evaluation for perennial crops in the area of study identified 654,217 hectares were suitable for cocoa, 566,375 hectares for coffee, and 506,479 hectares for palm oil. Additionally, land suitability analysis for horticultural crops in the study area found 423,149 and 432,524 hectares were suitable for citrus and banana, respectively. Therefore, this research findings could be considered as a valuable information for agricultural development planning in Papua.

### Updating the swamp map scale of 1: 50,000 with method quick assessment and decision tree

**Mawardi, M. Nor, Hendri S , K Anwar, Masganti, V Karolina, I Kahirullah**

Indonesian Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjarbaru, Indonesia

Email: Mawardi37@yahoo.co.id

**Abstract.** Swamp land is a top priority in increasing national rice crop production both through increasing the Planting Index (IP) and productivity Map of swamp land until now has not been much detailed to the type of overflow and typology of land, even though this information is needed in directing the development of agriculture on swamps and the application of technology. As a source of data for making policies in the application of technology and for reference to make other thematic maps in swamps. However, there is no effective method for updating swamp maps of 1: 50,000 scale from various sources. Some of the activities that have been carried out have difficulties, besides being slow and also less accurate, it is not in accordance with the existing conditions. Therefore, in this study using the Quick Assessment and Decision Tree methods with stages: desk study, field verification, extrapolation, and decision tree. From the results of updating the district swamp map in South Kalimantan in 2019 using the method. 1: 50,000 scale swamp maps can be produced quickly, accurately and updated.

### Micromorphological characteristics of soils developed on volcanic ash in Lembang area, West Java, Indonesia

**E Yatno, M Hikmat and E Suryani**

Indonesian Center for Agricultural Land Resources Research and Development, Bogor, Indonesia

E-mail: edi_yatno@yahoo.com

**Abstract.** The study of micropmorphological characteristics of soils formed from Volcanic Ash parent materials in Lembang area, West Java is still rare. About 16 Kubiena boxes soil samples from three representative soil profiles were analized to determine their soil micromorphological characteristics. Results indicated that thin sections of the soils show that most horizons of the soils developed on volcanic ash have granular microstructures. The c/f related distribution of the soils is open porphyric.
The coarse materials found in the soils are generally dominated by hornblende. Some fresh rock fragments are clearly identified and are generally composed of feldspar, hornblende, and hyperstene. The fine materials of most horizons are brown to dark brown, dotted to stipple-speckled clay and showing undifferentiated b-fabric. The main organic materials observed in the profiles are plant root residues of fine to coarse size and are filled by excrement of soil animals. Weathering of rock fragments and mineral alteration are the most common pedofeatures. The high amount fresh ferromagnesian minerals and the granular microstructures indicated that the soils have high nutrient reserves and high pore spaces supporting for plant growth and development.

Characteristics of acid sulphate soils and its effect on rice yields (case study: in Kapuas, Central Kalimantan and South Kalimantan)

E Maftuah, A Susilawati and Masganti

Indonesian Swampland Agriculture Research Institute (ISARI), Jl. Kebun Karet, Loktabat, Banjarbaru, South Kalimantan, Indonesia

E-mail: eni_balittra@yahoo.com

Abstract. Acid Sulfate soils has a limiting factor that causes low land productivity, especially on newly developed lands. The main problem is the presence of pyrite layers, if pyrite is oxidized can cause the soil to become very acidic, and dissolve Fe, sulfate and Al ions. The study was carried out within Tamban Baru Tengah village, Kapuas, Central Kalimantan in January-September 2019. The research location was separable (1) intensive managed land covers 5 ha (2) newly developed land covers 7 ha. Cultivation technology from land preparation to harvesting is the same, except the dosage of lime for newly developed land was 2 t/ha, while intensive land was 1 t/ha. Rice varieties in newly developed land used Margasari, while intensive land was Inpara 8. Pyrite content in the upper layer (<50 cm) at newly developed land was 1.58-4.21% while on intensive land was 0.51-0.82%. Tidal swampland characteristics affected rice yield. Increasing the dose of lime from 1 t/ha to 2 t/ha has not been able to increase rice yields in newly developed land. The yield of Margasari rice in the newly developed land reached 2.4-2.6 t/ha, while the intensive land using Inpara 8 variety reached 3.52-3.78 t/ha.

Characteristics and land potential for sugarcane development in Blitar Regency East Java Province

M M Pratamaningsih and A Mulyani

Indonesian Centre for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
Abstract. The expansion of sugarcane planting area needs to be supported by land resource data, such as characteristic and land suitability map to optimaliz sugarcane growth and production. The aim of this research was to evaluate the land suitability and the dominant limiting factor for sugarcane development in Blitar Regency. Land suitability assessment was conducted by matching between land characteristics and sugarcane growth requirements. The dominant soil in Blitar Regency was Kambisol Eutrik, which has a moderate to very deep soil depth, well drained, and medium to fine texture. The results of the land evaluation showed that most of the land was marginally suitable (S3) covering 87,529 ha (97.11%), with the limiting factors were rooting condition (poorly drained and slightly coarse texture), nutrient retention (CEC <5 cmole/kg, pH >8.0), nutrient availability (very low K₂O), and erosion hazard (slope 8-15%). The rest were classified as moderately suitable (S2) covering 2,604 ha (2.89%). Based on land use, most of the land has been used for rice fields, dry land, existing sugarcane plantations, and other uses, so that for the extensification areas in Blitar Regency was about 21,876 ha, the largest was found in Kademangan Subdistrict 3,723 ha.

Differences in Andisol properties as affected by land uses and slope positions in Lembang Sub District, West Java

D P Hati, R A Gani and A Mulyani

Indonesia Centre for Agricultural Land Resources Research and Development, Ministry of Agriculture, Indonesia

E-mail: diahpuspitahati@gmail.com

Abstract. Volcanic soils have different characteristics depending on the use and management of the soil. This study aims to study the different characteristics of volcanic soil properties at different land uses and slope positions. Three soil profiles in Lembang, West Java, have been identified to represent the upper, middle and lower slopes, as well as differences in land use and 23 soil samples for analysis of the chemical and physical soil properties. The results showed that all of areas have clay-texture, BD 0.40-0.68 g/cm³, pH NaF >10, very high P retention (>90%) and soil reaction was acidic to slightly acidic. C-org was very high in surface horizon and decreased irregularly with soil depth. The top soil on the lower slopes planted with vegetables has a higher content of K-total and P-available nutrients than the land on the top soil on the upper slopes of pine forests, but not much different in the lower layers. Soil on the upper and middle slopes is classified as Andosol District (Ultic Hapludands) and the lower slope as Andosol Eutrik (Alfic Hapludands). The P₂O₅ total and phosphate retention are very high so phosphate solubilizing bacteria are needed to increase P₂O₅ solubility and availability for plants.

Properties of peat soils surrounded by calcarenite hills in Papua highland
P A Barus, D P Hati and E Yatno

Indonesian Center for Agricultural Land Resources Research and Development, Bogor, West Java, Indonesia

E-mail: padana.aperta.barus@gmail.com

Abstract. Peat soils in Papua highlands are unique because they formed in basin areas surrounded by calcarenite hills. However, there is no information about the characteristics of these peat soils. Thus, the purpose of this study was to assess properties of these specific peat soils. Five selected peat soils located at an altitude between 1548-1782 m asl were studied for their morphology. Twenty one samples were taken for analysis in the laboratory. The results showed that peat soils were derived from uncomposed ferns biomass and peat decomposition rate was dominated by hemic and sapric. Peat thickness varied from moderate to deep (150 - > 500 cm). Ash content ranges from 4.22 to 56.75%, indicating mineral enrichment. Soil acidity ranges from very acid to slightly acid. Base saturation classified as low to moderate (30 - 62%). An interesting finding was exchangeable Ca in peat layers was very high (21.11 - 42.62 cmolc kg\(^{-1}\)). Based on ash content and amount of cations, these peat soils received Ca enrichment from the surrounding calcarenite hills. Chemical properties of peat soils in Papua are more fertile in highlands than lowland with implication of lower input application in the highland to overcome peat soil acidity.

Spatial land use planning for sustainable food crop areas development based on land resource information using land evaluation approach and GIS application

A Bhermana, Syamsuddin, Suparman, S Agustini and D Irwandi

Assessment Institute for Agricultural Technology (AIAT) of Central

E-mail: andybhermana@yahoo.com

Abstract. The need of landuse planning become apparent since the lands have the opportunity to be developeled. At the same time, in order to achieve sustainable landuse, the need of landuse planning is urgently required. While it can be designed based on the result of spatial land resource data management. The procedure of land resource evaluation consisting of land capability evaluation (LCE) and land suitability evaluation (LSE) was applied to determine land allocation of arable lands for rice farming development. The use of geographic information system (GIS) technology was also employed not only for spatial data management but it can also be applied to support decision making within establishing landuse planning. The objective of this study was to design appropriate agricultural land regions for land use policy for extensification and intensification programs in order to support food crops development areas. In the case of Pulang Pisau district, land allocation for extensification and intensification regions are mainly found in southern part and mostly located at watershed areas with each total areas of 380,261 hectares (36.81%) and 29,941 hectares (2.90%) respectively. In order to support these potential areas, specific programs can then be formulated to increase the yield and productivity for these regions.
Evaluation of land suitability and factors influencing the development of shallots (Allium cepa L.) in North Padang Lawas, North Sumatera

S S Girsang and M A Girsang

North Sumatera Assessment Institute for Agricultural Research, North Sumatera, Indonesia

Email: girsang313@gmail.com

Abstract. Allium cepa L. is a horticultural commodity that influences inflation. Increasing productivity through the intensification and extensification processes is the government's top priority in achieving the world food barns in 2045. The study was conducted in 20 villages (6 sub-districts), North Padang Lawas District (10 13’50” and 20 2’ 32” South Latitude and 990 20’44” and 1000 19’10” East Longitude, elevation 99-317 m.a.s.l.) period May-August 2019. Survey method to obtain data on shallot farming (R/C ratio) and soil sampling using a purposive sampling technique using a descriptive exploratory survey method, with an analysis unit of the Land Mapping Unit (LMU). The results showed that the potential land suitability class increased to be moderately suitability (S2) and increased shallot productivity with improvement through planting shallots at the end to the beginning of the rainy season, organic matter application, fertilizing, liming, certified high yielding varieties, farmers training about cultivation to marketing which is facilitated by the government because economically and financially shallot farming in North Padang Lawas Regency is very feasible to be developed. It is hoped that the development of shallots in North Padang Lawas District and other districts in North Sumatra can change the commodity paradigm of sources of inflation to be available throughout the season at competitive prices.

Biophysical characteristics of dry-climate upland and agriculture development challenges in West Nusa Tenggara and East Nusa Tenggara Provinces

A Suriadi1, A Mulyani2 and R E Subandiono3

1 Assessment Institute for Agricultural Technology (BPTP NTB)
2 Indonesian Centre for Agricultural Land Resources Research and Development

Email: ahmadsuriadi@pertanian.go.id

Abstract. West Nusa Tenggara Province (NTB) and East Nusa Tenggara (NTT) have an area of about 6.6 million ha, of which largest part (95%) categorized as dry-climate with annual rainfall <2,000 mm. In fact, about 1.56 million ha or 25% of the area has 8-10 dry months with annual rainfall <1,000 mm. To identify the soil characteristic in order to develop dry agriculture challenges, soil analyses have been conducted in 12 soil profile, 57 composite soil sample and undisturbed soil. Soil samples were analyzed for chemical properties such as texture, pH, nutrient content, C, N, P, K, cations exchangeable, cation exchange capacity (CEC), basa saturated (BS), and for physical properties such as water content, bulk density, total pore space, water holding capacity and permeability. The results showed good fertility status at three islands which is characterized by
neutral to basic soil acidity, medium to high P and K total content, high sum of cations, high CEC and high to very high BS, except for several observation at South West Sumba and West Sumba, which have acidic pH caused by andesitic lava parent material and have >2000 mm rainfall that lead to high leaching. From 57 composite soil sample showed correlation among chemical and physical properties, such as texture, organic-C, CEC, bulk density (BD), total pore space and water content. The higher sand content lead to smaller CEC. The higher organic-C content, smaller BD but higher total pore space. Soil texture may influence water content where the higher sand content, the lesser capacity to hold water and nutrient. Fertility status of the three islands was quite good but low organic carbon (OC) content which indicated special attention to improve soil quality in all islands. Thus land management of upland dry-climate area should be focused on surface water availability (pond, borehole, river) and conservation agriculture. Water supply availability during the dry season will be important for upland dry-climate agriculture development especially for short-lived vegetable crops to increase farmers daily incomes.

Cation ratio of intensified lowland rice in Java island and it’s relation to other soil nutrients

A Kasno, D Setyorini and L R Widowati

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

Email: antkasno@gmail.com

Abstract. The soil cation ratio is the result of the interaction of various factors, including soil acidity, C-organic content, clay minerals, and land management. Paddy soil in central intensified paddy rice generally have near-neutral soil pH (6.19), low organic C (1.63%) with very intensive management, and low Al³⁺ content in the soils. This paper aims to study the cation ratio in intensification paddy fields in Java and its relationship with the availability of other nutrients. Soil chemical data is obtained by collecting data from soil survey for land suitability map, surveys for soil nutrient status maps, and also from research results that have been published. The results showed that average of cation saturation ratio in paddy soils in Java Ca:Mg:K is 70.8:24.5:1.5. The content of Ca, Mg, K and Na varies from provinces in Java, the Ca content is higher, especially those soil made from calcareous parent material. The content of Ca> 50.0 cmol(+)(kg⁻¹) is found in Grobogan, Bojonegoro, and Gunung Kidul. The dominance of Ca cations in the soil can be known if the saturation of Ca> 70%, there are 40 districts spread from West Java, Central Java, Yogyakarta and East Java. Ca saturation is positively correlated with pH, P-Bray, CEC soil, and negatively correlated with C-organic, N-total, Mg, K and Na saturation. Based on the regression there is a significant negative relationship between Ca saturation and Mg saturation with R² = 0.92 and there is a weak negative relationship with K and Na saturation with R² is 0.19 and 0.09. The cation saturation ratio needs to be taken consideration when fertilizing K nutrients for lowland rice.
Physiological condition of North Sumatera local sheep in several districts

A Destomo¹, A Febretrisiana¹, Anwar¹ and B Tiesnamurти²

¹ Indonesian Research Institute for Goat Production, North Sumatera, Indonesia
² Indonesian Centre for Animal Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: Alfiandestomo@gmail.com

Abstract. North Sumatra, has great potential to support livestock production in Indonesia, because many farmers raise sheep in the plantation area. The aim of this study was to determine the effect of the area, production system, age, sex and body weight on the physiology of the sheep (heart rate, respiratory rate and rectal temperature). The study was conducted in December 2019 using sampling methods in several groups of farmers in five areas. The results showed that the different areas, production system and age of had significant influence (P <0.05) both on heart rate, respiratory rate and on rectal temperature. While the breed of sheep has no effect on heart rate (average of 49.2 times/minute) and respiratory rate (average 49.2 times/minute). However, local sheep's rectal temperature was higher (P <0.05) when compared to St. Croix crossbreed sheep. (39.5 °C and 39.1 °C, respectively). The body weight also appeared to affect (P <0.05) heart rate, respiratory rate and rectal temperature, respectively. This study shows that the physiological condition of the local sheep kept in several areas in North Sumatera is influenced by various factors, including the location of sheep raising, management practices, sex, age, body weight, and breeds of sheep.

Properties of soils from different landform and parent material in Kundur Island, Riau Islands Province

P Kricella, M M Pratamaningsih and R E Subandiono

Indonesian Centre for Agricultural Land Resource Research Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: pronikakricella@pertanian.go.id

Abstract. Information of soil properties derived from different landform and parent material can be used to establish agricultural development strategy. The aim of this study was to determine the properties of the soil in Kundur Island. Soil survey was conducted to determine soils distribution and their properties. Total of 24 samples from 8 pedons representing each landform and parent material were taken for laboratory analysis. The results showed that soils in Kundur Island were lying in granite intrusion, alluvial, peat, and fluviomarin landform. The soils were Kambisol, Gleisol, Organosol, Podsolik, Aluvial, and Regosol. The soil in peatland was acidic to very acidic (pH 2.6-3.5) with very high Al saturation (62-81%) due to mineral enrichment. Regosol derived from granite intrusion has higher carbon content and slightly lower base saturation compared to Kambisol and Podsolik which were derived from the same parent material. The soil in fluviomarin contains very high exchangeable Na (12.9-18.0 cmolc/kg) due to the influence of saline water. For the agricultural development in Kundur Island, soil derived from granite intrusion and peat need liming to suppress
soil acidity while soil derived from clay and sand deposits in alluvial and fluviomarine should consider management of saline water intrusion.

Contribution of sulphidic material in the substratum on the acidification of peat soils from Central Kalimantan, Indonesia

Arifin Fahmi¹, Anna Hairani¹, Ani Susilawati¹, Bostang Radjagukguk³, Benito H Purwanto³, Eko Hanudin² and Muhrizal Sarwani²

¹ Indonesian Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjarbaru, Indonesia
² Indonesian Center for Agricultural Land Resources Resesarch and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
³ Faculty of Agriculture, Gadjah Mada University, Yogyakarta, Indonesia

E-mail: fahmi.nbl@gmail.com

Abstract. A part of tropical peatlands developed above on sulfidic material. Most of them in dome form, the convex shape causes variation in groundwater level (GWL) fluctuation and their thickness tend to increase with increasing distance from the river. Water level fluctuation in peatlands may influence on peat soil geochemistry such as soil acidity and soil reduction-oxidation (redox). Differentiation in GWL and peat thickness may lead fluctuate of oxidation intensity of sulfidic material that lies below peat layer. This research was conducted in order to evaluate the contribution of sulphidic materials substratum on peat soils acidification as well as their acidity dynamic. With this information, we will have a better management of peatlands especially considering the peat layer thickness and hydrological condition. The study sites was at Pangkoh IX, Pulang Pisau District, Central Kalimantan, Indonesia, previously, was an ex-area of timber industrial company. The land was planted with Belangeran (Shorea Belangeran), but due to fire, most of the area now covered by wild vegetation such as alang-alang (Imperata cylindrica), rubber (Hevea sp), karamunting (Melastoma sp), acacia (Acacia mangium), gelam (Melaleuca leucadendron), kelakai (Logidium), perupuk (Phragmites sp), banta (Kersia), and some types of shrub. At the present, peatlands with various thickness and mineral soil is found in the area, the perfect place for this study with various thickness of peat layer. This research was conducted on deep peatland (Deep), moderate peatland (Moderate), shallow peatland (Shallow), peaty acid sulphate soil (PASS) and potential acid sulphate soil (ASS), shallow peatland which all of peat layers were removed (SP 0) and shallow peatland which partially of peat layers were removed (SP 0.5). Soil pH and redox potential (Eh) were monitored and observed on three season i.e. during on wet season (W), transition from wet to dry season (T), and dry season (D). The results showed that interaction of peat layer and sulfidic materials influence on soil pH of peatland with sulfidic materials as substratum, in which the pattern of soil pH fluctuation were following the GWL fluctuations. Nevertheless, the soil pH in peatland with sulfidic material as substratum was not only influenced by GWL fluctuations as related with decomposition activity, but rather caused by large impact of the pH changes from sulfidic material that located below peat layer. Hence all management for utilization and conservation of peatland should be based on protection of the peatland from subsidence, through maintaining GWL.
Mapping spatial distribution of carbon stock & thickness of tropical peatland using machine learning based on remote sensing: a case study in Lake Sentarum National Park Kapuas Hulu, West Kalimantan

Faizal Musthofa¹, Demetria A Putri², Fahrudin F Raharja³, M K Arrasyid⁴, Wirastuti Widyatmanti¹ and Sanjiwana Arjasakusuma¹

¹ Department of Geography Science Information Faculty of Geography, Gadjah Mada University, Yogyakarta, Indonesia
² Faculty of Forestry, Gadjah Mada University, Yogyakarta, Indonesia
³ Department of Mechanical Engineering Vocational School, Gadjah Mada University, Yogyakarta, Indonesia
⁴ Department of Economy Faculty of Economy & Bussines, Gadjah Mada University, Yogyakarta, Indonesia

Abstract. Indonesia is one of the countries with the largest area of tropical peatlands in the world. This wide peatland has a vital role in the carbon cycle and carbon storage in large quantities, so conservation in this area is needed. One effort to carry out conservation is to know the spatial distribution of carbon stocks in peatlands. This study aims to map the spatial distribution of carbon stocks based on peat thickness models using machine learning models such as Random Forest (RF), Quantile Regression Forest (QRF), and Cubist. This study uses a DEM (Digital Elevation Model) data and Radar image data. Digital stock carbon mapping is produced utilizing a peat thickness model, a random forest with a range of values from 0 to 120 Mg of 12.5 x 12.5 m unification pixels. The accuracy of the peat thickness model is calculated using three machine learning models based on RMSE and R² values. The RMSE values of the RF, QRF, and Cubist models are 48,304 cm, 54,368 cm, and 75,611 cm. The R² values of the RF, QRF, and Cubist models are 0.786, 0.729, and 0.511. Further justification for accuracy values is provided, focusing on evaluating the effectiveness of remote sensing for mapping tropical peatlands that are determined.

Assessing machine learning techniques for detailing soil map in semiarid tropical region

D Cahyana¹,², B Barus¹, Darmawan¹, B Mulyanto¹, Y Sulaeman² and E Yatno²

¹ Department of Soil Science and Land Resource, IPB University, Bogor, Indonesia
² Indonesian Centre for Agricultural Land Resources Research and Development, Bogor, Indonesia

E-mail: destika_cahyana@yahoo.com

Abstract. The major problem detailing soil map in large tropical country such as Indonesia is high cost and time consuming. Options need to be exercised including digital soil mapping techniques that make use available data coupling with predictive spatial modelling and map assessment. Machine learning technique is one of DSM methodology that explore spatial pattern and use this pattern to predict soil attribute. K-nearest neighbours (KNN), random forest (RF) and support vector
machine (SVM) are popular for detailing soil map in temperate country, but the application in tropical country is still limited. This study aimed to assess both machine learning techniques in detailing soil map from 1:50,000 to 1:25,000 scale in semiarid tropical region. We collated the existing soil map of 1:50,000 scale and derived environmental covariates representing soil forming factor from digital elevation model (DEM). A total of 72 training datasets originating from polygon soil map was used as input for these two machine learning to recognize pattern and predicted of soil class map in Timor Tengah Utara Regency, Indonesia. Our result showed that K-nearest neighbours (KNN) is more resemble with reference soil map with 1:25,000 scale than random forest (RF) and support vector machine (SVM) for all combination of environmental covariate. Overall accuracy and kappa coefficient by KNN for the best three predictive soil map are 74—75% and 0.62—0.63, respectively; and followed by SVM, 71—73% and 0.58—0.60; and the last by RF, 69—75% and 0.55—0.63. All of machine learnings also have limitation unable to recognize minor soil or inclusion soil that undetected in the legacy soil map.

Polder system water management on non-tidal swamp area based on water balance analysis

B Kartiwa¹, N Sutrisno¹, A Hamdani¹, W T Nugroho¹, I Muhardiono, Harmanto¹, I Yani, R Roland and Isro

¹ Indonesian Agroclimate and Hydrology Research Institute (IAHRI)
E-mail: budi.kartiwa@gmail.com

Abstract. Polder system is the key to manage floods in agricultural non-tidal swamp land. Infrastructures to support polder system integrated management include: regional drainage systems, retention ponds, dikes, pumps and/or gates. Pump requirement in an optimally managed polder system is influenced by the polder area, rainfall, soil, and hydrological characteristic. This article presents water balance models application in determining the number and operational duration of pumps to achieve effective and optimal polder function in controlling floods and inundation during the rainy season. This study was conducted in a palm-oil plantation located in lebak swamp area in Pawalutan, Banjang, Hulu Sungai Utara, during September 2016 to September 2017. Pump units and operation durations were calculated based on estimated inundation volumes depending on the water inlet and water balance. Seepage discharge was estimated using Darcy equation. Result of the recovery test measurements showed hydraulic conductivity value of 4.13x10-05 m/s, while the estimated seepage discharge was 8.62 m3/hour/Km. The pump requirement analysis indicated the need of 55 units of pump with 2500 m3/hour pump capacity to overcome inundation in the study site with 1417 ha inundated area. These pumps were distributed into 9 pump zones, with 4 to 10 pump units per zone.

Soil quality degradation under horticulture practices in volcanic slope soil, East Java – Indonesia
S Kurniawan¹, M P Agustina², R A Wiwaha², A Y Wijaya² and A D Fitria³

¹ Soil science department, Faculty of Agriculture, Universitas Brawijaya, Malang, Indonesia
² Agroecotechnology study program, Faculty of Agriculture, Universitas Brawijaya, Indonesia
³ Soil and water management study program, Faculty of Agriculture, Universitas Brawijaya, Indonesia

E-mail: syahrul.fp@ub.ac.id

Abstract. Volcanic slope soils in Indonesia may have degradation in quality due to forest conversion to intensive agriculture since more than three decades. This research aimed to assess soil characteristics from different land uses and slopes within Kali Kungkuk micro Watershed - East Java. Three different land uses, namely vegetable crops, apple orchard and forest were chosen as different land use factors, where each land use was examined in four slope classes (e.g 0-8 %, 8-15 %, 15-25 %, and > 25 %), except forest with three slopes area, and each plot repeated three times. Soil samples were taken from three sub-plots at 0-10, 10-30, and 30-50 cm. Variables measured include soil properties (i.e texture, bulk density, pH, CEC, soil nutrients). Horticulture practices (i.e vegetable crops and apple orchard) increased 27-40% of soil bulk density and decreased 17-65% soil nutrient content (i.e. C and N) as compared to forest. The impact of slope on soil fertility degradation was more pronounced in the forest soil as compared to horticulture land. Our study suggested the benefit of tree density and diversity, as well as proper soil management practices to slow down soil fertility degradation in the sloped areas using for agriculture systems.

Decreased lead metal in the soil with remediation treatment plus

W Purbalisa, I Zulaehah, D M W Paputri and S Wahyuni

Indonesian Agricultural Environmental Research Institute, Pati, Central Java, Indonesia

E-mail: purbalisa@gmail.com

Abstract. One of the pollutants on agricultural land is lead (Pb). Remediation is an effort to reduce contamination of heavy metals in agricultural soils. The treatment plus combines the use of ameliorant, microbial, nano technology, and botanical pesticides. This study aimed to determine lead content in the soil in remediation plus treatment of shallot for one planting season. The studies conducted at screen house on a pot scale using a completely randomized design with three replications and nine treatments, i.e. control/without organic fertilizer (P0), compost (P1), biochar-compost (P2), nano biochar-compost (P3), nano biochar-compost+microbial consortia (P4), compost+microbial consortia (P5), biochar-compost+microbial consortium (P6), biochar-compost+biopesticide (P7) and biochar-compost+Balingtan biological agents (P8). Biochar-compost (1: 4) used as base fertilizer at a dose of 2.5 tons/ha. Parameters observed were lead content in the soil at 7 DAP, 37 DAP and harvest, and lead content in shallot plants (leaves and tubers) after harvest. Lead analysis used wet ashing method measured by AAS (Atomic Absorption Spectrophotometer). The results showed the levels of lead metal in soil decreased from time to time except in the treatment of compost, while the levels of lead metal in shallots were still below of critical limit ≤ 0.5 mg/kg.
Agronomic changes and tolerance of soybean genotypes to waterlogged soil

A Krisnawati, S Nuryati and M M Adie

Indonesian Legume and Tuber Crops Research Institute, Malang, Indonesia

E-mail: aydakrisnawati@pertanian.go.id

Abstract. Stress from excess water is one of the most harmful limiting factors in soybean yield during the wet season. This research aimed was to study the response of soybean genotypes to waterlogging. Ten soybean genotypes were grown in the screen-house of the Indonesian Legume and Tuber Crops Research Institute (ILETRI), Malang, Indonesia. The experimental design was a randomized block with three replicates. Waterlogging treatment was imposed at 10 days after planting (dap). Water was allowed to stand for 30 days, and then pots were drained, and plants permitted to recover and grow to maturity. Parameters measured on individual plants: shoot length at 30 dap, root length at 30 dap, shoot dry weight at 30 dap, root dry weight at 30 dap, number of reproductive branches, plant height, number pods per plant, leaf chlorosis, and seed yield in grams per plant. Changes in the normal environment to waterlogging directly influence the agronomic character's performance of soybean plants. Soybean agronomic characters of shoot length, root length, shoot dry weight, root dry weight, the number of reproductive branches, plant height, and number pods per plant were most severely affected by waterlogging, and contribute to the seed yield reduction. Waterlogging during vegetative phase reduced seed yield by 93.82% (14.89 gr/plant in normal condition to 0.86 g/plant in waterlogged soil). A variety of Wilis produced high yield in both normal and stressed environments, hence, it categorized as tolerant to waterlogging in the vegetative phase. Variety of Sinabung considered as susceptible variety due to the highest yield reduction which reached 98.02%.

The productivity of fodder plants in ex-coal mine land

Sajimin, Harmini and A Fanindi

Indonesian Research Institute for Animal Production (IRIAP)

E-mail: djiemin@yahoo.com; hmini2011@gmail.com

Abstract. Rehabilitation of ex-coal mining land with animal feed plants (AFP) in addition to returning vegetation is also to improve the welfare of the local community. This study aims of the study are to determine the productivity of grass for pasture planted in the former coal mines. Soil samples were taken at three points in a composite manner and then analyzed by soil chemistry in the Soil Research Institute Laboratory. The experimental design was used Random Group (RBD), with plant varieties as treatments, namely Brachiaria humidicola (A), Cynodon dactilon (B), Paspalum notatum (C), Sienotaprum scundatum (D) and Pennisetum purpurium cv Mott (E). The grass is planted each in a 5 x 7 m plot and 0.5x 0.5 m spacing and harvest intervals are conducted every two months. Soil analysis results showed organic matter content (%) for C, N respectively 1.67 and 0.11, P and K content (%) 0.04 and 0.43 and minerals (ppm) for Ca, Mg, Na, Fe, Al, Mn, Cu, Zn and B: 0.08; 2.07; 0.60; 543.00; 24.33; 54.00; 6.01. The results of this study indicate that the type of animal feed plants has a significant effect (P <0.05) on biomass production (gram plot$^{-1}$) and plant height (cm). The highest forage production and grass height was purpureum cv Mott with a
production of $52716.57 \pm 6366.12$ grams plot$^{-1}$ and $104.26 \pm 2.46$ (cm). It was concluded that the *purpureum* cv Mott has the potential to be developed as grazing pasture on ex-coal mining land.

**Comparison study of growth and yield of three soybean varieties on acid upland soil of South Lampung**

D Diptaningsari$^1$ and A A Rivaie$^2$

$^1$ Assessment Institute for Agricultural Technology of Lampung, Ministry of Agriculture, Lampung, 35145, Indonesia  
$^2$ Assessment Institute for Agricultural Technology of Jakarta, Ministry of Agriculture, Jakarta, 12540, Indonesia  

E-mail: ddanarsi@gmail.com; arivinrivaie@yahoo.com

**Abstract.** Most of land area in Lampung is occupied by marginal acid upland soils. However, indeed, by application of suitable technology innovations, these marginal land areas have great potency for increasing national soybeans production. Until now, only a few field studies have been conducted on the adaptability of new soybean varieties on acid upland soils of Lampung. Therefore, the objectives of the present study were to compare the agronomic performance and the yield of three soybean varieties, namely Variety of Anjasmoro, Grobogan, and Dering 1 on an acid upland soil of South Lampung. The results showed that in general, based on the agronomic performance, the Variety of Anjasmoro was more adaptable compared with Grobogan and Dering-1 varieties. In addition, the Anjasmoro variety had a higher yield than that of the two other varieties.

**Adaptation of new superior varieties for soybean early maturity climate change in rain–filled rice fields**

Y Haryati$^1$, R Sari$^1$, I Noviana$^1$ and N Sunandar$^2$

$^1$ West Java Assessment Institute for Agricultural Technology, Bandung Barat, Indonesia  
$^2$ Indonesia Center for Agricultural Technologi Assessment and Development, Bogor, Indonesia  

E-mail: dotyhry@yahoo.com

**Abstract.** Adaptation is an effort to adjust technology, management and policies in the agricultural sector to global warming and climate change. One of the adaptation efforts to climate change is the application of adaptive technologies such as the use of improved varieties that are drought tolerant and early maturing. Therefore, it is necessary to study the adaptation of New Soybean Superior Varieties to anticipate climate change impact such as drought due to minimal rainfall and lack of support for irrigation facilities to meet water needs. The study was conducted in the Bantarjaya Farmer Group, Sanca Village, Gantar Subdistrict, Indramayu Regency in July - September 2019. The adaptive technology component applied is the recommendation technology in the form of the use of early maturing superior varieties (Dega-1), legowo planting method with spacing of 40 x 20 x 15 cm, organic fertilizer, inorganic fertilizer based on recommendations, and pest and disease
control based on IPM concept. The observed variables include components of growth and production. Observation data were analyzed using t-test with a technical cultivation of farmers' ways as a comparison. The results of the study showed that the Dega-1 variety that used recommended technology has a fairly high productivity of 1.25 tons ha⁻¹, adapts well in rain-fed rice fields and has the potential as an alternative to selecting superior soybean varieties in anticipation of limited water reserves in the dry season.

Increasing yield of sweetcorn through application of Mycorrhiza biofertilizer and additive intercropping with two peanut varieties

W Wangiyana, N Farida and I K Ngawit
Faculty of Agriculture, University of Mataram, Mataram, Lombok, Indonesia
E-mail: w.wangiyana@unram.ac.id

Abstract. This research was aimed to examine the effects of mycorrhiza biofertilizer application and additive intercropping with two varieties of peanuts on growth and yield of sweetcorn grown on a paddyfield following flooded rice crop in Dasan Tebu, West Lombok, Indonesia, in the dry season 2018. The experiment was designed according to Split Plot design with three blocks (replications) and two treatment factors, i.e. application of mycorrhiza biofertilizer containing mixed species of arbuscular mycorrhizal fungi (AMF) as the main plots (M₀= without, M₁= with AMF) and additive intercropping with peanut as the subplots (T₀= without intercropping, T₁= intercropping with peanut var. “Kelinci”, and T₂= intercropping with peanut var. “Bison”). The sweetcorn cobs were harvested at the dough maturity stage. Results indicated that application of mycorrhiza biofertilizer significantly increased stover dry weight, cob fresh weight, and number of green leaves per plant at harvest. Intercropping with peanut also affected those observation variables and the height of ear position in the stem, but between the peanut varieties tested, “Bison” was better than “Kelinci”. Although, there was no significant interaction, intercropping with “Bison” showed higher benefits of biofertilization than intercropping with “Kelinci” variety, both for stover dry weight and sweetcorn cob fresh weight.

Essence, necessity, principle and technique of assessing land quality by using land quality index plus for sustainable tropical agriculture land management

L M Rachman¹, F Hazra¹, D Suprayogi², Sukarman³ and B Mulyanto¹

¹ Department of Soil Science and Land Resource, Faculty of Agriculture, IPB University, Bogor, Indonesia
² Department of Soil Science, Faculty of Agriculture, Brawijaya University, Malang, Indonesia
Abstract. Interaction between components of land resources is very important to determine agro-ecosystem productivity and sustainability. Lands in the tropics, especially in Indonesia, are characterized by highly varied topography, climate, parent material; intensive weathering; and intensive erosion. Therefore, they are threatened with relatively rapid changes and degradation if not managed with appropriate land management techniques. Land evaluation techniques are needed to assess land quality accurately and comprehensively which also can evaluate very dynamically changes in land quality. Currently, a widely used land evaluation technique is only for evaluating land capability classes, especially for assessing land use and land suitability for certain commodities but it is unsuitable for assessing land quality changes. Beside produced in the qualitative form, it is also not sensitive and accurate to assess land quality changes and land degradation. For this reason, techniques are still needed to assess land quality comprehensively and accurately and also land changes that are quite dynamic by involving all land components. The purpose of this study was to formulate Land Quality Index Plus (LQI-Plus) which can accurately and comprehensively assess land quality and changes in a period due to a land use or management. LQI-Plus also demanded as a tool for agricultural planning.

*Turiman* innovation dissemination strategy to improve cropping index

R Purnamayani and M Mardiharini

Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

Email: rimacahyo@yahoo.com

Abstract. The main issue related to the role of innovations in the production of food crops is the lower adoption process, including in the cropping index innovation. One of the innovations in cropping index is the intercropping system of rice namely *turiman*. The aim of this study was to (1) analyse the factors that influence the process of *turiman* innovation dissemination and (2) to formulate an alternate innovation dissemination strategy. The study was conducted through a survey approach in five provinces (Java and Outside Java) in Indonesia, from June to December 2019. Number of respondents (n) was 56 farmers. Data analysis was performed descriptively and inferential using Partial Least Square (PLS). The results of the study indicated that farmers interested in the culture technology components of the *turiman* system, especially in the preparation and maintenance stages (indicated by higher loading factor values) than the technology components of harvest and post-harvest. The fit model has a value of AVE > 0.5, CR > 0.7, and $R^2 = 82.80\%$ (good). The future strategy needs to consider the support of local government, farmers' access to production facilities, capital, markets, and the dynamics of farmer groups.
Optimal irrigation at various soil types for soybean production

Ahmad Suriadi and Fitria Zulhaedar
Assessment Institute for Agricultural Technology of NTB
E-mail: ahmadsuriadi@pertanian.go.id

Abstract. Soybean is one of the leading national commodities where production is still lower than demand. A factor determining soybean production is irrigation. Water distribution officials at the secondary level mostly have not considered the type of soil in order to distribute water irrigation for soybean cultivation, especially in the second and third growing seasons. This study aimed to determine the optimal irrigation for soybean production at various types of soil in Lombok. The study was conducted in 3 texture types of soil: A. loam (located at Jonggat Sub-district of Central Lombok District), B. Clay (located at Praya Sub-district, Central Lombok District) and C. sandy loam (located at Selaparang Sub-district, Mataram City). Each soil type was applied for four treatments of irrigation water during the growing period of soybeans: A. 1 time (15 days after sowing, DAS); B. 2 times (15 and 45 DAS); C 3 times (15, 30 and 45 DAS) and D 4 times (15, 30, 45 and 60 DAS). The treatments were arranged in a randomized block design and repeated at least three times in each location. Irrigation frequency data was then mapped as a consideration in determining the irrigation schedule for each soil type. The results showed that water irrigation significantly influenced soybean yields although this was varied in each type of soil. In sandy soil types, the highest soybean yield was obtained at 4 times irrigation treatment. Whereas in loam soil type, the highest yield of soybean was obtained in the irrigation treatment 4 times although this was not significantly different with 3 times irrigation treatment. In the clay soil type, the highest soybean yield was obtained at 3 times irrigation treatment, even though this was not significantly different with 2 and 4 times irrigation treatments. The frequency of water supply was then extrapolated to a frequency irrigation map of soybean at various types of soil. The results of this study can be used as a reference for farmers and water distribution officials as a consideration in the water delivery schedule and increase soybean productivity in irrigated land.

Variability of harvest time of vegetable at different three altitudes based on heat unit analysis

Suciantini and A Pramudia
Indonesian Agro-climate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
E-mail: suciantini@yahoo.com

Abstract. Growth and development are very essential processes. All climatic elements have an effect on growth, while the dominant in development is mainly temperature. The concept of heat unit or degree days for seasonal crop is calculated from the planting stage until harvest. Heat unit analysis can help in determining the optimum harvest time. The purpose of this paper is to determine the harvest time for tomato, chili, cucumber and onion based on the accumulation of heat unit or degree days for vegetables growth in with different altitude, such as 56 meters (low), 577 meters (medium), and 1163 meters above sea level (high). The daily air temperature data was used for the
calculation. The reference cumulative value of the heat unit at harvest as follows; tomato is 1661 °C
days, chili is 1690 °C days, cucumber is 979.8 °C days and onion is 945.8 °C days. Based on the
analysis it is known that in lowland areas more past harvest than in the highlands, because
accumulated of heat more rapid is achieved. The harvest time in lowland and highland was vary, as
follows; around 41-53 days on tomatoes, 39-55 days on chilies, 23-36 days on cucumbers, and 22-
35 days on onions.

Land management of shallot planting of residual chlorpyrifos insecticide pollution with through remediation technology

Poniman, Indratin, A N Ardiwinata and S Rianto

Indonesian Agricultural Environment Researeh Institute (IAERI), Agriculture Agency of Indonesia

E-mail: poniman63ir@gmail.com

Abstract. Every chemical that fell to the ground almost certainly will become a residue, not
excluded agricultural insecticide chemicals. That the facts show in the management of crop
vegetables especially cultivation almost impossible without the use of chemical insecticides. This
fact then continues to grow to find a mitigation solution further of effects chemical insecticide
residues by remediation of land. Shallot plant is one type of plant which is its cultivation requires a
maximum of organism pest management (OPM). This demand then forcing farmers using
insecticides above average requirement other plants. To reduce chlorpyrifos insecticide residues in
the onion field research has been carried out in Naru Village, Sape subdistrict, and Bima District in
June until August 2018. The research was design in a Randomized Group (RBD), three replications,
and six treatments. The treatments consist of: (1) farmer methods, (2) urea coated biochar, (3) urea
coated biochar enriched with microbial consortia, (4) microbial consortia (microbial consortia 2 L /ha),
(5) urea coated nano biochar, and (6) urea coated enriched with microbial consortia. Urea coated
nano biochar of treatment can reduce chlorpyrifos residues the best level of the accommodating
shallot of yield results.

Status of soil organic carbon and its management recommendation for rice plants at four experiment stations

L R Widowati1, P Sasmita2, D Setyorini1 and A Jamil3

1 Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
2 Indonesian Center for Rice Research, Indonesian Agency for Agricultural Research and Development, Subang, Indonesia
3 Indonesian Agricultural Quarantine Agency, Ministry of Agriculture, Indonesia

E-mail: ladiyanirwidowati@gmail.com
Abstract. It is undeniable that the function and role of organic material is very important for the fertility of rice fields. Utilization of in situ material and its management must continue to be done both directly and indirectly. A survey, mapping and compilation of recommendations for paddy land have been carried out in four (4) Experimental Station of Indonesian Center for Rice Research in 2015-2016. The aim is to study the performance of C-organic at the four Experiment Stations and develop management recommendations for sustainable land with high productivity. The results of the study are as follows: map of C-organic content of paddy soils, at Sukamandi Experiment Station from 318.44 ha of paddy fields, almost entirely 314.37 ha (98.72%) having low C-organic content, only 4.07 ha (1.28%) has moderate C-organic content, and there is no paddy field with high C-organic content. Pusakanagara Experimental Station has 37.50 ha of paddy fields, low levels of organic C-8.68 ha (41.75%), and moderate C-organic 12.12 ha (58.25%). The Experimental Garden of Kuningan has a rice field area of 20.80 ha, low levels of organic C-8.68 ha (41.75%), and moderate C-organic 12.12 ha (58.25%). Muara Experiment Station has 20.00 ha of paddy fields, low levels of organic C-8.14 ha (40.72%), and moderate levels of C-organic 11.86 ha (59.28%). Of the four Experiment Stations there are no locations with high C-organic content. Therefore, for those with moderate and low C-organic status, good organic material management must be carried out every planting season, with a minimum dose of 5 tons of fresh straw ha⁻¹. It would be better if combined with cow manure.

The use of botanical insecticide based on local resources to increase swamp rice yield in South Kalimantan

M T Sutriadi, R Kartikawati and S Wahyuni

Indonesian Agricultural Environment Research Institute, Jl. Raya Jakenan Jaken KM 05 Jakenan Pati 59182

Email: teddysoma@yahoo.com

Abstract. The use of botanical insecticide is one of the ways to reduce the negative impact on the agricultural environment due to chemical insecticide applications. Some plants have identified as botanical insecticide such as Azadirachta indica (Neem), Swietenia mahagoni (Mahagony), Aegle marmelos (Maja fruit), etc. This study was conducted as a part of the demonstration plot located in the swamp rice field in South Kalimantan. The objective of the study was to increase the swamp rice yield by controlling plant pests and disease based on local resources environmental friendly. The plot experiment was arranged in a randomized block design with three treatments and six replications. The treatments consisted of fully RAISA technology (P1), RAISA + Balingtan botanical insecticide (P2), and RAISA + Galam botanical insecticide (P3). In P1, plant insect was controlled using chemical insecticide; in P2 using extract of Neem and Mahagony leaves, water, turmeric, cattle urine, liquid smoke, and Bacillus aryabhattai; and in P3 the botanical insecticide was extracted from leaves of Galam (Melaleuca leucadendron), cattle urine, water, and Bacillus aryabhattai. The result showed that the highest yield rice was produced in P2 (6.5 ton ha⁻¹ unhusked dry rice), then P3 and P1 were 5.5 and 5.1 ton ha⁻¹ unhusked dry rice, respectively. The highest amount of insect was found at P1, P3 and P2, respectively.
The role of communal pasture for sustainable grazing management: A case in Lar Badi, Sumbawa

M I Shiddieq¹, B Tiesnamurti¹, Y Widiawati² and R A Saptati¹

¹Indonesian Center for Animal Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Indonesian Research Institute for Animal Production, Indonesian Agency for Agricultural Research and Development, Ciawi, Indonesia

E-mail: m.ikhsan.shiddieqy@gmail.com

Abstract. Cattle farming plays a great role in most economic and social societies in Sumbawa, West Nusa Tenggara, Indonesia. In this area, the majority of cattle are grazed extensively in an open grassland. West Nusa Tenggara is home to many natural pastures, which is commonly used for cattle grazing. The pasture owned and managed by groups of farmers and passed down from generation to generation. The lar (local language for pasture) it is not only a grassland, but also a tradition. The aim of this research was to evaluate the role of communal pasture for sustainable grazing management. Field verification took place in Lar Badi, Sumbawa, West Nusa Tenggara, which is one out of 59 lars in Sumbawa. Data related to pasture condition, beneficiary farmers and institutional management have been collected. Lar Badi has a total area 460 of hectares, where Directorate General of Livestock and Animal Health has a program to improve 100 hectares of it with pasture grasses and legumes. This program introduced species of grass and legumes, such as Brachiaria ruziziensis, Lamtoro Taramba and Leucaena. The estimated number of beneficiary farmers is 177 farmers from 10 of farmer groups. The total number of cattle owned by the farmers is 3,200 heads with 2,941 cattle and 259 buffalos. Cattle graze in Lar Badi for 10-12 hours during the day. The study revealed that the community have optimized the use of communal pasture and practiced rotational grazing to support sustainable grazing management.

Remote sensing and GIS application for mapping data base on sustainable agriculture land in Denpasar City

I Lanya and T J Manalu

Agroecotechnology Study Program, Faculty of Agriculture, Udayana University, Bali Indonesia

E-mail indahnet@yahoo.co.id

Abstract. The Government of Indonesia has issued legislation in an effort to protect sustainable food agricultural land (SFAL), supplemented by Ministerial Regulation, the aim is for national food security and sovereignty. The accuracy of paddy field wide data is often different from one institution to another, affecting the national food balance. Inventory and description of geospatial-based agricultural data can accelerate agricultural development and food self-sufficiency. This study aims to map land resources (LR), human resources (HR), artificial resources (MR), and agricultural resources (AR). Research methods include analysis of high-resolution Word View 2018 satellite imagery, field surveys, and thematic mapping. QGIS 3.6 software, SAS Planet, and Locus GIS. LR inventory (paddy area in three subak 59.8 ha, Typic Tropaquepts, rainfall of 1500-2000 mm/year,
origin slope 3-8%, very suitable for lowland rice, suitable for horticulture). HR (farmer owner 82 people, farmer cultivating 88 people, farmer age 50-75 years, level of education graduated from elementary school). MR (4800 m tertiary irrigation canal, 2470 m jogging tract, 5 tractors), Cropping pattern of rice-paddy-horticulture, productivity of 6.5 tons of dry grain harvest/ha. Maps and information systems for Subak paddy fields, land suitability, and geospatial-based land tenure information are produced as a database of SFAL.

Composition of media that promotes seedling growth and root nodules of jengkol (*Pithecellobium lobatum* Benth)

D Emilda, M Andini, Martias, B Hariyanto and Sunyoto

Indonesian Tropical Fruit Research Institute, Indonesian Agency for Agricultural Research and Development, Solok, Indonesia

E-mail: deni_emild@yahoo.co.id

**Abstract.** Jengkol (*Pithecellobium lobatum* Benth) is a type of vegetable that is popular in Indonesia, especially in West Sumatra. This plant has not been cultivated intensively and there is not much information about its cultivation techniques. Jengkol is included in the Fabaceae family which its relative, *P. dulce* (Roxb) Benth, is known to have root nodules that are able to promote plant growth. In addition, mycorrhizae are also reported to be able to increase growth in various plants. This research was conducted at Indonesian Tropical Fruit Research Institute from September 2017 to April 2018. The aim of the study was to find out the best media to promote plant growth and the presence of root nodules on Jengkol seedlings. This research was arranged in a randomized block design with 10 treatments and 3 replications. The treatments were 10 compositions of media that consisted of a combination of two or three materials, namely: soil, manure, compost, and rice husk charcoal with a ratio of 1:1 without and with the addition of mycorrhizae. The results showed that the best media to promote Jengkol seedling growth was soil: rice husk charcoal 1:1 (v/v) and the highest number of root nodules was also found in this media composition. There was no significant growth difference in Jengkol seedlings until 6 months after planting due to the addition of mycorrhizae.

Increasing of tidal swamp land productivity through the used of new superior rice varieties and the planting system

Muhamad Hidayanto¹, Yossita Fiana¹, Akas Pinaringan S and Sumarmiyati

¹ Assessment Institute for Agricultural Technology of East Kalimantan, Indonesian Agency for Agricultural Research and Development, Samarinda, Indonesia

² Faculty of Agriculture, University of August 17 1945, Samarinda, Indonesia

E-mail: mhidayanto@yahoo.com
Abstract. The potential of swamps land in Indonesia is large enough for agricultural development, but until now the productivity of the land is still low and has not been used optimally. Swamp land optimization can be done through the use of new superior varieties (VUB) of rice and through the application of a planting system. The study was conducted on tidal swamps in Food Estate Area Bulungan Regency 2016-2017. The aim of the study is to increase swampland productivity through the use of new superior varieties (VUB) of rice and through the planting system. The study was carried out through the introduction of New Superior Varieties (VUB) of swamp rice (Inbrida Padi Rawa-Inpara), namely Inpara 1, 2, 4, 5 and local varieties as a comparison, with the legowo row planting system (Jarwo) 2: 1. The dosage of lime and fertilizer are dolomite 1000 kg ha\(^{-1}\), NPK 250 kg ha\(^{-1}\), and Urea fertilizer 100 kg ha\(^{-1}\). The data collected is primary farm data and economic benefits and feasibility are calculated. Economic feasibility is calculated by looking at the break even point value and the BCR ratio. The results showed that the use of new superior varieties Inpara 4 with the Legowo Row (Jarwo) planting system 2: 1 was BCR value> 1, whereas if using local varieties BCR<1.

Developing and promoting bamboo agroforestry approach to support the community-based bamboo industry in Indonesia

D Ekawati\(^1\), A Rabik\(^2\), M Tanuhandaru\(^3\), D Djaenudin\(^1\), B D Prasetyo\(^1\), Handoyo\(^1\), Indartik\(^1\), E Y Suryandari\(^1\) and G Kartikasari\(^1\)

\(^1\)Center for Research and Development on Social, Economic, Policy and Climate Change, Ministry of Environment and Forestry, Bogor, Indonesia
\(^2\)Environmental Bamboo Foundation, Denpasar, Indonesia

E-mail: desyahputra2001@gmail.com

Abstract. Bamboo has been part of Indonesian history, socio-culture and community livelihoods. It is mostly found in their mixed garden or “kebun campuran”, which grows with other plants e.g. trees, shrubs, palms and understorey species. Bamboo has been managed without a cultivation system and without intensive maintenance. Currently bamboo can be processed into various wood substitute products with appropriate technologies and innovations, called “engineered bamboo”. These products have opportunities of increasing demand in the global market as wood supply steadily decreases. This study was conducted to determine opportunities and challenges in developing and promoting a community-agroforestry based bamboo industry as part of supply chains for engineered bamboo. The method used participatory action research, SWOT analysis, policy analysis and multidisciplinary expert analysis. The results show that the paradigm existing in the community and among stakeholders share a traditional mind-set. However, communities that already owned social capital, proved that they can strengthen and drive modern bamboo utilisations. Community capacity enhancements such as sustainable bamboo management and skills of industrial culture are required. This study provides appropriate recommendations on formulating policy strategies and regulations in order to ensure bamboo remains as community agroforestry commodity to improve livelihood and contribute to village inclusive economic growth.
Limitation factors analysis of citrus fruit productivity (Case in Pal 7 Village, Bermani Ulu Raya District, Rejang Lebong District)

I Calista, Nurmegawati, M Puspitasari, Miswarti, K Dinata, W Mikasari, R Hartono, S Yuliasari and Y Sastro

Bengkulu Assessment Institute for Agricultural Technology, Indonesian Agency for Agricultural Research and Development, Bengkulu, Indonesia

Email: Irmaca_list@yahoo.com

Abstract. Environmental factors, especially climate, soil and pest attack, are limiting factors in citrus production. The purpose of this study was to determine the limiting factors on RGL citrus productivity. This research was carried out in 2019 in Pal VII Village, Bermani Ulu Raya District, Rejang Lebong Regency. Data collected from secondary and primary data are climate data, soil characteristics and orange HPT identification, which are then analyzed descriptively. The results showed that the productivity of citrus orchards in Pal VII Village, Bermani Ulu Raya District was influenced by high rainfall during the fruiting period. Another limiting factor is the relatively low soil nutrient content because farmers generally do not apply fertilization technology following crop needs. Pests and diseases that have the potential to reduce the productivity and quality of citrus fruits are fruit borers, fruit flies and scurvy, and climate factors also influence their presence.

Distribution of endosulfan insecticide residues on intensive shallot agriculture farming in Brebes Regency

Indratin¹, Poniman¹, Sukarjo¹ and Muhamad Hilmi²

¹ Indonesian Agricultural Environment Research Institute (IAERI), Indonesian Agency for Agricultural Research and Development, Pati, Indonesia
² Department of Oceanography, Faculty of Fisheries and Marine Sciences, Diponegoro University Semarang, Indonesia

E-mail: indratin.99@gmail.com

Abstract. Endosulfan is an insecticide from the organochlorine group which was last banned in Indonesia since 2013. Endosulfan insecticide is very effective in controlling for organisms pest management (OPM) and is widely used, including for controlling pest of shallot plants. Research to determine the distribution of endosulfan insecticides residues has been carried out in three villages representing intensive shallot planting areas in Brebes Regency. The three villages are in the villages of Wanasari, Siasem, and Pebatan of the Wanasari sub-District. In the village, 3-4 times shallots are planting in one year and crops are used once. Soil sampling is done at the beginning of the dry season (between June until July 2019). The area of the spread that is the object of sampling is 1,853 ha. Analysis of endosulfan insecticides residues was carried out in the integrated laboratory of the Indonesian Agricultural Environment Research Institute (IAERI), using the QuEChERS method. From 14 soil sampling points, eleven of them were detected containing endosulfan residues exceeding Maximum Residues Limit (MRLs) of 0.0085 mg/kg. The distribution of endosulfan
residues was mapping using the spline interpolation method and divided into five categories, namely (very low, low, medium, high, very high). Interpolation showed 68.47% of the land experienced very high endosulfan residual pollution (> 0.0117 mg/kg).

Identification of organochlorine insecticide contamination on shallots land in Nganjuk Regency, East Java Province, Indonesia

Indratin, S Wahyuni, W Purbalisa, Poniman and M T Sutriadi

Indonesian Agricultural Environmental Institute (IAERI), Agriculture Agency of Indonesia

E-mail: indratin.99@gmail.com

Abstract. The high and excessive use of pesticides has reportedly contaminated the shallot land in Nganjuk Regency, East Java Province, Indonesia. Managing the excessive use of pesticides needs to be done in order to control environmental pollution as a form of national food security program. The aim of this study was to identify organochlorine contamination in the shallot land of Nganjuk Regency. The study was conducted in the field and laboratory. The field research was carried out in Nganjuk Regency, East Java. The analysis of pesticide residues is performed in the Integrated Laboratory of the Indonesian Agricultural Environment Research Institute (IAERI), Pati, Indonesia. The research was held from January to May 2020. The data collection method used were the survey method and interview of farmers in the field. The soil samples were taken from 13 sampling points located in 5 Districts in Nganjuk Regency, East Java, Indonesia. The soil samples in shallot fields which has been obtained from each field were tested for organochlorine insecticide residues using the QuEChERS method. The results showed that from 13 points of soil samples taken, organochlorine contamination was detected by 4 samples (30.77%) with a concentration of <LOD - 0.2249 ppm.

Productivity of five species herbaceous legume on the post tin mining area as forage source in Bangka Island

Sajimin, A.Fanindi, Harmini and N D Purwantari

Indonesian Reseach Institute for Animal Production

E-mail: seminarbbsdlp@gmail.com

Abstract. Tin mining activities, in contributing to the state revenues, at the same time also caused to the damage to the environment. To rehabilitate this land, in addition to the necessary efforts to improve soil conditions, success is also determined by the selection of appropriate forage species. This study was aimed to determine the adaptability of some herbaceous legumes grown on the soil in post tin mining areas as forage source. The forage legumes tested were Arachis pintoi, Clitoria
ternatea, Stylosanthes guianensis, Centrosema pascuorum cv Bundey, and Lab-lab purpureus. Forage production, quality and its carrying capacity. Analysis of the forage nutrition and digestibility of dry matter and organic matter the laboratory. The growth rate at transplanting of five legumes A.pintoi, C.terntatea, and S.guianensis, was 100%. The highest total fresh yields forage one year was S. guianensis 514.29 kg/plot with a carrying capacity of 17.61 AU (animal unit) and 74.02% dry matter digestibility and 73.96% organic matter, while the lowest L.purpleus. The highest crude protein was 18.62 % (C.terntatea). At the age of one year in the field, 3 species of herbaceous legumes (C.terntatea, S.guianensis and A.pintoi) showed the average ability of the high life of up to 100%, where as L.purpureus, C. pascuorum cv Bundey were totally death after the third harvest. In general, the type of legume selected in this trial showed good adaptability.

Genetic variability, heritability, and corelation for yield and yield components in waterlogging-tolerant hybrid maize

Ahmad Muliadi, Roy Effendi and Muh Azrai

Indonesian Cereals Research Institute

E-mail: ahdimb@ymail.com

Abstract. Maize (Zea mays L.) is cultivated in various agroecology ranging from subtropical to cooler temperate regions. Therefore, maize are inevitable from various types of biotic and abiotic stresses. Waterlogging is one of the abiotic stresses caused by heavy rainfall or high ground water table or heavy soil texture which can be one of the most important constraint for maize production and productivity. This research was conducted in two locations, namely in the provinces of Southeast Sulawesi and Lampung, Indonesia. The research material consisted of 8 hybrids (G8, G9, G21, G41, G28, L12 / MR14, L15 / MR14, and L19 / MR14) and 2 check varieties (Bima 19 and Bisi 18). The experiment was laid out in randomized complete block design with three replications. The analysis of variance showed highly significant differences for days to 50% silking, ear length, ear diameter, number of kernel rows per ear, and number of kernel per row, while the thousand kernel weights and grain yield showed significant differences. The G41 hybrid shows the days to 50% tasseling (52.83 days) and the days to 50% silking (53.83 days) the most early, has a shelling percentage (84%) and thousand kernel weight (341.54 g) was high. The shortest hybrid is L19 / MR14 (182.95 cm) with an ear height of 89.3 cm. The ratio of plant height with ear height ranges from 48.08% - 50.27%. The L15 / MR15 hybrid has the longest ear (17.56 cm), and the G8 hybrid has the largest ear diameter (4.88 cm). The highest number of kernel row per ear was L19 / MR14 and the highest number of kernel per row was L15/MR14. The L19/MR14 hybrids had the highest grain yield (9.64 t/ha), followed by L15/MR14 hybrids (9.30 t/ha) and L12/MR14 (9.20 t/ha). Genotypic variants ranged from 0.00 (plant height) to 15.98 (thousand kernel weights) while phenotypic variant ranged from 0.06 (shelling percentage) to 20.43 (thousand kernel weights). High estimates for the broad sense heritability were found in various plant characters under study. Grain yields showed a positive and significant correlation with days to 50% tasseling and silking, shelling percentage, thousand kernel weight, ear length, ear diameter, number of kernel rows per ear and number of kernel per row. The thousand kernel weight has a positive and large direct effect on the grain yield and is almost the same as the correlation value, so that the character could be used as an index in the selection of high grain yield per plant.
Response of Andisols to intensive agricultural land uses: Implication on changes in accumulation and availability of P and colloidal surface charge

M Anda, A Kasno, C B Ginting, P A Barus and S Purwanto

Indonesian Centre for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: marksandas@yahoo.com

Abstract. Andisols have unique properties and have been intensively used for agriculture owing to their high bearing capacity. The response of Andisols to intensive agricultural practices were not fully explored although intensive cultivation has been practiced for a long period of time. The objective of the review is to bring together all findings, which have been documented with the focus on changes in soil organic matter, P content and retention, and colloidal surface charge. The Andisols contain an abundance of nano-clay consisting mainly of hollow allophane spherules forming globular aggregates of about 100 nm in diameter, indicating the large reactive surface area. Huge quantity of P have been accumulated in uppermost two soil horizons, deriving from residue of continuous application P fertilizer every crop growing season. Andisols have strong ability to retain organic C through ligand exchange of metal hydroxyl functional groups. The soil colloids bear positive charge at soil pH less than 5. The colloidal negative charge continuously increased with increasing soil pH over 5.0. Hence, the Andisols should be managed by maintaining soil pH above pH 5.0 by adding lime or compost to allow soil capability to retain cation and reduce P fixation. Nano-clay has positive impact on carbon stabilization and therefore C sequestration.

Developing sustainable smallholders of cinnamon (Cinnamomum burmannii Blume) by intercropping of patchouli and coffee in the Regency of Kerinci, the Province of Jambi

R A Permadi and A Wahyudi

Indonesian Spice and Medicinal Crops Research Institute

E-mail: redy.aditya@gmail.com; aguswahyudi211@gmail.com

Abstract. Cinnamon is one of the spices traded in the international market, Indonesia supplies about 60% and the others come from China, Vietnam, Srilanka, and Madagascar. In Indonesia, the productions of cinnamon are mostly conducted by smallholders in The Regency of Kerinci, The Province of Jambi and The Province of West Sumatera. Cinnamon is included in the Genus Cinnamomum (Lauraceae) and varieties of C. burmanii Blume, which differ from other countries, such as C. zeylanicum from Srilanka. The problem of cinnamon is harvested from the bark, so it should be cut out of the trunk, and must wait about 12 years to harvest. In the case of higher prices, it encourages farmers to harvest more rapidly and expand, so that there are extensive planting and encouraging the occurrence of shifting cultivation, thereby threatening the sustainability of land resources. This review aims to assess the possibilities to encourage farmers to plant other crops such
as patchouli (fast-yielding crops) and coffee (perennial crops that can produce continually) that can be technically done, and can support the sustainability of land resources and contribute to farmers' income. In accordance with the suitability of the land and climate, patchouli is suitable to be cultivated especially for land with slope of less than 15% after harvesting cinnamon and coffee (shady crop) can be used to intercrop among cinnamon trees.

Theme 2: Soil, water, and crop management and the socio-economic dimensions (SWCM)

Use *green super rice* varieties and harvest waste on sustainable rice farming in tidal swamp land

Susilawati¹, Syamsudin¹ and R Qomariah²

¹ Assessment Institute of Agricultural Technology, Indonesian Agency for Agricultural Research and Development, Central Kalimantan, Indonesia
² Assessment Institute of Agricultural Technology, Indonesian Agency for Agricultural Research and Development, South Kalimantan, Indonesia

E-mail: kalteng_bptp@yahoo.com

**Abstract.** Increased rice productivity followed by environmental sustainability is the principle of applying environmentally friendly agricultural systems. The development of this system on tidal swamp land is guided by the synergistic agricultural cultivation between technology components through integrated crop and nutrient management. Several environmental preservation measures on rice farming in tidal swamp land have been carried out, including planting adaptive superior varieties and returning in-situ harvesting waste. One of the superior rice varieties of environmentally friendly rice that is used is the Green Super Rice (GSR) rice group, namely Inpari 42 and Inpari 43 and the provision of soil ammends in situ by utilizing crop waste. The activity carried out on the tidal swamp land of Central and South Kalimantan is aimed at obtaining information on tidal land improvement technology through environmental engineering of growing plants and increasing rice productivity on tidal land that is environmentally friendly and sustainable. The method used is on farm and participatory research farmers conducted by evaluating the application of technology packages on tidal land, which involves 10 farmers on an area of 10 ha. The results obtained show that the Inpari 42 variety is the preferred variety of farmers compared to the Inpari 43 variety.

Water saving irrigation management for mung bean in acid soil
H Sosiawan and S H Adi

Indonesian Agroclimate and Hidrology Research Institute (IAHRI), Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: hsosiawan30@gmail.com; setyono.hari@gmail.com

Abstract. Indonesia dry agricultural lands development requires support of appropriate water-saving irrigation technology to cope water shortages that has become common problem for farmers. Especially for mung bean, irrigation management implementing crop-water requirement is needed due to the short vegetation phase and rapid growing period where water shortages could increase the risk of crop failure. This research conducted mung bean irrigation experiment in acid soil with two factors completely randomized design in a greenhouse. The first factor was irrigation volume, i.e., 40, 60, 80 and 100 % of the crop water requirement, while the second factor was mung bean varieties, i.e., Merak and Vima 1, with three replicates respectively. The results showed that drip irrigation reduced the negative effects of water salinity on mung bean yields and increased water use efficiency. Moreover, water requirement for mung bean during the growth period was 320.72 mm, with tolerable water stress just reached up to 80% of the standard water requirement. The response of irrigation water to crop height was shown at 30 Day After Cropping (DAP). Furthermore, this research also identified that Vima 1 was significantly responsive and adaptive to water stress.

Socio-economic aspects in developing strategic commodities and agricultural land support capacity

Mamat H S

Indonesian Center for Agricultural Land Resources

Email: mamath.suwanda@gmail.com

Abstract. Some agricultural commodities are a source of foreign exchange sourced from exports, such as oil palm, cocoa. The contribution of the agricultural sector to national income is quite high, among others shown by the gross domestic income (GDP) of agriculture which amounts to around 10.26% (in 2014) of national GDP. While soybean is one of the agricultural commodities whose import value is quite high. Fluctuations in market demand and prices of agricultural commodities depend on the level of supply and demand. Supply is related to production which is affected by climate anomalies, pest outbreaks and natural disasters, while demand is related to population and national and religious holidays. Based on the ratio of paddy fields to population, compared to other countries the carrying capacity of Indonesia's paddy fields is very heavy, namely 34 perha, while other countries as a comparison, such as Thailand 2.5 perha, Vietnam 14.0 perha, even Australian around 0.6 people perha.

Private forest peasant and their culture
Maria Palmolina, Aris Sudomo and Dian Diniyati

Ministry of Environment and Forestry Republic of Indonesia

E-mail: mariapalmolina@yahoo.com

Abstract. The private forest farming system in each region, one of which is formed by how farmers viewed natural resources in their environment, and ultimately form a distinctive farming culture system. The purpose of this study was to discussed how the farming culture system applied by private forest farmers in different areas, namely were Linggajaya’s Village (West Java) and Triwidadis Village (D.I. Yogyakarta). The method of this research was by qualitative approach. Data collection is done by participatory rural appraisal (PRA) techniques. The sample of these research was 70 (seventy) of private forest farmers and 15 (fifteen) informants from 2 (two) research’s locations. The results of these studied showed that the cultural systems of private forest farmers in Linggajaya’s and Triwidadi’s villages were different, due to their differed views on natural conditions and themselves as farmers, especially differences in land tenure and ownership patterns which result in differences in cropping patterns and social relations. Contributing to the suggestion of this research is that before community forest development is carried out in an area, preliminary research needs to be done on the culture of community forest farming in these communities so that development programs are acceptable and sustainable because they are appropriate to their cultural.

Inventory of natural enemy on corn plants in the experimental garden of the cereals research institute

M S Saenong¹, S P Lestari², F Permatasari² and A Arrahman¹

¹ Indonesian Cereals Research Center of Maros
² Student of Pharmacy Study Program, Faculty of Agriculture, Universitas Muhammadiyah Yogyakarta

E-mail: msadjaksaenong@gmail.com

Abstract. In-situ inventory of natural enemy on corn plants in the garden of the Cereals Research Institute has been conducted in the garden of the Cereals Research Institute, Maros Regency, South Sulawesi from 24 September to 29 September 2018. The research uses survey method through field observation on the existence of natural enemy in the experimental garden of corn and sorghum plants of the Cereals Research Institute, Maros. The results of observation will be identified based on the guidance of Shepard et.al (1987) about the natural enemy of crops. Observation plots use 3 replications by taking a sample of 20-30 plants in each repetition with a total plant observation of 90 units per block. The repetition is done by dividing a plot of land into 3 observation plots. The number of natural enemy populations obtained is recorded by counting the number of natural enemies to find out the total average number of natural enemy populations found in the observation plot. Based on the results of identification carried out on corn plants in the Experimental Garden of the Cereals Research Institute, there are 11 types of natural enemies, namely *Harmonia octomaculata* (dome beetles), *Menochilus sexmaculatus* (dome beetles), *Ophionea nigrofasciata* (Schmidt-Goebel) (soil beetles), *Cyrtothrips lividipennis Reuter* (bed bugs), *Panstenon nr. Collaris Boucek* (wasp predator), *Araneus inustus* (round spider), *Cardiochiles philippinensis* (wasp), *Phanerotoma sp.* (wasps), *Pipunculus mutillatus* (large head fly), *Harpalus pensylvanicus* and *Chrysoperla carnea* (Stephens).
Distribution of pyrite depth and soil properties in fresh water swamp land in North Candi Laras Subdistrict, Tapin Regency, South Kalimantan Province

R Q Muslim and S Ritung

Indonesian Centre for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: qonitarufaidah@gmail.com

Abstract. One of the challenges of swamp land utilization for agricultural uses is the existence of pyrite (FeS₂), especially in the top soil. The aim of this research was to study the distribution of pyrite position with depth and soil properties in fresh water swamp land in North Candi Laras Subdistrict, Tapin Regency, South Kalimantan Province. Pyrite layer was determined by using hydrogen peroxide (H₂O₂) and its unique reaction was marked by foam existence with soil pH <2.5. Ten soil samples analyzed to determine physical and chemical properties. The result of this research showed that pyrite depth varied from 25 cm to >100 cm. The depths of pyrite material were grouped into 25-50 cm, 51-75 cm, 76-100 cm, and >100 cm. The closer to the river, pyrite depth in the soil was deeper. The pyrite depth affected soil pH and cations. Soils containing pyrite material were very acidic with an average field soil pH 4.0-4.5. Cations K and Na were higher in soil with pyrite depth 25-50 cm while Ca and Mg were higher in pyrite depth 51-75 cm and 76-100 cm. The information of pyrite position within the soil is useful for controlling water table management to prevent pyrite oxidation.

Agroforestry patterns on a gaharu (Gyrinops verstegii) plantations in Flores Island East Nusa Tenggara

R Iryadi, Sutomo, A Rahayu, S F Hanum and I D P Darma

Research Centre for Plant Conservation and Botanic Garden - Indonesian Institute of Sciences (LIPI): Research Station Bali Botanical Garden, Candikuning, Baturiti, Tabanan, Bali, Indonesia 82191

E-mail: masrajifgeo@gmail.com

Abstract. Flores is one of producing the agarwoods from Gyrinops verstegii (Gilg.) Domke. This presence in nature has been threatened and some communities have made this type of cultivation. This study examines the composition of intercropping and planting patterns in agarwood cultivation. The method used the purposive sampling plot 10 x 5 m to record the composition, structure of vegetation, and environmental conditions. The intercropping of G. verstegii is applied by farmers in
five districts of Flores (East Manggarai, Nagekeo, Ende, Sikka, and East Flores). There are containing 23 species of intercropping plants. *Theobroma cacao*, *Coffea robusta*, *Syzygium aromaticum*, and *Cocos nucifera* are the dominant plant species planted. The diversity concept of this type is important for increasing the resilience or resilience of ecosystems and is one of the pillars of agroforestry.

**Flood vulnerability impact for food estate potential in Central Kalimantan, Indonesia**

I Muhardiono

Indonesian Agroclimate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: imanmuhardiono@pertanian.go.id

**Abstract.** Provision of agricultural land to support food security has criteria including optimal crop productivity, adequate intensity, guaranteed water availability (surface water and groundwater), and environmental conditions that are secured to damage (conservation). Potential large of area for food estate in Central Kalimantan around 165.000 Ha or 165 km² where contains 85.000 Ha existing land functionality for production where 28.300 Ha well irrigated and 57.200 Ha needs to rehabilitate. The rest of potential area bushes around 79.500 Ha which needs to be land cleared. Land allocation for food state sustainability must be prepared and studied with its complexity, which environmental aspect from hydrological issue become one major aspect must be considered. This study asses potential land capacity to reduce flood with its existing land use proportion, by using GIS and HEC-RAS model simulation, each watershed will be compared with same scenario hydrology input and shows which one will give small number of vulnerability impact through by flood. The results indicate where composition of existing land use in upstream of each watershed give different impact vulnerable index to each zone of food state area targeted. Higher size watershed will be followed by higher flood impact to area near from the river, but not all of them have highest vulnerable index because it depends on land use proportion.

**Application of technology innovation supporting increasing of planting index swamp land ecosystem in Riau Province**

A Fahri, R Yusuf, R S Anggraini and Salwati

Assessment Institute for Agriculture Technology Riau, Indonesian Agency for Agricultural Research and Development, Indonesia

E-mail: anisfahri@gmail.com

**Abstract.** Swamp land will become the foundation of future food security because irrigated paddy fields are very vulnerable to the transfer of functions as has happened in Java. Swamp land has
considerable potential to be developed into food-based agricultural land in supporting national food security. Swamp land is divided into 2 (two) typologies of swamps, namely: (1) tidal swamps and (2) swamps. Swamp land is spread over 17 provinces with an area of around 34 million hectares consisting of 20.707 million hectares of tidal swamps and 13.296 million hectares of swamp land. However, only around 5.0 million hectares have been cleared or reclaimed. Tidal land that has been reclaimed in Riau Province is 80,868 hectares with an average low productivity of around 3.5 - 4.5 tons / ha and an average crop index (IP) of 100. This paper aims to examine the application of technological innovation to the improvement of the rice crop index. Referring to the Recapitulation of Rice Planting Potential Calendar of Riau Province, planting season MH 2019/2020 (October 2019 - March 2020) and MK 2020 obtained an average rice planting index of 171.49%. The application of jarwo super technology innovation and planting calendar of rice crop productivity reached 5.73 t / ha.

Adaptability of rice varieties on swampland in South Kalimantan

Koesrini, S Nurzakiah, V Mayasari and Y Rina

Indonesian Swampland Agricultural Research Institute, Indonesian Agency for Agricultural Research and Development, Banjarbaru, Indonesia

Email : koesrini353@gmail.com

Abstract. Swampland was marginal land with considerable potential for rice farming. There were many contraints on swampland, i.e. water and soil acidity, macro and micro nutrient deficiency, ferrum, aluminum, and sulfat toxicity, drought, and water lodging. These contraint caused low rice productivity on swampland. Local rice variety was the adaptable variety on this regions. Local rice cultivation uses a gradual nursery system, from “taradak, ampak, and lacak”, so that the seedlings can adjust to the water level and soil acidity. These variety dominate almost 90% of rice cultivation on dry season in swampland of South Kalimantan, and the rest is planted with high yield variety. This local rice is preferred to be planted because its adaptation to waterlogged condition, soil acidity, and its rice texture. However, the local rice has long-lived plants (8-10 months) and low productivity (2.0-2.5 t/ha). The main problems developing rice in swampland are soil acidity, iron toxicity, water stress. The key solution to overcome swampland constraints are nutrient and water managements as well as the use of adaptive rice varieties. Some local rice varieties developed in South Kalimantan are Siam Mayang, Siam Unus, Siam Kupang, Siam Karang Dukuh and several other cultivars with various names. High yield rice variety can be developed in swamplands especially its environment condition has been improved. Some of the superior adaptive rice varieties in swampland are Batanghari, Banyuasin, Indragiri, Inpara 2, Inpara 3, Inpara 4, Inpara 8, Inpari 30, and Inpari 32.

Identification of kobalt in paddy fields in Karawang and Bekasi Districts
D M W Paputri¹², C O Handayani¹³, Sukarjo¹, S Rianto¹ and F Purnariyanto¹
¹ Indonesian Agriculture Environment Research Institute, Indonesian Agency for Agricultural Research and Development, Pati, Indonesia
² Faculty of Geography, Gadjah Mada University, Yogyakarta, Indonesia
³ Graduate School of Environmental Sains, Gadjah Mada University, Yogyakarta, Indonesia

E-mail: dolty.mellyga@gmail.com

Abstract. Plants need cobalt for nitrogen fixation and encourage seedling growth. If the amount is excessive, cobalt causes a reduction in crop yield and poisoning. Healthy food is produced from healthy land that is free from pollution. This study aims to monitor the toxic levels of cobalt in paddy fields. The study was conducted in the lowland rice fields of Karawang and Bekasi regencies by taking 428 samples of topsoil. The analysis showed that all samples contained cobalt, ranging from 0.477 - 31.829 ppm. The data is classified into 3 classes, namely: normal, normal-toxic and toxic in accordance with the quality standards of heavy metals in the soil (Alloway, 1995). The classification results obtained 425 samples included in the normal class, 3 samples included in the normal-toxic class, and no sample included in the toxic class. The results of this study can be a basis for stakeholders to conduct land management to avoid cobalt poisoning.

Seed treatment using bio-fertilizer improves plant growth and yield performances of upland rice cultivars under various planting density

A Saryoko¹, S Kusumawati¹ and A Pohan²
¹ Assessment Institute for Agricultural Technology Banten, Indonesian Agency for Agricultural Research and Development, Banten, Indonesia
² Directorate General of Food Crop, Ministry of Agriculture, Jakarta, Indonesia

E-mail: andysaryoko@pertanian.go.id

Abstract. Producing upland rice (Oryza spp.) through high yielding cultivars and better agronomical practices is one of promising way to improve rice production in Indonesia. The objectives of study were to evaluate the effect of seed treatment using bio-fertilizer on growth and yield performances of two high yielding upland rice cultivars under two different planting density, and to identify its related traits. A field experiment with a randomized complete block design with two replications was conducted at Panggarangan sub-district, Lebak district, Banten Province, Indonesia from September 2018 to January 2019. Seeds of two recent cultivars, Inpago 8 (V1) and Inpago 9 (V2) were treated without bio-fertilizer (P1) and with bio-fertilizer with the dose of 16 g per kg seed (P2) and were arranged into double row system with the density of 21 plant m⁻² (J1) and 33 plant m⁻² (J2). Plant growth, canopy development, biomass production, yield and yield components were measured to evaluated plant performance. Research result showed that seed treatment using bio-fertilizer significantly improved plant growth and seed yield for both cultivars due to greater panicle number per m⁻² and seed number per panicle. Bio-fertilizer contributed to greater amount of total biomass as well as harvest index. Increasing planting density from 21 to 33 plant per m⁻² improved panicle number per m⁻² that affected seed yield increase. The Inpago 9 performed superior in seed yield as compared to Inpago 8 due to its better seed number per panicle and bigger seed size. High yielding
upland rice cultivars in combination with bio-fertilizer and appropriate planting density would be an approach to improve upland rice production.

Dinamic of groundwater table, peat subsidence, and carbon emission impacted from deforestation in tropical peatland, Riau, Indonesia

I Muhardiono

Indonesian Agroclimate and Hydrology Research Institute (IAHRI), Bogor, 16111, Indonesia

Email: imanmurdiono@pertanian.go.id

Abstract. Drainage canals had triggered peat subsidence and lowered water level, then enabled wild fires and peat degradation in Riau, Indonesia. This study was part of jurisdictional approach to reduce greenhouse gases emission from peatland and support Siak District’s ‘Green Development Strategy’. It aimed to examine the changes on groundwater level, peat subsidence rate, and carbon emission in response to deforestation and land cover changes. 27 study sites, 81 monitoring dip wells and 27 peat subsidence poles were setup, across a range of land use types and peat depths. They were monitored for 18 months. Ground water table of all plots averaged at -55 cm in Dosan Village, higher than the one in Dayun Village, i.e., -66 cm. Correspondingly, in Dayun Village (oil palm and shrubs) peat had subsided in faster rate (8.4 cm yr\(^{-1}\)) than that in Dosan (oil palm, acacia and mixed agriculture; 3.3 cm yr\(^{-1}\)). Our average annual ground water level (-55 cm) reflect the carbon emission from peat decomposition, based on Hooijer (2012), as much as 59 Mg CO\(_2\) ha\(^{-1}\)yr\(^{-1}\). On the other hand, canal discharge of the 10 measured sites ranges from 2 dm\(^3\)sec\(^{-1}\) to 73 dm\(^3\)sec\(^{-1}\) (averaging at 26 dm\(^3\)sec\(^{-1}\)). Deforestation had decreased groundwater table, caused peat subsidence, and emitted significant amount of carbon from tropical peatlands. Accurate information about the impact of deforestation and land cover changes are crucial to improve management strategies in peatland ecosystems, to mitigate carbon emission and avoid peat fires.

Conservation agriculture in semi-arid area of Indonesia: lesson learnt to increase maize production and farmers awareness on environmental friendly land management

Y Ngongo\(^1\), Irawan\(^2\) and U Haryati\(^2\)

\(^1\) Assessment Institute for Agriculture Technology East Nusa Tenggara (AIAT-ENT) Jl. Timor Raya Km. 32, Kupang, Nusa Tenggara Timur, Indonesia.

\(^2\) Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: yohanisngongo@gmail.com
Abstract. Dominated semi-arid area of East Nusa Tenggara (ENT) is characterised by low and erratic rainfall, poor soil fertility, diverse agro-ecosystem and dominant rocky lands. Crops production within this environment is generally low and uncertain. This paper reviews Conservation Agriculture (CA) conducted in ENT province. The data and information were mainly taken from FAO and IAARD’ CA collaboration research program implemented in ENT during 2014 – 2018. All farmers involved in the programs acknowledge that CA has increased maize productivity and indeed some farmers have able to plant maize twice a year and experienced good harvest even in long drought. Integrated forage into CA based farming in Timor enable farmers to provide enough feed for cattle at least 1 – 2 head/household. Nevertheless, most farmers showed some constraints in implementing and expanding the introduced CA concepts. The main constraint is lack of labour and equipment to make permanent planting hole in dominated rocky land. CA concepts related to permanent cover crops and mulching have not fully implemented due to crops residues mostly used to feed cattle. The complexity of semi-arid environments and indigenous knowledge of local people in managing semi-arid upland agriculture should be taken into consideration in incorporating suitable induced CA.

Planting time optimization on tidal agricultural land

S H Adi¹, M W Trinugroho¹, H Sosiawan¹,², A Aprilyanto¹ and A Baroto¹

¹Agroclimate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
²Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjar Baru, Indonesia

E-mail: setyonohari@pertanian.go.id

Abstract. Tidal agricultural land (TAL) is a marginal farming field that is highly available but yet to be optimized in Indonesia. Productivity enhancement of TAL is achievable through agriculture technologies, but water management is the key solution to TAL main problems, i.e. flood and drought cycle. The main objective of this research was to predict tidal cycle for available planting time optimization in TAL. Research was conducted on 100 hectares TAL in Jejangkit, Barito Kuala, South Kalimantan, with the Alalak river become the main subject of the hydrodynamics monitoring. Watershed water balance simulation model run on 10-day interval was utilized to predict the tidal cycle with 4 input parameters including water-level, precipitation, percolation, and evapotranspiration. The prediction result showed that the available planting months in Jejangkit TAL was about 8 months, between the first or second 10-day of May and third 10-day of January or first 10-day of February (calibration and validation R² were 0.78 and 0.92, respectively). On-field validation in Jejangkit recorded flood event started during the third 10-day of January 2020, which indicates the prediction was reliable. This result shows that tidal cycle could be simulated using watershed water balance model to assist farmers on TAL’s productivity enhancement.
Peat land management adaptation using ameliorations for oil palm agronomic performances

L Izhar¹, S Primilestari¹ and Salwati²

² Assessment Institute for Agricultural Technology in Riau, Jl. Kaharuddin Nasution No.341, Simpang Tiga, Bukit Raya, Kota Pekanbaru, Riau. Indonesia. 28284.

E-mail: lutfi.izhar@pertanian.go.id; lutfiizhar@yahoo.com

Abstract. Peatland management is affected by adding production inputs such as various soil amendment applications. The agronomic performance of oil palm is influenced by those application of ameliorant types. This study was aimed to obtain the optimum combination of fertilizer and ameliorant to increase the production of oil palm production on peatlands. The 4-year study from 2016 to 2019, was conducted in Arang-Arang Village, Kumpeh Ulu District, Muaro Jambi Regency, Jambi Province with an area of 4 ha. The design used was a Randomized Complete Block Design (RCBD) with 4 fertilizer and ameliorant treatments, namely: fertilizer, Chicken manure fertilizer, Tankos compost fertilizer, and Control (without ameliorant). The results showed that the application of tankos compost produced the highest fresh fruit bunches (FFB) production in 2016 and 2017. The average production of tankos fertilizer in 2016 was 14.28 kg / tree which was significantly different from other treatments. The average production in 2017 from tankos treatment is also the highest compared to other treatments (12.13 kg / tree), although it is not significantly different from other treatments. Whereas, in 2019 the highest weight of FFB of oil palm was produced at a complete fertilizer treatment of 16.3 t ha⁻¹, followed by treatment of manure and tankos compost.

Sustaining porang production for improving farmers’ income

S K Dermoredjo, M Azis, Y H Saputra, G Susilowati and B Sayaka

Indonesian Center for Agricultural Socio Economic and Policy Studies, Bogor, Indonesia

E-mail: saktyanuadi@yahoo.com

Abstract. One of the main programs of Ministry of Agriculture is GRATIEKS (Three-Fold Export Movement). It aims to boost agricultural export resulting in production enhancement as well as farmers’ income improvement. Porang is among the promising commodities to enhance export. This paper aims to analyze role of porang farm business as an exported commodity through sustainable agriculture. Specifically, this paper aims: (i) to analyze land management for porang farm business, (ii) to study the cost and income of porang farm business, and (iii) to evaluate porang export development measures. This research was conducted in Madiun Regency, East Java, using a survey method. Porang farm business is conducted on production forest and protection forest areas. It should be implemented carefully in accordance with sustainable land management. Porang farm business is relatively cost-effective as it applies minimal tillage, low production inputs, and profitable farm-gate price. Porang flour export demand is still promising. Porang production enhancement is possible through sustainable land management.
Level and distribution of paraquat and carbosulfan residues in soil, surface water, and plant from Indonesia

A N Ardiwinata, E S Harsanti, A Kurnia and E Sulaeman

Indonesian Agricultural Environment Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia.

Email: asena020361@gmail.com

Abstract. The utilization of paraquat and carbosulfan pesticide for weed and pest control chemical has been of great interest on residue contamination in soil, surface water, and plant from several provinces in Indonesia such as Riau, Lampung, East Java, South Sulawesi, West Sulawesi and South Kalimantan provinces. The levels of paraquat and carbosulfan in surface water and soil were investigated to evaluate their potential pollution. Paraquat and carbosulfan residues are not found in surface water and plants. The limit of detection of paraquat pesticides in soil were at the range of 0.0479–0.0597 µg g⁻¹ and recovery 91.20–98.71 %. The total paraquat and carbosulfan concentrations in soil were in the range of 0.1525–14.4366 mg kg⁻¹ and 0.0582–0.3072 mg kg⁻¹ (dw), respectively. Distribution of paraquat and carbosulfan were different indicating their different contamination sources. The results showed that there are still found paraquat and carbosulfan residues in the soil with the concentration are still below the tolerance limit.

The powder-post beetle pest management on corn plants through improvement of cultivation technology and product treatment

A Arrahman and M S Saenong

Research Institute for Cereal Crops

Email: msudjaksaenong@gmail.com

Abstract. Beetle pest is a type of corn pest that significantly reduces production on the field, and damages the stored material quality. Therefore, beetle pest treatment should be done simultaneously by applying all the technologies that have been implemented so far. This pest becomes very important since the damage caused can reach 30% of the total plants productivity; this has not been yet calculated based on the loss value as the result of the declining material quality that can damage the health and safety, both as food and feed. For example, the contamination of aflatoxin fungi is one type of material quality degradation which is harmful if consumed. This paper tries to expose the role of post-harvest treatment and cultivation technology in reducing the damage scale and increasing the added value of the production and stored materials quality improvement, thus, they are safe to use, both as food and feed.
Challenges of soybean self-sufficiency policy in Indonesia

B Sayaka, DKS Swastika and YH Saputra

Indonesian Center for Agricultural Socio-Economic and Policy Studies (ICASEPS), Ministry of Agriculture, Bogor, Indonesia

E-mail: bambangsayaka@gmail.com

Abstract. Indonesia deals with adverse soybean trade balance deficit as its domestic production is far below its demand. This paper aims to analyse the challenges of achieving soybean self-sufficiency based on a survey in Lampung, West Java, Central Java, and West Nusa Tenggara Provinces. The special program (UPSUS) of soybean distinctively designed to achieve soybean self-sufficiency is characterized by heavily subsidized inputs, intensive practice on existing farm land area, as well as newly-planted area enhancement (PATB) on fragmented, less fertile and unsuitable land areas. Nevertheless, it results in unsatisfactory national soybean production enhancement. Soybean farming is not competitive in term of farm business due to its relatively low yield and unfeasible farm-gate price. To enhance national soybean production, this crop should be grown on the suitable farm land at appropriate scale. A soybean variety resistant to insect-pests attack is mandatory to be adopted by farmers. In addition, the government needs to restructure the marketing aspect consisting of an effective floor price establishment through BULOG purchase with sufficient state budget allocation. It is also urgent to regulate soybean trade such as soybean import during off season as well as reasonable import tariff.

Salinity of paddy field in main landforms in Indramayu Regency, West Java

M Hikmat, E Yatno and E Suryani

Indonesian Centre for Agricultural Land Resource Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: muhammad_hikmat@ymail.com

Abstract. One of the main problems of paddy field in Indramayu is the high level of salinity. Paddy fields in Indramayu Regency are located around the North Coast of Java Island. These soils are developed from alluvium and marine deposits. This area is dominated by landforms from the Alluvial, Fluvio-marine, and Marine groups. This study aims to examine the relationship between the nature of soil salinity and the type of landform. A total of 102 soil samples on paddy soils in Indramayu were analyzed in the laboratory. These soil samples are taken during the dry season. Soil properties analyzed are soil salinity and soil texture. The results showed the soils in the marine landform group had higher salinity levels, followed by the Fluvio-marine group and then the alluvial group. The distance from sea water and the type of soil parent material are the main factors that cause high soil salinity. Soils developed from marine materials have higher soil salinity properties compared to soils developed from alluvium. The closer distance to the sea makes the possibility of higher sea water intrusion, causing higher soil salinity. Landform approach is useful in soil management to reduce negative impact of salinity for paddy field.
Residual effects of rock phosphate on soybean growth at tidal swampland South Kalimantan

Husnain¹, W A Yusuf² and A F Siregar³

¹ Indonesian Center for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Indonesian Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjar Baru, Indonesia
³ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: husnainuut@yahoo.com

Abstract. Phosphorus fertilizer application could be an option to improve soybean yield in Indonesia. As in tidal swampland, phosphate deficiency is one of the main obstacles in the soil because of its fixation of ferro iron as insoluble phosphates. This experiment aimed to determine the residual effects of Reactive Phosphate Rock (RPR) in second cropping season on soybean growth in tidal swampland of South Kalimantan. The experiment was conducted at Barambai Village, South Kalimantan. This study was set in factorial randomized block design with four treatments and four replications. The treatments were Farmer practice, P Fertilizer (SP 36) in two season, residual of RPR, residual of RPR with mycorrhiza in second planting season. The N and K doses were determined based on soil nutrient status. The result showed that the residual effect of RPR treatments with mycorrhiza in second planting season gave higher plant height of soybean compared to farmer practice and SP 36 treatment. The residual effect RPR treatment with mycorrhiza increased soybean yield up to 40.9% compared to without RPR and mycorrhiza in second planting season.

Direct application of reactive phosphate rock on improving maize yield in dry acid soil

A F Siregar¹, Husnain², I W Suastika¹, N P S Ratmini³ and I A Sipahutar¹

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Indonesian Center for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
³ South Sumatera Assessment Institute for Agricultural Technology, Indonesian Agency for Agricultural Research and Development, Palembang, Indonesia

E-mail: adha_siregar@yahoo.com
**Abstract.** This guidance Dry acid soil is characterized with low soil acidity, organic carbon, soil P availability and high concentration of Al3+ and H+. Due to its productivity, dry acid soil needs an improved specific location technology that applicable for farmers. Reactive phosphate rock (RPR) which characterized with high reactivity, residual effect, and slow release is one of the effective solutions to overcome P problem in dry acid soil. The objective was to study the effect of direct application of reactive phosphate rock (RPR) on improving maize yield at dry acid soil. The experiment was conducted at farmer’s field at Banyu Urip Village, Tanjung Lago, Banyuasin District, Sumatera Selatan. Randomized block design with four treatments and four replications was set and the treatments consist of farmer practice (R1), recommendation with single fertilizer (R2), recommendation with compound fertilizer (R3) and RPR recommendation technology (R4). The results showed that R4 treatment could improve plant growth and maize yield up to 25% compared to farmers practice. This results showed that application RPR technology (1 ton RPR.ha-1, 1 ton dolomite.ha-1, 2 ton manure.ha-1, 400 kg Urea.ha-1 and 400 kg KCl.ha-1) could be an applicable option on improving maize yield at dry acid soil.

---

**Response of Rice Plant to Silicon Addition in Oxisols**

A F Siregar¹, I A Sipahutar¹, L Anggria¹, Husnain², M P Yufdi³

¹Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
²Indonesian Center for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
³Indonesian Centre for Horticulture Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: adha_siregar@yahoo.com

**Abstract.** Addition of beneficial nutrients as silicon (Si) has become a concern in rice cultivation in some countries. It is known that Si plays an important role on improving plant resistance on biotic and abiotic stresses. A pot experiment was conducted to study the response of rice plant growth on Si addition in Oxisols. A completely randomized design was set with eight treatments as varying Si rates (0, 100, 200, 300, 400, 500, 600, and 700 kg SiO₂.ha⁻¹) and three replications. The results showed that initial soil Si available was 264 mg SiO₂.kg⁻¹ and categorized below the critical level. Si application showed significant effect on increasing number of tillers, stem strength, lodging resistance and the yield which occurred at 700 kg SiO₂.ha⁻¹ treatments. The rice yield increase by 34.66% at 700 kg SiO₂.ha⁻¹ treatments compared to control. This current result showed that addition of Si fertilizer has showed the effect on improving rice growth and yield in Oxisols.

---

**Swampland optimization in supporting to enhancing farmers income through the implementation of technology innovation "Panca Kelola" in Central Kalimantan, Indonesia**
Y R Darsani¹, W A Yusuf¹ and H Sosiawan²

¹ Indonesian Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjarbaru, Indonesia
² Indonesian Agroclimate and Hidrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: tuha13@yahoo.co.id

Abstract. Rice production in swampland can be increased of farmers income through intensification activities based on local wisdom. This study aims to determine the household income of farmers by implementing of Innovation Technology “Panca Kelola”. One-way system water management, high yielding high yielding varieties, planting system with legowo 2:1, balanced fertilization, use of biological fertilizers and pest management are the component of “Panca Kelola” technology. The method of data collection is done through a survey method with direct interviews to farmers using a questionnaire. The results showed that the implementation of Technology Innovation “Panca Kelola” technology has economic prospects to be developed on a large scale with R/C> 1 and MBCR> 2. The increase in income of cooperator farmers was 60.73% (Rp. 20.363.987 /household/year) compared to non-cooperative farmers.

Identified diseases would threaten on expansion of porang (Amorphophallus muellery Blume) cultivation in Indonesia

M Soedarjo

Indonesian Legume and Tuber Crops Research Institute, P.O. Box 66, Malang, Indonesia 65101

E-mail: muchdar.soedarjo62@gmail.com

Abstract. As one of important agribusiness crops, the cultivation areas of porang (Amorphophallus muellery Blume) has significantly increased in the past recent years. The increase of cultivation area has been triggered by the significant increase of corm price and by the government program for enlargement of porang cultivation. Consequently, farmers would eventually grow porang on open agricultural land. An increase of corm production, as a result of cultivation expansion, is required to meet an export demand. Like other tuber crops, which have been cultivated on large and open areas in Indonesia, porang plant would similarly experience a serious damage and even a failure of harvest due to the diseases. The present field observation found diseases, caused by fungus and virus, significantly reduced corm yield of porang (Amorphophallus muellery Blume). Thus, the expansion of porang cultivation area in Indonesia would be challenged by the infestation of these diseases.
Soil destruction level at vegetables cultivation land upstream of Cikapundung Sub Watershed and its alternative management to be sustainable

N Sutrisna, Wiratno, Y Surdianto, B Susanto and D Rahadian

The Assessment Institute for Agricultural Technology of West Java, Indonesian Agency for Agricultural Research and Development, Bandung, Indonesia

Email: natrisna@yahoo.co.id

Abstract. The agricultural land in the Hulu Cikapundung sub watershed is a dry land with slope topography. The land is relatively fertile, but farmers in carrying out vegetable cultivation activities have not applied conservation techniques so that they are very vulnerable to erosion and have an impact on decreasing land productivity. The objectives of study were: (1) to evaluate erosion (value and risk erosion) at the use of land existing, (2) to investigate soil destruction level by erosion and its impact to productivity of land at upstream of Cikapundung sub watershed, and (3) Formulate alternative management of Vegetables Cultivation Land Upstream of Cikapundung Sub Watershed to be sustainable. The research used survey method. The data consisted of secondary data and primary data. The secondary data was collected through desk study, whereas primary data was collected through interviewed farmers, the soil observation, and soil sample analyses that is included the contain of sand, dust, and clay; C-organic; and nutrient content (N, P, K, and Ca) at Laboratory. The data analysis was done according to descriptive and to formulate management alternatives is done by desk studies. The result showed that the most soil erosion was at the type of vegetable land use which use intensively at slope 25-40%. Value erosion roundabout 22.57-597.76 ton ha-1 year-1 or 0.33-8.79 cm. Level of destruction soil by erosion at upstream of Cikapundung sub watershed majority was medium critic (the upper soil was loss >75%) and spread at some units land. During five years, the impact of erosion decreased C-organic 60.05%, N 44.7%, P 52.3%, K 24.7%, and Ca 27.2%. Productivity Potato decrease 60%, whereas cabbage 40%. Management alternative for countermeasures and prevention that can be done include: (1) soil rehabilitation (2) conservation of gulud terrace farming (0-15%), (3) bench terrace farming (15-30%), (4) beds cutting slopes, and (5) intercropping (combination of types of plants).

Response of lansuna red onion varieties (Allium ascolonicum L) to bulbs size and the use plant spacing different in Minahasa District

Olvie Grietjie Tandi1, Meivie Lintang1 and Yusuf2

1 North Sulawesi Assessment Institute for Agricultural Technology, Indonesian Agency for Agricultural Research and Development, Manado, Indonesia
2 Horticulture Research and Development Centre

Email: olvietandi@gmail.com

Abstract. The local red onion variety, Lansuna from Minahasa Regency, very popular among farmers because adapt in all seasons, but information about the optimization of plant spacing and tuber size has not been yet available. The study was conducted April to November 2017 in Tonsewer
The potency of plant growth-promoting microbes from indigenous plant of sulphate acid soil ecosystem in Central Kalimantan

E Yuniarti¹, Surono¹, Nurjaya¹, and D N Susilowati²

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Indonesian Center for Agricultural Biotechnology and Genetic Resources Research, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: erny_yuniarti@yahoo.com

Abstract. Rhizobacteria and dark septaendophytic fungi (DSE) isolated from indigenous plant of sulphate acid soil in central Kalimantan has potency as a growth promoter. The greenhouse treatment was conducted to investigate the potency of selected microbes in promoting swamp rice growth. Seven treatments included three rhizobacteria, three DSE fungi, and one control. The experiment used Randomized Complete Design, three replications, and rice variety of Inpara 2. Seven days before rice seedling cultivation, inoculants (1%) and compost (1 ton/ha) was applied to the soil media in the pot. The observed parameters including plant height at 14, 21, and 56 days after planting (dap) and number of tillers, rice stover fresh weight, root fresh weight and length at 56 dap. The rhizobacteria significantly affected plant height at 14 and 21 dap, at which they had higher plant height than the three DSE and the control. The rhizobacteria showed higher number of tillers and rice stover fresh weight than the DSE treatments and the control. Although all treatments had no significant difference on root fresh weight and length, all microbes produced higher root fresh weight and length than the control. Therefore, inoculation of rhizobacteria and DSE respectively could enhance paddy growth in Sulphate Acid Soil.

Farmers’ perception towards water and soil management in the irrigated paddy field in North Sumatera, Indonesia
Wasito¹, V W Hanifah¹, and Sukardi²

¹ Indonesian Centre for Agricultural Technology Assessment and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Faculty of Economics, Sumatera Utara University, Medan, Indonesia

E-mail: wasito63@yahoo.co.id

Abstract. Intermittent irrigation and balanced fertilization are two of components in Integrated Crop Management for paddy. We studied how farmers’ perception on these components since the first introduction in 2002. Study consisted of two cases, continual and not continual assessment since 2003 in Serdang Bedagai and Deli Serdang Regency, North Sumatera. Method used cross-sectional and field survey. Primary data was initially collected through observation and involvement with the community in natural setting. Farmers were selected purposively based on the classification of being innovators or early adopters. Secondary data was collected from the review of previous studies. Results showed that since its first introduction most farmers had not applied intermittent irrigation and balanced fertilization including soil analysis, compost, and leaf color chart (BWD). Farmers perception were: no trial before adopting and difficulty to see the technique agronomically. Regarding technological characteristics, those technologies did not correspond with adoption level because high understanding on complexity, comparative advantage, and compatibility were not followed by high level of adoption resulting innovation dissonance (disonansi inovasi) to occur. Farmers in downstream area were unsatisfied of irrigation institution (P3A) particularly in dry season. Therefore, ecological approach using experience and socio-culture of local community is considered to stimulate behavior changes despite hard effort to do so.

Variability of soil mineralogical composition in Bareh Solok central paddy field as affected by material eruption from Mt. Talang

E Suryani, R E Subandiono, E Yatno, M Hikmat and M Anda

Indonesian Centre for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: erna_suryani2004@yahoo.com

Abstract. Mt. Talang is one of the active volcanoes in West Sumatra with the last eruption occurred in 2017. The Bareh Solok Central paddy field distributed from volcanic middle slope to Singkarak Lacustrine Plain. The composition of sand mineral fraction of nine representative of soil profiles has been analyzed using polarization microscope with line counting method. Results show that mineralogical composition are the same, but the amount are different. At the volcanic middle slope, opaque is dominant. It is probably due to thermal formation associated with the melting of existing iron oxides attributed by lava flow. Labradorite and hypersthene are dominant in Alluvial Plain and it could indicate rather slow weathering processes. While, the soils at Lacustrine Plain were dominated by volcanic glass and labradorite and it could be due to silica saturation; more cations and higher pH of soil solution hindering dissolution of minerals. The K-bearing minerals were absent in all soils, indicating K would be the problem as revealed by low K content and its trend decreased from middle slope to the lacustrine. The implication is soils in the Lacustrine Plain and Alluvial Plain would need more K fertilizers than soils in the middle slope.
Habitat characteristics and population of *Syzygium cuminii* L in community forest of Yogyakarta

A A Sudomo and M Palmolina

Research and Development Center of Agroforestry Technology- FOERDA-Indonesia

E-mail: arisbpkc@yahoo.com

**Abstract.** In the development of *Syzygium cuminii* as a prospective commodity for pharmaceutical raw materials, information on habitat characteristics is required as a basic for technical suitability to land. The objective of this research is to determine the characteristics of the habitat and population of *S. cuminii* in community forests. The research method was carried out by field surveys in the form of making 20 mx 20 m plots in *S. cuminii* habitat. The results showed that the *S. cuminii* habitat is at an altitude of 110 to 300 asl, more than 1000 mm/year of rainfall, and 25-30°C of temperature. *S. cuminii* habitat has a clay textured soil with low N, P and K nutrient content. *S. cuminii* grows in community forests mixed with other types of plants. The composition of vegetation in Triwidadi community forest as *S. cumunii* habitat consists of 10 species. The five species have the highest of Important Value Index, i.e. *Syzygium cumini* (158%), *Acacia auriculiformis* (44.2%), *Swietenia macrophylla* (41.28%), *Tectona grandis* (32.04%) and *Gnetum gnemon* (13.83%). The total amount of vegetation in community forest as *S. cuminii* habitat is 923 stands/ha. The total amount of *S. cuminii* is 417 stands/ha. *S. cuminii* has more potential to be developed on low land and to start fruit in the middle of the dry season.

Response of shallots growth and yield to phosphate fertilizer and trychoderma application on peat soil

Suparman and W A Nugroho

Central Kalimantan Assessment Institute of Agricultural Technology, Indonesian Agency for Agricultural Research and Development, Palangka Raya, Indonesia

E-mail: arman.litbang@gmail.com

**Abstract.** Peat soil is considered less fertile due to its high organic acid and low nutrient content. Despite its higher cation exchange capacity, the soil has a low base saturation and a higher acidity causing the nutrients less available for plant growth. However, proper fertilization and amelioration would improve peat soil fertility and productivity. A pot experiment was conducted to investigate the effect of Trichoderma application and P fertilization on growth and yield of shallots on peat soils. Started in July to September 2019, a 4x4 factorial experiment in a complete randomized design was established in Palangka Raya. The results showed that there was an interaction effect of Trichoderma and P treatment on shallots growth and yield. A treatment combination of 2 g/plant⁻¹ Trichoderma and 0.57 g/plant⁻¹ P fertilizer resulted in the optimum yield by 55.07 g dry bulbs.
Farming conservation management on potato cultivation in sloping upland

Z Arifin, C Hermanto and I R Dewi

Assessment Institute for Agricultural Technology of East Java - Indonesia Agency for Agriculture Research and Development - Ministry of Agriculture

E-mail : arifin_bptpjatim@yahoo.co.id

Abstract. Highland farming in Indonesia is identic with vegetable production center. To ease the work, highland farmer used to arrange the beds in the same direction with land slope (uni-directional slope). Without any conservation approaches, it could accelerate soil erosion and degradation. It became worse the soil fertility as the farmer practice excessive use of agro-chemicals. This study aims to obtain a potato farming conservation technology package that can increase productivity and income of potato farming, and to reduce soil erosion rate. The has been done in area of 15,000 m² in the sloping upland of Tosari Village - Tosari Subdistrict - Pasuruan during the dry season of 2016. The experiment was design in randomized block, consisted of three treatments of conservation agronomic practices for conservation with 4 replicates. The treatments were: (1) Improved technology (potato cultivation arranged in uni-directional slope beds and ridges contour, combined with green leeks + Setaria sp. feed grass + recommended dosage of fertilizer); (2) Agreed technology with farmer (potato cultivation arranged in uni-directional slope beds and ridges contour, combined with green leeks, and adjusted dosage of fertilizer); and (3) Farmer’s technology (potato cultivation arranged in uni-directional slope beds, combined with green leeks, and farmer version of fertilizer dosage). The results showed that the improved technology in potato cultivation resulted in potato tuber weights reaching 14.17 t/ha, while agreement technology for potato tuber weights fell 5.93% and farmers’ technology dropped 33.31%. With improved technology, green leeks 0.84 t/ha and Setaria Sp grass pruning 117 kg/ha for animal feed. Application of improved technology with beds uni-directional slope combined with ridges contour obtained the highest profit of IDR. 23,103,500 (equal to 1,714.80 USD) and R/C 1.51, improved the efficiency of chemical fertilizers, and reduced erosion to 26.98 t/ha (34.31%) compared to erosion on potato cultivation arranged in uni-directional slope only that reached 41.07 t/ha.

The effect of amelioration on peat soil properties and shallots productivity in Peatlands

Maswar, Anang F, Umi H and Irawan

E-mail: maswar_bhr@yahoo.com

Abstract. Utilization peatlands for agriculture activities is growing rapidly since the limited availability of mineral soil which can be utilized. However, peatlands has a number of constraints in terms of very acid pH (pH 3.3-4.7), and low bulk density which does not support plant growth properly. A study which aims to knowing the influence of amelioration on peat soil properties and
The production and yield components of oil palm (Elaeis guineensis Jacq.) under the land application of POME (Palm Oil Mill Effluent) at palm oil plantation in Indonesia

Pujono H R 1, S Kukuh 2, R Evizal 2, Afandi 3 and A Rahmat 4

1Department of Agrotechnology, Faculty of Agriculture, University of Lampung, Lampung, Indonesia
2Department of Agronomy and Horticulture, Faculty of Agriculture, University of Lampung, Lampung, Indonesia
3Department of Soil Science, Faculty of Agriculture, University of Lampung, Lampung, Indonesia

Email: pujonohalim17@gmail.com

Abstract. Oil palm plant (Elaeis guineensis Jacq.) is one of the plantation crops which has become a major export commodity outside the oil and gas sector, and become the largest foreign exchange earner in the national economy. The lack of information regarding the utilization of palm oil liquid waste or Palm Oil Mill Effluent (POME) deserves serious attention since POME utilization could support plant growth and production and reduce the environmental pollution. This study aims to evaluate the agronomic character of oil palm plants due to the application of POME; evaluate the production and yield components of oil palm plants due to POME application; and determine the criteria of healthy oil palm plants based on agronomic character of plants. The study was conducted in the oil palm plantation of Perkebunan Nusantara VII Company in Bekri, Lampung Tengah,
Lampung, Indonesia, from April to August 2019. This research is an experiment with one-way treatment, namely land application POME which will be compared with plants on land without POME application. The experiment was arranged in a Complete Randomized Group Design (CRGD) with three replications. The agronomic character data were analyzed with variance at 5% significance level; while the difference in mean values between treatments was analyzed with the Independent T-Test for the production and yield component variable. The results of this research showed that the land application of POME provides variations on the total number and weight of harvested fresh fruit bunches (FFB). The total number of FFB harvested on the land applied by POME could increase to 40% significance with 38 FFB harvested / month. Afterwards, the total weight of FFB harvested on the land applied by POME could increase to 44% significance with 791.3 kg / 38 FFB harvested / month.

Improving the quality of acid soils to increase soybean yields and farmer’s incomes

Endriani¹, A A Rivaie², J Barus¹, D Meithasari¹ and R Asnawi¹

¹ Lampung Assessment Institute for Agricultural Technology (AIAT), Z.A. Pagar Alam Street 1A, Rajabasa, Bandar Lampung 35144, Lampung, Indonesia
² Jakarta Assessment Institute for Agricultural Technology (AIAT)

E-mail: endriani75@yahoo.com

Abstract. The contribution of Lampung Province is large to increase soybean production on dry land acid. The activity was held in Margototo Village, Metro Kibang District, East Lampung Regency. The scope of this activity was to study three packages of Lampung dry land acid soybean cultivation technology, using a randomized block design with 10 replications. Data on the results of the analysis were analyzed using the analysis and continued testing with BNT at 5% level and economic feasibility with the MBCR test. The study aims to obtain a package of cultivation technology in Lampung’s dry land and obtain adaptive soybean and high production of dryland acid. Soybean production with the application of technology means that farmers get as much as 0.78 tons of dry beans per hectare, while the application of technology B package (location specific) produces dry seeds as much as 1.33 tons per hectare, higher and significantly different than farmers (Package A). While, for the recommended technology package to produce 1.2 tons of dry beans per hectare and not significantly different from package B (location specific), there is an increase in soybean yield with the application of package B (location specific) of 66%, compared to farmers and an increase in income of 30%.

Progress of paludiculture projects in supporting peatland ecosystem restoration in Indonesia
Abstract. Sustainable peatland management practices such as paludiculture are crucial for restoring degraded peatland ecosystems. Paludiculture involves wet cultivation practices in peatland and can maintain peat bodies and sustaining ecosystem services. However, information about paludiculture effects on tropical peatlands is limited in the literature. Therefore, this study aimed to analyse the effectiveness and progress of paludiculture projects in supporting peatland ecosystem restoration in Indonesia that uses approaches of soil rewetting, revegetation of peat soil/forest, and the revitalisation of rural livelihoods around peatlands. We obtained qualitative and quantitative data from field measurements, observations, document reviews, spatial data from open-source web applications, and interviews with key stakeholders in two projects (agri-silviculture and agro-sylvofishery) that adapt paludiculture principles to Indonesia’s South Sumatra Province. We found that the limited use of paludiculture principles in both projects has a different contribution to peatland restoration. The agri-silviculture project has been utilising jelutung (*Dyera polyphylla*), ramin (*Gonystylus bancanus*), and balangeran (*Shorea balangeran*) for (forest) revegetation. These species are 3 of the 534 paludiculture species that are adaptive to peat soils and tolerant to acidic conditions and inundation. The revegetation resulted in effective results that supported peatland restoration despite the delayed application of rewetting activities in the initial phase of the project. Additionally, in the agro-sylvofishery project, trade-offs between soil rewetting to maintain high peat water tables and the need to provide short-term economic benefits for local communities through horticulture and fishery practices were noted. During the 2019 El Niño, the involvement of a closed-loop canal to support fishery practices appeared to contribute to affecting the water table, which was also influenced by the open canals dug in nearby palm oil plantations.

In Vitro Effectiveness of Heavy Metals Resistant Bacteria to Degrade Multi-Metals

R C B Ginting and J Purwani

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: r.cintabadia@pertanian.go.id

Abstract. Industrial waste that uses heavy metal raw materials caused significant environmental problems and poses a threat to human life. Soil damage due to heavy metal pollutant causes decreasing soil fertility and can even be toxic to plants. Bioremediation provides a sustainable waste management technique to reduce heavy metal pollutants in plants. This technique uses microbes which can degrade the metal contaminants to become non-toxic and be an eco-friendly and more effective process. This study aimed to find in vitro effectiveness of heavy metal resistant bacteria in degrading single Hg and multiple heavy metals of Hg, Cd, Pb, Cr, and Cu. The effectiveness of the
single and the consortium of three bacteria against heavy metal were tested in broth medium which supplemented with single mercury, while the effectiveness to degrade multi-metals was tested in broth medium which supplemented with multi-metals of Hg, Cd, Pb, Cr, and Cu. The results showed that the consortium of these three bacteria could degrade by 98.6% single mercury with an initial concentration of 1 ppm. It could degrade Hg by 90.15-94.72%, Cd by 64.27-73.47%, Cr by 30.6-37.8%, and Pb by 99.83-99.94% of the initial multi-metal concentration Hg+Cd+Cr+Pb 1.0+1.0+5.0+200 ppm. The bacteria are the potential to be developed as mercury bioremediation agents.

Land and resources management of shallots farming in the dry and rainy season: case study in the highlands of Solok, West Sumatra

A M Kiloes, Puspitasari, D Mulyono and M J A Syah

Indonesian Center for Horticulture Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: adhityakiloes@pertanian.go.id

Abstract. As one of the important horticulture commodity in Indonesia, due to its role in determining the national economic condition, shallot has several production centres throughout Indonesia. Solok Regency in West Sumatera Province is one of the new development centres for shallot production in Indonesia. This region has a specific cultivation characteristic that is different from other shallot production centres. Here, the cultivation of shallots is done in the highlands throughout the year. It is estimated that there will be differences in yields and production techniques between the rainy and dry seasons. The purpose of this study was to analyse land management practices conducted by farmers and to compare the inputs and outputs of shallot cultivation in Solok Regency during the dry and rainy seasons. Survey on the use of production inputs and outputs conducted on 95 shallot farmers in Solok Regency, which were then analysed using descriptive statistics and t-test. Rainfall data from the nearest weather station were used to support the discussion. The results showed that the use of labour inputs, solid pesticides, leaf fertilisers, and adhesives was significantly different between the rainy season and the dry season. While the land area inputs, mulch use, organic fertiliser, chemical fertiliser, dolomite, and liquid pesticides were not significantly different. The productivity of each land unit in the rainy season is lower than the dry season. The results of this study are expected to be a reference for planning the application of integrated pest and disease management technology according to the appropriate season on the shallot commodity in the highlands of Solok Regency.

Evaluation of results of corn local maize Islands Tanimbar Maluku Islands
M Pesireron¹, R E Senewe¹, A Gaffar¹ and Yusuf²

¹ Researcher of Maluku Agricultural Technology Assessment Institute (BPTP)
² Research and Development Center for Horticulture

E-mail: itjepesi@yahoo.com

Abstract. Local pulut corn (Zea mays Ceratina) originates from Tanimbar Islands Regency and Southwest Maluku Maluku Province. The aim of this research is to find out the superiority and yieldability of local pulut corn. The research was carried out in the dry climate lowland agroecosystem, in BBU (Main Seed Center) Wesawak Village (Rainy Season) and Tumbur Village (Dry Season), South Tanimbar sub-district. Using a Randomized Block Design with 6 treatments repeated five times. Pulut variety corn as a treatment consists of; three local varieties (Pulp Tanimbar, Pula Tepa, and Pulut Ungu Sulteng) and three new superior varieties (Pulmon Uri-1 composite, Pulan Ketan Hybrid and Pulutan Manis Hybrid Pulut). The results of the research show that the local corn Pulut Tanimbar has developed hereditary so that it adapts to a specific environment that is the power to grow in two growing seasons >90% with low rainfall (1,000-1,500 mm/year), early maturity <90 days (86.20 days), resistant to major borer pests (stem and cob), but susceptible to downy mildew, has an average yield of 3.24 t/ha (range 2.44-4.04 t/ha) and a potential yield of 4.04 t/ha. In addition, Pulut Tanimbar corn has the advantage of having high carbohydrate, protein and amylose content (63.47%, 13.05% and 26.68%), low fat content (5.08%), soft young corn texture, fluffier and delicious corn taste.

Theme 3: Adaptation and mitigation to climate change (CC)

Anticipating the impact of climate change in agricultural sector through implementation of solar water pump irrigation system using drip irrigation

Popi Rejekiningrum and Yayan Apriyana

Indonesian Agroclimate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: popirejeki@gmail.com

Abstract. Solar Water Pump Irrigation System (SI-PTS) that has been developed does not depend on fossil fuels. It could reduce greenhouse gas emissions into the air, moreover is able to raise and flow water to agricultural lands through supplementary irrigation. The research aims to design SI-PTS that is environmentally friendly, save water and energy and compare the efficiency of the irrigation of SI-PTS with jet pump used by farmers on shallots. The results of the study indicate that the use of SI-PTS could save fuel consumption from 70 to 14 litters per hectare per season, resulting
in a savings of 400%. Furthermore, the use of SI-PTS could reduce GHG emissions originating from the use of hydrocarbon materials from 0.176 to 0.035 tons of CO₂ with the result that it is more environmentally friendly. In addition, the results of water content analysis show that the use of SI-PTS with streamline drip irrigation has relatively higher water content compared to farmers' irrigation patterns, this indicates that irrigation system is more effective in distributing water both horizontally and vertical. Likewise, plant growth and shallots yields represented by plant height and total shallots weight indicate higher growth and yield when compared to farmers’ patterns.

The use of seasonal prediction of dry-spell in crop management decisions

E Surmaini¹,², E Susanti¹,², Suciintini¹, M R Syahputra² and F R Fajary²

¹ Indonesian Agro-climate and Hydrology Research Institute
² Bandung Institute of Technology
³ Main Contributor

E-mail: elzasurmaini@gmail.com

Abstract. Climate forecast have shown potential for improving resilience of agriculture to climate change. The usefulness of climate forecasts for applications in agriculture can be enhanced if the forecasts are translated into agricultural outlooks, where the information is targeted for decision-making. Sequence of dry periods necessary for successful crop management decisions especially in dry season planting. This paper investigates how well CFSv2 seasonal forecasts predict the dry spell (DS) over Indonesia region. The seasonal forecasts were downscaling using constructed analog method and, which in turn were corrected with TRMM 3B42 rainfall data to match monthly precipitation totals. The DS is defined as rainfall less than 5mm/day for ≥ 10 consecutive days. Accuracy of the DS prediction were assessed using Brier Score (BS) method. The results demonstrate that the highest accuracy of the DS predictions occurred in June-July-August. The operational DS prediction are needed to manage agriculture practices for the following planting season such as the choice of a crop/variety, supplemental irrigation, and crop water requirement.

Assessing the vulnerability of food farming system to support climate change adaptation in tropical area: case study in Java, Indonesia

W Estiningtyas¹, A Mulyani², Sumaryanto³ and B Kartiwa¹

¹ Indonesian Agroclimate and Hidrology Research Institute
² Indonesian Center for Agricultural Land Resources Research and Development
³ Indonesian Center for Agriculture Socio Economic and Policy Studies

E-mail: woro_esti@yahoo.com
**Abstract.** Indonesia is a tropical country with a very dynamic and complex climate and is vulnerable to climate change. Java Island is the center of food production where 51% of Indonesia's rice production comes from Java. Around 45.7% of 7.46 million hectares of paddy fields are in Java. This means that vulnerability in Java will have a significant impact on Indonesia. This paper presents the results of identifying the level of vulnerability of food farming in Java at the district/city level which can provide information on the level of vulnerability and the determinant factors that predominantly contribute to the level of vulnerability. The level of vulnerability of food farming is analyzed based on data on land, climate and water resources as well as socioeconomic data grouped to represent the level of sensitivity, exposure and adaptation capacity. The results of the analysis show that 20% of district/city in Java have very high levels of vulnerability. The determinants identified in each district can be used as a basis in developing adaptation programs and actions to reduce the level of vulnerability to climate change. The reduced level of vulnerability in Java will encourage climate-resilient farming to support food availability and security.

**Contribution of CO₂ emission from litter decomposition in an oil palm plantation on tropical peatland**

N Wakhid¹³ and T Hirano²

¹ Indonesian Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjar Baru, Indonesia
² Research Faculty of Agriculture, Hokkaido University, Sapporo, Japan

E-mail: n_wakhid@yahoo.com

**Abstract.** Soil carbon dioxide (CO₂) emission consists of peat decomposition, root respiration, and litter decomposition. Although there are some publications on soil respiration in oil palm plantations, information of CO₂ emission from palm litter (frond) decomposition is still limited. Therefore, our objective was to estimate the CO₂ emission from frond decomposition in an oil palm plantation on tropical peat. The study was conducted in a smallholder oil palm plantation with two different cultivars (M and S) on peat in Jambi, Indonesia, using meshed litter bags of 40 cm x 80 cm. The temporal pattern of carbon loss was similar to that of dry weight loss, following a negative exponential. Annual carbon input through pruned fronds into the plantation were 189 and 281g C m⁻² yr⁻¹, respectively, for M and S cultivars. Annual CO₂ emissions through oxidative frond decomposition were estimated to be 98 and 153 g C m⁻² yr⁻¹, respectively, for M and S cultivars. The annual CO₂ emission from oil palm litter decomposition accounted for about 13% of soil heterotrophic respiration of oil palm plantations on tropical peatland.

**Adaptation and mitigation strategies for impacts and efforts of climate change 405**

W A Tri¹ and T Zulchi²
Abstract. Global warming has become an important issue at this time, where this phenomenon is caused by an increase in the concentration of Greenhouse Gases (GHGs). Greenhouse Gases (GHGs) is a collective term for gases that have a greenhouse effect, such as chlorofluorocarbons (CFCs), carbon dioxide (CO$_2$), methane (CH$_4$), nitrogen oxides (NO$_x$), ozone (O$_3$) and water vapor (H$_2$O). Climate change is believed to have a negative impact on various aspects of life and the development sector, especially the agricultural sector, and it is feared that it will bring new problems to the sustainability of agricultural production, especially food crops. Rice fields are one the main anthropogenic source of nitrous oxide (N$_2$O) gas, which contributes to global warming. Impact of climate change requires an active effort to anticipate it through mitigation and adaptation strategies. Mitigation technologies aim to reduce greenhouse gases (GHG) emissions from agricultural lands through the use of low-emission varieties, water management, and land management technologies. Adaptation technologies include adjusting planting time, use of varieties resistant to drought, soaking, and salinity, and development of water management technologies.

Assessing freshwater water balance in Indramayu Estuary

M W Trinugroho$^1$ and D H Nguyen$^2$

$^1$ Indonesian Agency for Agricultural Research and Development, Ministry of Agriculture, Jl. Ragunan 29 Pasar Minggu, Jakarta Selatan 12540, Indonesia

$^2$ Asian Institute of Technology (AIT), P.O. Box 4 58 Moo 9, Km. 42, Paholyothin Highway, Klong Luang, Pathum Thani 12120, Thailand

Email: wahytrinugroho@pertanian.go.id

Abstract. Managing of freshwater inflows in river basin is an essential effort due to the complex interaction between river flow and water extraction for multiple users. This study aims to assist the freshwater water balance in the lower Cimanuk River Basin, Indonesia. Hydrological, meteorological and statistical data were used to compute water availability and water demand. Additionally, the Water Evaluation and Planning System (WEAP) has been applied in evaluating water demand and supply taking into account of changes in river flow. The models were calibrated using the stream flow and the water requirement for irrigation, fishery, domestic, and industries. The study shows current water shortages in the Lower Cimanuk River Basin are relatively high. It becomes big problem which coverage of water demand is not satisfied for water users. The irrigation sector is the dominant water users which have biggest impact on water shortage.
Effects of rice cultivar on the net greenhouse gas emission under continuous flooding and alternate wetting and drying irrigations in paddy field

A Pramono, T A Adriany, H L Susilawati and M T Sutriadi

Indonesian Agricultural Environment Research Institute, Indonesian Agency for Agricultural Research and Development, Pati, Indonesia

E-mail: ali_pramono@yahoo.com

Abstract. Rice production has been challenged by increasing food demand and water scarcity. Alternate wetting and drying (AWD) irrigation is a water-saving irrigation technique for paddy fields. To obtain an option of irrigation in increasing rice yield and reducing greenhouse gas emissions from paddy fields, we investigated the effect of rice cultivar on the net greenhouse gas (GHG) emission under different rice cultivar in the water management of continuous flooding (CF) and AWD irrigation in paddy field. The research was conducted at IAERI, Pati, Central Java from November 2017 until February 2018. The emission rates of methane (CH₄) and nitrous oxide (N₂O) gases were simultaneously observed every week using closed chamber method. The results showed that the AWD irrigation treatment was not significantly different on rice yield compared to CF. The highest rice yield was Inpari 32 rice cultivar by 5.02 ton ha⁻¹. The combined AWD irrigation and Inpari 32 rice cultivar gave the highest net greenhouse gas emission. This study clearly suggests the possibility of reducing GHG emission from the paddy field through appropriate selection of water management and rice cultivars to achieve an economically feasible and technically as a mitigation option.

Lessons learned from Europe’s peat management regimes

D H Azahari¹, Sukarman² and B W Van Assen³,⁴

¹ Indonesian Center for Agriculture Socio Economic and Policy, Bogor, Indonesia
² Indonesian Center for Agricultural Land Resource Research and Development, Bogor, Indonesia
³ Indonesian Auditor Network, Bogor, Indonesia
⁴ KAYON, Bogor, Indonesia

E-mail: heppsuci@yahoo.co.id

Abstract. Indonesia owns 14.93 million hectares of peatlands throughout Sumatra, Kalimantan, Papua and a little in Sulawesi. For over two decades, it is criticised by international and local activists for the (commercial) management of its extensive peat bogs/lands. Criticism pivots around the draining of peatlands for the use of (dryland) agriculture, horticulture and forestry. The brunt of it concerns the use of peatland for oil palm expansion, and the emotive global black campaigning ignores the latest sustainable practices (such as maintaining the maximum ground water depth and protecting the centre of peat domes). In contrast, Europe has (commercially) managed its peatlands since the 13th century – spanning a period of 7 decades – and accrued extensive institutional knowledge on its various management regimes. This paper explores various management regimes applied to European peatlands and extracts lessons learned as an initial guide for defining the best
management practices of peatlands throughout Indonesia. A comparison of European and Indonesian trends in peatland distribution, followed by a gap analysis of management regimes, identifies interim strategies that are further explored with local experts. Based on the feedback received, these interim strategies are adopted, adapted or rejected and a roadmap for revising the current management strategies is presented.

Designing a GIS-based android application for tractor distribution in Maros Regency of South Sulawesi

A B Kresna1,2, M Achmad1, Iqbal1 and A P Hanifa3

1 Agricultural Engineering Program, Faculty of Agriculture, Hasanuddin University, Makassar, Indonesia
2 Batangkaluku Agricultural Training Center, Agricultural Human Resource Extension and Development Agency, Gowa South Sulawesi, Indonesia
3 School of Agriculture and Environment, Massey University, New Zealand

E-mail: akrisna5@gmail.com

Abstract. One of the key issues in agricultural machinery aids program from the central government is the difficulty to access the distribution information. Aiming to address the problem, a cellular application namely GIS Maros Tractor is designed using Android Studio software and Google Maps API to provide the information of spread location for two wheels and four wheels tractors in Maros Regency. It is expected with this application the field data can be managed and accessed in detail and faster. Besides, it enables to identify the shortage and surplus of hand tractor and four wheels tractors. The result of this study is an android application to find information about agricultural machinery movement in Maros Regency. Suggested development for this application design is an additional security feature and an animation to make it more attractive.

Soil CO₂ emissions from tropical peat in a strong El Niño year was higher than in a normal year

N Wakhid and S Nurzakiah

Indonesian Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjar Baru, Indonesia

E-mail: n_wakhid@yahoo.com

Abstract. El Niño event potentially enhances the soil CO₂ emissions due to the prolonged of the dry season which lowers more the groundwater level. However, field information on the effect of the El Niño years on the soil CO₂ emissions is limited in Indonesia’s peatlands. Therefore, we measured soil CO₂ efflux using a closed chamber system monthly on the dry season, from June to November, in the normal year of 2014 and strong El Niño year of 2015, respectively, on a rubber plantation
established on peat soil. Also, peat surface elevation was measured to determine the peat soil subsidence during those events. No significant relationship was found between soil CO\textsubscript{2} emissions with groundwater level or soil temperature. We found that soil CO\textsubscript{2} emissions in the strong El Niño year of 2015 were larger than that in the normal year of 2014. Also, the peat subsidence in 2015 was almost double that in 2014. We expected this finding can be used as the first baseline information regarding soil CO\textsubscript{2} emissions under different climatic conditions and challenging how to manage the peatland for mitigating high soil CO\textsubscript{2} emissions during El Niño events.

### Excessive amount of rainfall decreases oil palm yield on well drained peatland

S Marwanto\textsuperscript{1}, J Hendri\textsuperscript{2} and Salvati\textsuperscript{3}

\textsuperscript{1} Indonesian Soil Research Institute (ISRI), Indonesian Agency for Agricultural Research and Development (IAARD), Bogor, Indonesia
\textsuperscript{2} Assessment Institute for Agricultural Technology of Jambi (AIAT), Indonesian Agency for Agricultural Research and Development (IAARD), Jambi, Indonesia
\textsuperscript{3} Assessment Institute for Agricultural Technology of Riau (AIAT), Indonesian Agency for Agricultural Research and Development (IAARD), Riau, Indonesia

E-mail: setiari_mr@yahoo.com

**Abstract.** Low inputs smallholder plantation in drained peatland causes the low oil palm yield. In addition, extreme environmental factors in tropics, such as excessive rainfall, may also reduce the yield. The objective of this study was to evaluate the effect of the amount of rainfall on oil palm fresh fruit bunch (FFB) yield. Two study sites of well (WD) and fair (FD) drained oil palm plantations on peatland was used in 2018 and 2019 in Jambi Province, Indonesia. The daily rainfall was monitored using a manual rain gauge. FFB yield was monitored every two weeks, in accordance with farmer’s practice. This study showed that the excessive amount of rainfall in WD plantation site decreased FFB yield in the subsequent weeks after the rainfall events. The higher the amount of rainfall the longer the recovery of FFB yield. The lowering FFB yield possibly be affected by nutrient deficiency due to nutrient transportation through water movement during the event of high rainfall amount [1]. The FFB yield in the FD site was not affected by rainfall, reflected the higher nutrient availability of FD compare to WD. Based on these findings, it is confirmed that well drained agricultural peatland is a fragile ecosystem in term of nutrient loss.

### Dynamics of carbon content of peat soils from several land use on the Kampar Peninsula, Riau Province, Indonesia

Suratman\textsuperscript{1}, Widiatmaka\textsuperscript{2}, Bambang Pramudya\textsuperscript{2}, Muhammad Yanuar Jarwadi Purwanto\textsuperscript{2} and Fahmuddin Agus\textsuperscript{3}

\textsuperscript{1} Indonesian Centre for Agricultural Land Resource Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
Abstract. One of the main greenhouse gases (GHGs) arising from peat decomposition is CO2 which has a large influence on emission in nature. Land management can trigger decomposition, causing carbon content disruption in peat soils. Carbon content dynamic studies have been carried out on various land uses on the peat dome in Kampar Peninsula, Riau Province, Indonesia. Secondary data compilation from 2016 completed by primary data until 2018 has been carried out to obtain multi-temporal data. Carbon content analysis was performed on 25 cm thick layers of the peat land surface, which were analyzed by the Walkley and Black Method in the laboratory. The dynamic of land use types are analyzed by interpreting multi-temporal imagery and ground check in the field. Changes in land use have changed the biophysical characteristic of peatlands, including carbon content. The result showed that over period of three years, from 2016 to 2018, there was a carbon level decrease in the land with intensive management, namely estate corps, IFP (Industrial Forest Plantation) and dry land crops there was decrease in average carbon content between 0.12-1.39 % per year. Whereas there is an increase of average carbon content on unmanaged land in swamp grass and shrub forest between 0.24-0.75 % per year. Below-ground carbon stock in the study area is between 1926.78-6643.68 ton/ha/yr, the lowest is in abandoned/shrubs fallow land, the highest is in the shrub forest area. These results are expected to provide an overview of appropriate peatland management option based on balanced economic and ecological considerations.

Rainwater harvesting technology to increase cropping index under perennial crops

N Heryani, B Kartiwa, A Hamdani, I Muhardiono, B Rahayu and Purwaningasih

Abstract. Spatial and temporal water availability uncertainties are the major constraints to dryland crops productivity. Comprehensive hydrologic survey to determine water harvesting location as supplementary irrigation source is the key to increase dryland cropping index. This research was conducted in Lampung during April to December 2019. The aims of this research were to determine cropping pattern of upland paddy cultivation and to apply efficient irrigation techniques on upland paddy and maize farming under perennial crops. The applied irrigation techniques consisted of sprinkler, furrow, and spray hose, while 3 varieties of the used upland paddy were Rindang 1, Rindang 2, and Inpago 10. Results of this research revealed differences in crop productivity between paddy under “sengon” and rubber. This finding suggests supplement irrigation requirement from water harvesting infrastructures to increase land productivity during dry season. Moreover, the percentage of tolerable shading was up to 50% or 3-year age of the perennial crops.
Trend analysis of agricultural water supply and demand for water conservation and climate change anticipation

R Nurkhaida and P Rejekiningrum

Indonesian Agroclimate and Hidrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: seminarbbsdlp@gmail.com

Abstract. The use of water for various uses tends to exceed the available water supply and sometimes neglects water conservation. This is increasingly stressful on the availability and supply of water for various uses. Agricultural water demand is allegedly the biggest among other users, the fact is the use of water for agriculture is manageable if water is not available, efficiently is carried out by developing water-saving irrigation technology, introducing water-saving commodities. The research aimed are: (1) Identifying water availability, (2) Identifying agricultural water use, and (3) Calculating agricultural water supply-demand balance in various planting scenarios. Results of analysis indicated that the potential of water availability in 2020 is 21,576.47 MCM and the projection 2050 are 25,163.64 MCM. The total water demand for agriculture in 2020 is 21,615.33 MCM and projected 2050 is 20,970.05 MCM. Total agricultural water demand for one cropping is 6,597.65 MCM and projection 2050 is 6,226.62 MCM, for two cropping 14,037.29 MCM and projected 2050 is 13,430.84 MCM, and three cropping 21,615.33 MCM and the projected 2050 is 20,970.05 MCM. Analysis of water supply-demand balance in each district area one and two cropping in 2020 and 2050 shows a surplus, whereas for three cropping, some regions showed a deficit.

Effects of residual biochar amendment on soil chemical properties, nutrient uptake, crop yield and N\textsubscript{2}O emission reduction in acidic upland rice of East Lampung

Jubaedah\textsuperscript{1}, Muhtar\textsuperscript{2} and N L Nurida\textsuperscript{1}

\textsuperscript{1} Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
\textsuperscript{2} Central Sulawesi Assessment Institute for Agricultural Technology, Palu, Central Sulawesi, Indonesia

E-mail: jhjubaedah@gmail.com

Abstract. Many attentions to biochar as soil amendment lately due to its ability as soil amendment and also as one of strategy to mitigate climate change. Previous studies reported that biochar may increase plant nutrient uptake, crop yield and reduce N\textsubscript{2}O emission. A field trial was conducted at Taman Bogo Research Station of East Lampung, to investigate the effect of cacao shell and rice husk biochar on soil chemical properties, nutrient uptake, crop yield, and N\textsubscript{2}O emission reduction on upland rice at acidic soil of East Lampung. The study was at 4th planting season of upland rice, considering as residual effect of biochar application. Biochar was applied in the first planting season of 2012, and no biochr addition later on. Three rates of cacao shell and rice husk biochar namely 0,
5 and 15 ton/ha, N fertilizer (urea) = 200 kg/ha and NPK fertilizer (15:15:15)= 300 kg/ha were applied to soil. N$_2$O emission from soil were monitored with close chamber method during rice planting season, the measurement was parted in four phases (three phases of fertilization and one of harvest phase). The result showed that cacao shell biochar tends to have better response than rice husk biochar on crop yield at every rates of biochar treatment. Crop yield at cacao shell biochar 15 ton/ha treatment was the best yield (1.21 ton/ha). Meanwhile, it was difficult to describe biochar effect on upland rice nutrient uptake. N$_2$O total production on cacao shell biochar treatment during measurements was 1500 µg/m$^2$/h lower than in control. Nevertheless, total N$_2$O production on 15 ton/ha of ricehusk biochar treatment was increased compared to control.

Climate change impact on rice productivity in the rain land, Merauke District, Papua

P A Beding, F Palobo, B M W Tiro, R H S Lestari and M K Rumbarar

Papua Assessment Institute of Agricultural Technology, Jl. Yahim Sentani No. 49 Sentani Jayapura 99352

E-mail: peter.beding@gmail.com

Abstract. Plant growth and quality depends on the interaction between environmental and plant genetic factors. Genetic factors are related to characteristics that are usually distinguish plants, while environmental condition such us climate / weather plays role in controlling the potential of plants. One element of climate that can be used as an indicator in relation to plants is rainfall. The variance of rainfall is usually associated with the diversity of annual crop yields, especially for conditions in Regency of Merauke which are usually dependent on the available rainfall. This study aims to determine the impact of climate change (rainfall) on rice productivity on rainfed land in Merauke Regency. The research was carried out in the dry land area in Merauke Regency and focused on rice production centers, namely: Merauke Directorate, Semangga, Sloping Land, Kurik, and Jagebob District, from April to July 2020. The method used was the descriptive method (quantitative and qualitative descriptive analysis, namely research based on solving factual problems that exist today. The collected data is compiled, explained, and then analyzed. The data used in this study are climate data (rainfall) and rice crop productivity. To determine the relationship between climate change (rainfall as an independent factor) and productivity (as a dependent factor) analyzed by regression correlation. The results revealed the harvested area and production are quite affected by rainfall conditions, especially in extreme climatic conditions such as El-Nino.

Planting time options as alternative to the information system of integrated cropping calendar (kalender tanam/KATAM) at Muara Experimental Site in Bogor
E R Dewi, E Susanti and Y Apriyana

Indonesian Agroclimate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: elsarakhmi@gmail.com

Abstract. The information system of integrated KATAM has been broadly applied in Indonesia and become a guideline for the users entering the next planting season. However, it allows limited options of planting time of one growing season. APSIM was used to evaluate scenarios of favorable planting time to improve productivity at Muara Experimental Site in Bogor. Options evaluated considered the early and late planting times in accordance with the integrated KATAM recommendations. Productivity was used as variable in evaluating the ability of APSIM to simulate the considered planting times. APSIM simulated productivity with a pretty good accuracy (EF=0.74) across the different planting times following the growing season. For the irrigated rice, the late planting resulted similar productivity to the KATAM planting in the rainy (5.1-5.5 ton ha\(^{-1}\)) and dry season (5.6-5.8 ton ha\(^{-1}\)), whereas the early planting resulted the lowest productivity (3-5 ton ha\(^{-1}\)). For the rainfed rice, the early planting presented the same productivity as the KATAM planting in the rainy (2.9-3.2 ton ha\(^{-1}\)) and dry season (4.0-4.3 ton ha\(^{-1}\)), respectively. This study confirmed that simulation model is a useful tool in determination of planting time based on prevailing climate conditions to ensure the acceptable productivity in rice cropping system.

Mitigation of pyrite oxidation impact in tidal swamp management for agriculture

I G M Subiksa

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: igm_subiksa@yahoo.co.id

Abstract. Reclamation of tidal swamps by construction of drainage canal networks will increase the opportunities of pyrite oxidation which causes the land to experience severe acidification. High soil acidity causes the solubility of the toxic elements to increase and inhibit the optimum plant growth. Pyrite oxidation occurs due to over drained and pyrite exposed to oxygen from the air. The acidification process is unavoidable; therefore, mitigation efforts are needed to minimize any adverse impacts. In general, mitigation efforts can be done with 2 approaches, namely preventive measures, and curative efforts. The preventive approach is an effort to prevent continued acidification, meanwhile curative approaches are an effort to rehabilitate degraded land due to pyrite oxidation. Land use planning with detailed engineering design is the first step to mitigate the effects of pyrite oxidation. Mapping of soil containing pyrite layer depth and controlling the ground water level above that soil layer can prevent oxidation processes. Mitigation efforts for acidified soil can be using water management techniques to leach toxic elements out from the root zone. Many research results revealed that one-way flow system water management was effective to reduce toxic element from root zone. Another technique is tabat system that is suitable for C and D type of hydro topography. High soil acidity and toxic element can also reduce by applying soil ameliorant such as lime. Many evidences showed that applying 0.5 – 2.0 t ha\(^{-1}\) of lime can increase soil pH and significantly corrected plant growth. Ameliorant also increased of fertilizer use efficiency. Strong acid soils also cause low nutrient status due to intensive nutrients leaching. Therefore, nutrient
supply trough fertilization is needed. Site specific lime and fertilizer requirement can be determine using rapid test kit called swampy soil test kit (PUTR). Finally, mitigation efforts can also be done by planting acid tolerant rice varieties. Many acid tolerance varieties available resulted from longtime rice research in tidal swamps.

**Selection of chili and tomato cultivars for mitigation of climate change and sustainable production**

E Latifah¹, H A Dewi¹, P B Daroini¹ and J Mariyono²

¹ Assessment Institute for Agricultural Technology, East Java - Indonesia
² Department of Economics, Pancasakti University, Tegal - Indonesia

E-mail: evy_latifah@yahoo.com

**Abstract.** This study is to test the adaptation capacity of several selected lines and varieties of chili and tomato in farmers’ lands. Five improved lines and varieties of tomato and chili were selected based on the best performance in previous trials. Two participating farmers managed the trials. Agronomic aspects were used as performance indicators. The results show that several improved lines of tomato and chili performed better than others. However, the performance was dependent on the altitude and season. Lines performed better at high altitude and could not do the same at low altitude. This is the same case as at different seasons. Farmers were expected to select the best lines according to the locations.

**Planting time planning of crops through water balance approaches and rainfall prediction information**

Y Apriyana, A Pramudia and M R S Koswara

Indonesian Agroclimate and Hydrology Research Bogor, Jalan Tentara Pelajar No. 1A, Ciwaringin Bogor

Email: yanapri66@gmail.com

**Abstract.** This study presents an analysis of the planning of rice and secondary cropping patterns in three locations with different rainfall amounts and patterns and also various groundwater capacities. The analysis was carried out through a soil-water balance approach at a land thickness of 30 cm in ten days period interval. Input data used are rainfall prediction information from authorized institutions, the estimated value of potential evapotranspiration, and the value of groundwater storage capacity in each location. The results of the study show that the Bandar Sidorah watershed has a bimodal/equatorial rainfall pattern with an annual rainfall of 2,126 mm/year, Agro-climate type C2, five wet months, two dry months, and a groundwater storage capacity of 32 mm/30 cm. It could apply the Rice - fallow - Rice pattern with the planting season I in October-January and the planting season II in the May-August period. The February-April period is a critical period of water,
so it is highly recommended to fallow land. For the Mrican Kanan watershed which has a unimodal/monsoonal rainfall pattern with an annual rainfall of 3,301 mm/year, Agro-climate type B3, seven wet months, and five dry months, with a groundwater storage capacity of 66 mm/30 cm, it could be applied Rice – Rice - Fallow pattern with planting season I in November-February and planting season II in March-June. The July-October period is a critical period of water, it is therefore recommended to fallow land. Whereas for the Gadungan Lambuk watershed, which has a monsoonal rainfall pattern with an annual rainfall of 3,165 mm/year, Agro-climate type C2, five wet months, and five dry months, with a groundwater storage capacity of 27 mm/30 cm, it could be applied to the Paddy – Maize - Other Crops pattern with planting season I in November-February, planting season II in March-June and planting season III in the July-September period.

Organic matter application did not affect N₂O fluxes from two shallot cropping season in a sandy loam soil

M Ariani, P Setyanto and A Wihardjaka

Indonesian Agricultural Environment Research Institute, Jakenan-Jaken Main Rd. Km 5 PO Box 5, Jaken, Pati 59182, Phone: +62 295 4749044, Fax: +62 295 4749045

Email: miranti_ariani@yahoo.com

Abstract. Agricultural soils managed with a large amount of fertilizer generate nitrous oxide (N₂O). The N₂O emission rates depend on several soil conditions, climatic, and management factors. This study aims to observe the N₂O flux rates from four organic matter treatments and examining soil water-filled pore space (WFPS) and soil temperature in rainy and dry seasons. The experimental sites took place on a sandy loam soil with four organic matter treatments, i.e., 1). No OM, 2). Chicken manure, 3). Cattle manure, 4). Bio-compost. N₂O fluxes were measured bi-weekly during the rainy season and weekly during the dry season. Soil WFPS and soil temperature were both determine at the same time. N₂O fluxes from shallot were significantly different between rainy and dry season (p<0,01), but not between treatments. It is ranged between 3.58 to 20.19 mg N₂O m⁻² d⁻¹ on rainy season and between 0.57 to 2.79 mg N₂O m⁻² d⁻¹ on dry season. The linear regression showed that both soil WFPS and soil temperature only significantly relate to N₂O fluxes in the rainy season. Soil WFPS >45% lead to high N₂O fluxes and higher soil temperature. This finding showed that water is one of the important thing to maintain in order to mitigate N₂O emission from agricultural soils whether in upland or lowland.

CH₄ emissions and yield from submerged tolerance rice varieties

H Yulianingrum, D M W Paputri and R Kartikawati

Indonesian Agriculture Environmental Research Institute, Indonesian Agency for Agricultural Research and Development, Pati, Indonesia
Abstract. Anomalies in the global climate that often occur have an impact in the difficulty of predicting the intensity of flood that hit crops in flooded area agricultural or areas along river. Measurement of CH4 from submerged land need to be done as an effort to provide information on varieties that are resistant to submerged and low CH4 emissions. The objective of this study to get information the tolerance of plants to submerged for 10 days in various varieties and produce CH4 emission. The research was conducted in the rainy season in March - July 2019 at Jakenan Experimental Garden, Indonesian Agricultural Environment Research Institute, Jaken District, Pati Regency, Java. The research consisted of 4 varieties that were repeated 3 times. The varieties used include V1 (Ciherang), V2 (Inpara 2), V3 (Inpara 5), and V4 (Inpago 8). The parameters observed were number of tillers, plant height, yield component, grain yield and CH4 emission. The result showed the Inpago 8 is a variety that resistant to the submerged process having a yield/emission index of 1.09. Inpago 8 produce low CH4 emissions and high grain yield.

Quantifying the reduction of greenhouse gas emission from manure management through anaerobic digester in Central Java

Sarah, H L Susilawati and A Pramono

Indonesian Agricultural Environment Research Institute, Indonesian Agency for Agricultural Research and Development, Jakenan, Pati, Indonesia

E-mail: sarahsoedarma@gmail.com

Abstract. Indonesia has committed to reduce 29% of national greenhouse gas (GHG) emissions by its own efforts and 41% with international support by 2030. The livestock releases methane (CH4) and nitrous oxide (N2O) from enteric fermentation and manure management. Anaerobic digester can capture CH4 emission from manure and it can be used for bio-energy to replace LPG and kerosene. The aim of this study is to estimate GHG emission from manure management and its reductions through anaerobic digestion in Central Java Province during 2010 – 2015. The data were collected by questionnaire surveys, interviews, and institutional data collections. GHG emission from livestock and its mitigation were estimated using the IPCC 2006 Tier 1 method. The results showed that goats was the highest contribution of GHG emission from livestock approximately around 490, 494, 516, 520, 525, and 540 Gg CO2 per year during 2010-2015, respectively. The anaerobic digestion avoided CH4 emission approximately 11,55 – 117,43 Gg CO2 per year. Methane avoidance could substitute the energy around 0,50- 5,08 Gg CO2 per year. Anaerobic digesters are processes that convert livestock manure into biogas rich in methane, which can significantly reduce GHG emissions from animal waste.

Methane gas fluxes from livestock manure
Nutrient content and greenhouse gas emissions of goat manure compost processed without and with activator

W Puastuti, Y Widiawati and D Yulistiani

Indonesian Research Institute for Animal Production, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

Email: wisri_puast@yahoo.com

Abstract. The study was conducted to evaluate the compost of goat manure processed with or without activator on soil nutrient content and greenhouse gas emissions. Three treatments of compost made were Control = 100% goat manure only; C-EM4 = 85% goat manure + 15% sawdust + 300 g urea + 300 g TSP + 300 ml EM4; C-Promi = 85% goat manure + 15% sawdust + 300 g urea + 300 g TSP + 300 g Promi. The experiment was done in a completely randomized design with 5 replications. Composting was done for 60 days without activator (control) and 30 days with activator. The results showed that the activators application significantly affected (P <0.05) temperature during fermentation (C-EM4 = 40.86°C; C-Promi = 40.27°C vs Control = 36.59°C), compost methane gas emissions was lower (P<0.05) with activator application (C-EM4 = 341 ppm; C-Promi = 340 ppm) compared to Control (Control = 623 ppm), but between C-EM4 and C-Promi showed no significant difference (P>0.05). The usage of both activators did not significantly affect (P> 0.05) N2O gas emissions (C-EM4 = 17,736 ppb; C-Promi = 14,870 ppb vs Control = 15,844 ppb), compost nutrient content and ratio C / N. From this study can be concluded that goat manure compost processed with activators EM4 and Promi produced lower methane gas emissions, but it nutrient content did not different to Control.
Heavy Metal Pollution Assessment in paddy rice fields and horticulture fields in Bandung district

Sukarjo, I Zulaehah, C O Handayani and H Zu'amah

Indonesian Agricultural Environment Research Institute

E-mail: sukarjo@gmail.com

Abstract. Excessive use of fertilizers and pesticides in intensive agriculture causes the accumulation of heavy metals in agricultural land. Besides, the development of industries around the agricultural area further increases the accumulation of heavy metals. This study aims to assess the assessment of heavy metal pollution and describe pollution to evaluate pollution and determine cost-effective improvement plans. In this study, seven concentrations of heavy metals (Cr, Pb, Cd, Co, Cu, Ni, and Zn) were collected at 273 sampling sites in rice and horticultural land in Bandung Regency, Indonesia. The single pollution index (PI) and the Nemerow integrated pollution index (NIPI) are calculated for each surface sample (0-20 cm) to assess the level of heavy metal pollution. Ordinary kriging (OK) is used to map the spatial distribution of heavy metals and NIPI. The results show that the average values of all PIs and NIPI are at a safe level, except for Cobalt which shows slightly polluted. The analysis showed that 3.23% of soil samples were cadmium slightly contaminated and 8.76% of cobalt slightly contaminated.

Greenhouse gas emissions reduction and rice yield potential under bio-fertilizer application

E Yulianingsih¹, A Pramono¹, P Setyanto² and Sugarto³

¹ Indonesian Agricultural Environmental Research Institute
² Directorate General of Horticulture
³ PT Indo Acidatama Tbk

E-mail: eniyulianingsih@gmail.com

Abstract. Rice cultivation is one of the largest contributors of CH₄ emission to the atmosphere. It contributes approximately 5-19% of the total global CH₄ emissions. The aim of this research was to investigate the effect of the using of bio-fertilizers on greenhouse gas emissions and rice yield. This experiment used completely randomized design with three treatments and five replications. The treatments were (1) no amendments (control), (2) rice straw, and (3) rice straw + bio-fertilizer. We measured the CH₄, CO₂, and N₂O gas fluxes weekly during the rice-growing season by using closed chamber method. The results of this study showed that application straw + bio-fertilizers treatment reduced GHG emissions by 9.2% of CH₄, 14.8% of N₂O and 27.7% CO₂ emissions compared to the application of straw treatment. The application of straw + bio-fertilizers treatment decreased global warming potential (GWP) by 10.6% compared to the application of straw. The GHG intensity (GHGI) of straw + bio-fertilizer treatment decreased 16.0% compare to control. The results
suggested that application of bio-fertilizer could support environmentally agriculture in realizing food self-sufficiency.

Developing of the swamp planting calendar based on the hydrological model application

B Kartiwa, Y Apriyana, S H Adi, H Sosiawan, P Redjekiningrum and G Gumilar

Indonesian Agroclimate and Hydrology Research Institute (IAHRI)

E-mail: budi.kartiwa@gmail.com

Abstract. Determining the beginning of rice planting season is an important cultivation strategy in Indonesia, which influenced by climate anomalies. On swamps, the beginning of planting season depends on local rainfall patterns, upstream rainfall, discharge, and water level dynamics. This article presents hydrological model application in developing planting calendar for non-tidal swamp agricultural land. The research location was in Tanjung Alai Village, Padang, Ogan Komering Ilir, South Sumatra. This research analyzed multi-variable hydrological data during 1999-2000 period. River discharge was simulated using GR2M model, while land surface elevation dynamic was analyzed using water balance approach. Model parameters included rainfall, evapotranspiration, percolation, river water level, outflow, and inundation level. Results of this study showed the GR2M model calibration between the measured data and the Ogan River discharge had 65 percent similarity level. The water balance analysis result showed flooded land during the decade period of Jan I to May II, where Ogan River water elevation was between 6.21 m and 10.43 m asl. Water balance simulation identified the optimum planting period between the decade of May III to July III, where Ogan River water elevation was between 6.73 m and 8.83 m, and land water level ranged from 14.96 to 29.56 cm.

Adaptation and mitigation of climate change in the Bangsri Micro Watershed, East Java, Indonesia

K Hairiah, C Prayogo and S Kurniawan

Soil Science Department, Faculty of Agriculture, Universitas Brawijaya, Malang, Indonesia

E-mail: k.hairiah@cgiar.org

Abstract. The Bangsri subcatchment of the Brantas basin in East Java has experience on land use change during the past three decades. The study aimed to estimate land use change and its impact on carbon emission and sequestration, as well as to formulate the strategy for adaptation and mitigation of climate change in the Bangsri watershed. Land cover changes was analyzed from four different satellite image observation times, i.e 1994, 2001, 2011 and 2017. The field research was conducted for measuring the component of carbon stocks (i.e biomass, necromass, soil carbon stock). Based on data of land cover changes from satellite imagery of 1994, 2001, 2011 and 2017,
there was a decrease in natural forest area, and an increase in the area of shrubs, agroforestry and production forests and annual crop land. As consequence, net CO$_2$ emission from the Bangsri micro watershed was increased from 2.4 to 6.4 tons CO$_2$ ha$^{-1}$ yr$^{-1}$ during the period 2001-2011 and 2011-2017. The study suggested to maintain large trees such as *Michelia velutina* for conserving carbon, to increase the number of trees in bushland and community land for increasing biodiversity, and to maintain the sustainability of agroforestry vegetable production by smart water management.

The resilience of the agricultural system in the mids. of climate change issues: case of Labian Village, West Kalimantan

Ratih Solichia Maharani$^{1,4}$, Hangga Prihatmaja$^{2,4}$, Basoeki Karyaatmadja$^{3,4}$ and IGNN Sutedja$^{4,4}$

1 Kyoto University, Graduate School of Agriculture, Kyoto, Japan
2 Graduate School of IPB University, Bogor, Indonesia
3 Forest and Climate Change Programme – Financial Cooperation Module (FORCLIME FC) Planning Bureau, the Ministry of Environment and Forestry Republic of Indonesia
4 Forest and Climate Change Programme – Financial Cooperation Module (FORCLIME FC) Planning Bureau, the Ministry of Environment and Forestry Republic of Indonesia

Email: maharani09@gmail.com

Abstract. Population growth and land management are severe issues in Indonesia as a developing country. This condition leads to the food security problem and affects the high land demand for the agricultural sector. However, availability in the agricultural area is limited. As a country with forest area more than a half from the land area, it creates a phenomenon in converting forest area to agricultural area. This condition raises the assumption of some parties that the agricultural sector is the cause of deforestation in Indonesia. Based on an explorative study from five years of experience in a forest and climate change project in Labian Village, West Kalimantan, it is needed to analyze the impact of this project in solving their implementation on combating land deforestation from agricultural activity in community dependent forest. Community participation in land use planning is necessary to support sustainable land management and avoid encroachment in the forest area.

Utilization of organic fertilizer in response to mitigate CO$_2$ emission

D P Widiastuti, M Hatta and A Musyafak

Assessment Institute for Agricultural Technology of West Kalimantan, Indonesian Agency for Agricultural Research and Development, Pontianak, Indonesia

E-mail: dwwidiastuti@gmail.com
Abstract. Food security and sovereignty are strategic policy agenda of national security. Accelerating the growth of sustainable food production and improving the welfare of farmers through optimization of land resources are priority. One way to increase food production and enhance soil quality is through the utilization of organic fertilizers such as the waste livestock product. In addition, it is expected to reduce CO$_2$ emissions rather than leaving manure untreated. The purpose of this study was to determine whether the application of solid manure and biourine can increase maize production and mitigate CO$_2$ emission. This study was conducted in Inceptisols Rasau Jaya II, West Kalimantan. A randomized complete block design trial was established from plots fertilized with solid organic fertilizer (PO), biourine (BIO), solid organic fertilizer+biourine (PO+BIO), and control. CO$_2$ emission was measured using the static chamber method, placing chambers on the surface of the soil and taking measurements using infrared gas analyzer during 125 days. CO$_2$ fluxes ranged from 59.93–106.07 Mg ha$^{-1}$ yr$^{-1}$ and there was no significant difference among the organic fertilizer treatments; nevertheless, the lowest CO$_2$ flux was illustrated in PO+BIO. Maize productivity was also not influenced by the organic fertilizer; however, PO had the greatest maize production.

Sheep’s gastrointestinal helminth infection at several districts in North Sumatera

A Febretrisiana$^1$, A Destomo$^1$, Anwar$^1$ and B Tiesnamurti$^2$

$^1$ Indonesian Research Institute for Goat Production, PO Box I Sei Putih, Galang 20585, North Sumatera, Indonesia
$^2$ Indonesian Centre for Animal Research and Development, Jl. Raya Pajajaran Kav. E-59, Bogor 16128, Indonesian

E-mail: febre_arie@yahoo.com

Abstract. High adaptability to the environment is an important reason for the farmer to raise sheep, one of which is the adaptation of sheep to parasite attack infections. Infection of nematode parasite is commonly found in the digestive tracts of sheep. The purpose of this activity is to investigate the gastrointestinal helminth infection in sheep in five districts in North Sumatra. This research was conducted in December 2019 to February 2020 by collecting sheep feces in the districts of Batu Bara, Labuhan Batu Utara, Asahan, Serdang Bedagai and Deli Serdang, North Sumatra. The number of eggs in stool were examined (egg per gram) as a method of Fecal Egg Count Reduction Test (FECRT). The results showed that there was no difference in number eggs per gram of stool in sheep that were kept with intensive and semi-intensive systems. The effect of sex, body weight and age of the sheep also showed no difference in the number of eggs per gram of their faeces. However, the results showed that the number of sheep’s worm eggs per gram of stool from Labuhan Batu Utara district was higher (P <0.05) when compared to other areas, which was 73.33 eggs/gram of feces. Whereas the sheep in Deli Serdang showed the lowest number of worm eggs (P <0.05) which was 23.33 eggs/gram of feces. The conclusion of this study was sheep in five districts in North Sumatra were infected with gastroinstinal helminth.
Mitigating N$_2$O emission from chili plantation (*Capsicum annuum*) with organic based fertiliser and silver-black plastic mulches on the integrated pest management field school – case study in Rembang and Sukabumi Regencies

A Hervani$^1$, A Pramono$^2$, W P Mardiasih$^3$ and P Setyanto$^3$

$^1$ Indonesian Agroclimate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
$^2$ Indonesian Agricultural Environment Research Institute, Indonesian Agency for Agricultural Research and Development, Jakenan, Indonesia
$^3$ Directorate of Horticulture, Indonesian Ministry of Agriculture, Jakarta, Indonesia

E-mail: anggrihervani@yahoo.com

Abstract. Agricultural activities such as an inorganic nitrogen fertilization and biomass burning contribute to increase the N$_2$O emissions from the agricultural sector. Integrated Pest Management Field School (SLPHT) in chili plantations using organic based fertiliser and the application of silver-black plastic mulch promote to reduce the N$_2$O emissions from agricultural sector. The purpose of this study was to investigate the reduction of N$_2$O emissions using organic based fertilizer and silver-black plastic mulch treatment on SLPHT plots in Rembang and Sukabumi Regencies. The results show that there was no significant different on N$_2$O emission from the organic based fertilizer and plastic mulch application to the control. However, treatment of organic based fertiliser and silver-black plastic mulch in SLPHT contribute to reduce the N$_2$O emissions of 14% in Sukabumi and 27% in Rembang compared to conventional farmers' technology without organic based fertiliser and plastic mulch treatments.

Analysis of monthly rainfall to determine planting time of paddy in swamp area (study case: SP Padang Subdistrict and Muara Sugihan Subdistrict, South Sumatera Province)

D Firda$^1$, R Q Muslim$^2$, I R Banurea$^3$, D M Fauziah$^4$ and Misnawati$^1$

$^1$ Indonesian Agroclimate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
$^2$ Indonesian Center for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
$^3$ Indonesian Center for Agricultural Postharvest Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
$^4$ Indonesian Center for Horticulture Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: dariinfirda@gmail.com
Abstract. Rainfall is one of the climate factors that strongly affected swampland paddy cultivation regarding its water conditions. The research aimed to identify the planting of paddy in freshwater and tidal swampland based on monthly rainfall. Rainfall data were obtained from Climate Hazards Center Infrared Precipitation with Stations data (CHIRPS) for 20 years (2000-2019). Paddy cultivation and production data collected from field surveys through interviews with local farmers and agricultural extension agents. This study has conducted a descriptive analysis of paddy cultivation based on monthly rainfall. The result showed paddy cultivation in freshwater affected by land typology and monthly rainfall. Planting time of paddy in shallow swamp begins in March or April. In medium swamp, planting time starts in June. While planting time in deep swamp starts in August. In tidal swamp, paddy cultivation for tidal type A and type B were mainly affected by tide, while type C and type D were more affected by rainfall. Local farmers in freshwater swamp planted paddy once a year, while in the tidal swamp, farmer cultivated crop twice a year, namely paddy and corn. Understanding the cultivation crop in swamp areas is crucial to determine precise technology to increase crop productivity.

Enteric methane emission and growth rate of three different breeds of beef cattle fed on oil palm frond or grass basal diet

D Yulistiani¹, Y Widiawati¹, W Puastuti¹, B Tiesnamurti² and S Y Hayati³

1 Indonesian Research Institute for Animal Production, Ciawi, Bogor, Indonesia
2 Center for Research and Development for Animal Husbandry, Indonesia
3 Assessment Intitute for Agriculture Technology, Jambi, Indonesia

E-mail: dwiyulistiani@yahoo.com

Abstract: Methane (CH4) is one of green house gas produced by human activity. Enteric methane emission in ruminants is affected by quality of feed offered. Study was conducted to evaluate performance and enteric methane emission of three different beef cattle breeds fed on grass or oil palm frond basal diet. The study used 3 breed of cattle namely Bali, Ongole crossbred and Brahman crossbred. The cattle were fed on grass or oil palm frond (OPF) basal diet and supplemented with concentrate based on palm kernel cake (PKC), diet were fed in total mixed ration contained 12% crude protein. The study was conducted in randomized block design in 3x2 factorial arrangement. Results of the study showed that the growth rate, dry matter digestibility and enteric methane emission were not affected (P>0.05) by interaction of breed of cattle and type of basal diet. No main factor affected (P>0.05) on parameter observed. The average of dry matter digestibility, body weight gain, methane emission and methane conversion ratio of the cattle were 63.38%, 359 g/h/day, 91 l/day and 0.27 respectively. From this study can be concluded that OPF can be used as basal diet of beef cattle without affecting cattle performance. Breed of cattle had similar performance either fed on grass or OPF basal diet.

Yield and photosynthetic rate of wheat under continuously high temperature
A Zubaidi1, D R Anugrahwati1, G K McDonald2 and G Gill2

1 Faculty of Agriculture, University of Mataram, Mataram, Indonesia
2 Department of Plant Science, University of Adelaide, Adelaide, Australia

Email: akhmad.zubaidi@gmail.com

Abstract. In tropical regions high temperature occurs throughout wheat growth cycle and is a major factor influencing growth and yield in this area. The aim of this work is to describe the responses to continuously-high temperatures on growth, photosynthesis and yield of wheat, under controlled conditions. Nias and Dewata (Indonesian wheat varieties) and Axe and Gladius (Australian varieties) were tested in growth room experiment with temperature and photoperiod chosen to simulate conditions on Lombok Island, at lowland (32/23°C) and highland (28/20°C) sites. The third temperature (25/15°C) was selected to represent temperature in a more temperate wheat-producing area. High temperature reduced yield and dry matter accumulation which was associated with a reduction in photosynthetic rate and stomata conductance and an increase in respiration rate. Genetic variability in response to heat stress was evident with the Indonesian varieties being more tolerant to high temperatures than Australian varieties. Nias and Dewata produced higher yield and biomass and maintaining higher rates of photosynthesis. Maintaining high photosynthetic rate and high stomata conductance, are important characters in adapting wheat into tropical environment such as Lombok Island.

Remediation of arsenic-contaminated soil by chelating agents in shallot plantation land Bima, West Nusa Tenggara

Hidayatuz Zu’amah, Wahyu Purbalisa, Dolty Mellyga W. Paputri, Asep Nugraha Ardiwinata, and Ina Zulaehah

Indonesian Agricultural Environment Research Institute, Pati, Central Java, Indonesia

E-mail: aya.zuzun@gmail.com

Abstract. Bima regency is the fourth largest shallot commodity supplier nationwide. Arsenic contaminated agricultural land in Bima is due to the use of synthetic fertilizers and excessive pesticides in the shallot cultivation system. One of the efforts to remediate the contaminated soil by using the chelating agents. This research aims to study the ability of various chelating agents to remediate Arsenic contaminated soil. The study was conducted at the shallot production center of Kalampa Village, Woha Subdistrict, Bima Regency, West Nusa Tenggara, which indicated arsenic contamination. The experiment used a Randomized Block Design with six treatments, that are control, biochar-compost, chitosan, EDTA, ammonium thiosulfate, and zeolite with 3 replications. All the treatment of chelating agents can reduce As in the soil up to 39%. Ammonium Thiosulfate has the highest effect on the decreasing of As concentration in the soil from 26.71 (mg/kg) to 6.85 (mg/kg) after harvesting. Arsenic content in shallot bulbs with Chelating agents treatment is within safe limit (<1 mg/kg).
Cropping calendar analysis for dry season 2020 in Indonesia

A Pramudia, Y Apryiana, S H Adi, B Kartiwa, Suciantini, Misnawati and D Firda

Indonesian Agro-climate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia 787

E-mail: arispramudia@yahoo.com

Abstract. The paper present the analysis of planting time and potential area of rice, maize and soybeans in the dry season 2020 at 7062 sub-districts throughout Indonesia. The input data are the information of rainfall prediction, soil water availability information, standardized paddy area (SPA), and paddy cropping index. The stages of the analysis process are transformation the rainfall prediction information into the sub-district based, calculating of soil water balance to predict the planting schedules, designing the cropping patterns, and determination the potential planting area at sub-district level. The results illustrate that the rainfall intensity of 200-300 mm/month is predicted as a widest rainfall coverage in the March-May 2020 by covering 5,114,380 Ha of rice fields (68.6% SPA), and the rainfall intensity of <60 mm/month is predicted as a widest rainfall coverage in the June-August 2020 by covering 3,618,826 Ha of rice fields (48.5% SPA). The potential planting area of paddy is 5,259,661 Ha (70.5% SPA), with the time planting of March III-April I as the widest planting area as wide as 1,151,331 Ha. The potential planting area of maize is 1,996,156 Ha (26.8% SPA), with the time planting of August II-III as the widest planting area as wide as 783,545Ha. The potential planting area of soybean is 786,849 Ha (10.5% SPA), with the time planting of April II-III as the widest planting area as wide as 424,620 Ha.

The concentration of enteric methane from cattle fed different fiber level

N H Krishna, Y N Anggraeny, Mariyono and D Pamungkas

Loka Penelitian Sapi Potong

E-mail:

Abstract. Methane formed in the rumen of cattle is directly proportional to the feed fiber content, especially the neutral detergent fiber fraction. The aim of this study was to predict the concentration of methane formed in the rumen of cattle fed with different fiber content. Twenty-four male Bali cattle were kept for 16 weeks with three different feed treatments. Ration A (low crude fiber; <14%), ration B (medium crude fiber; 18-19%) and ration C (high crude fiber; > 22%). At the end of the study, the rumen fluid was taken at 0 and 3 h after feeding, and the partial VFA content (acetate, propionate, and butyrate) analyzed. The partial VFA content is used to predict the concentration of enteric methane formed. The experiment design was a completed randomized design. The data obtained were analyzed by analysis of variance. Prediction of methane concentration at 0 and 3 h and the increasing percentage did not differ between treatments. At 0 h, the predicted methane concentrations of treatments A, B, and C (mean ± SEM) were 12.59 ± 0.561 mMol/L, 9.53 ± 1.737 mMol/L and 9.06 ± 1.041 mMol/L respectively; at the 3rd h were 16.64 ± 1.19 mMol/L, 14.2 ± 1.052 mMol/L and 16.24 ± 1.495 mMol/L. The percentage increase in methane concentration after three hours of feeding was 42.74 ± 16.895%, 79.39 ± 16.332%, and 58.00 ± 11.120%. The process
of methane formation was very varied between individual cattle at early feed degradation in the rumen then it had not formed a certain pattern. It was concluded that the difference in ration fiber content had not affected the concentration of methane in the rumen up to 3 hours after feeding.

---

**Space-based drought analysis to support agricultural insurance facing climate change**

R Shofiyati\(^1\), W Takeuchi\(^2\), S M Pasaribu\(^3\) and S Darmawan\(^4\)

\(^1\) Indonesia Center of Agricultural Land Resources Research and Development (ICALRD), Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
\(^2\) University of Tokyo, Tokyo, Japan
\(^3\) Indonesian Center for Agriculture Socio Economic and Policy Studies (ICASEP), Ministry of Agriculture, Bogor, Indonesia
\(^4\) Institut Teknologi Nasional (ITENAS), Bandung, Indonesia

E-mail: rshofiyati@gmail.com

**Abstract.** The long drought experienced in Indonesia in the past was identified as one of the main factors in the failure of rice production. Special attention to farmers who have suffered from damage has been conducted by the government through the application of rice crop insurance program since 2015. Drought has hit several areas in Indonesia with huge claims. It was increased year by year, with the highest in 2019 (12,253 ha). The main problem associated with the insurance claim is the delay of inspection of the drought affected land. Meanwhile, various satellite data can provide relevant information more quickly for those affected areas. The purpose of this study is to examine the potential use of satellite data to detect drought to support rice crop insurance program. Daily and monthly rainfall data derived from TRMM and GSMaP, MTSAT and AMSR-E were analyzed to identify meteorological drought. Agricultural drought is studied through the character of several indices (EVI, VCI, VHI, LST, and NDVI) from MODIS and/or Landsat data. Preliminary results from the study showed that 80% of the analysis results were in conformity with field conditions. Satellite data has its potential to be utilized in the identification of claims on agricultural insurance.

---

**Estimated time for supply and drainage of water for rice planting in freshwater swampland**

V Mayasari\(^1,2\), A Hairani\(^1\), H Sosiawan\(^2\) and V Karolinoerita\(^1\)

\(^1\) Indonesian Swampland Agricultural Research Institute (ISARI), Indonesian Agency for Agricultural Research and Development, Banjar Baru, Indonesia
\(^2\) Indonesian Agroclimate and Hydrological Research Institute (IAHRI), Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: vikamaya.balittra@gmail.com
Abstract. Global climate changes that have occurred in recent years have caused a shift in seasons. Likewise in Indonesia, which is geographically and topographically located between two large oceans and their islands, so it is very risky affected by climate change. Freshwater Swampland is very dependent on the level of water. This is very influential on the amount of rice production produced in each year. Therefore, research is needed to predict the time of water discharge and time of water supply in the field within one year. As for what is analyzed among them is rainfall data as input which is reduced by evapotranspiration through the Hargreaves approach, then an output will be obtained in the form of a net rate that can describe fluctuations in the rate of rainwater which shows a shifting pattern of seasons each year. Water demand during the vegetative phase, the generative phase until the harvest phase is calculated. After that the water balance is simulated from the difference between the availability of water (the result of the net rate) and the water needs in the fields. The final results obtained based on this water balance simulation will be seen when the right time to remove water from the land or fill water into the land.

Soil amelioration using steel slag in drained peatland under oil palm plantation increases CO₂ emission

S Marwanto

Indonesian Soil Research Institute (ISRI), Indonesian Agency for Agricultural Research and Development (IAARD), Bogor, Indonesia

E-mail: setiari_mr@yahoo.com

Abstract. Increasing the productivity of tropical peatland can be achieved by soil ameliorations using steel slag and lateritic soil. However, the effect of such ameliorants to the peat decomposition is not well understood. This study was aimed to investigate the influence of soil ameliorants of steel slag and lateritic soil to peat decomposition as reflected by CO₂ emission. A year study was conducted in smallholder oil palm plantation in Jambi Province, Indonesia to monitor CO₂ emission from 20 plots of control (T1), steel slag 600 kg ha⁻¹ treatment (T2), lateritic soil 600 kg ha⁻¹ treatment (T3), and combination of T2 and T3 (T4), which each treatment had 5 replications. CO₂ emission was measured every three months by closed chamber method. Results showed that CO₂ emission were followed the order of T4>T2>T1≥T3. CO₂ emission from T4 (49±20 t ha⁻¹ yr⁻¹) was 20% higher than T1 (40±23 t ha⁻¹ yr⁻¹), while T2 (44±17 t ha⁻¹ yr⁻¹) was 9% higher than T1. CO₂ emission from T3 (40±14 t ha⁻¹ yr⁻¹) was similar with T1. This study showed that available nutrients derived from steel slag accelerates organic matter decomposition. Amelioration is beneficial to increase oil palm productivity in peatland; however, the excessive decomposition of peat should be noticed.

Productivity and morphology of benggala grass riversdale cultivar (*Panicum maximum* cv Riversdale) on acid soils

Achmad Fanindi, Sajimin, E Sutedi, I Herdiawan and Harmini
Abstract. Forage cultivation is always directed at suboptimal land. One suboptimal land that has the potential for forage development is acid dry land. The purpose of this study was to determine the productivity and morphology of Benggala grass (*Panicum maximum* cv Riversdale) in acid soils. The study was conducted in the greenhouse of the Research institute of Animal Production, using a completely randomized design (CRD) with 10 replications, for 10 months. The study used acid soils (pH 4.5 and Al^+3 0.27 cmol / kg) and non-acid soils (pH 7.1 and Al^+3 + 0.00). The seeds (pols) are planted in pots with a diameter of 40 cm and a height of 30 cm. The observed variables were morphological characters, productivity and reproduction fase. The results showed that the stem diameter, diameter of the internodes, the length of the internodes and plant height in non acid soil was higher (P <0.05) when compared to acid soil. Whereas shoot fresh weight, shoot dry weight and number of tiller in acid soils were lower (P <0.05). Fresh and dry root weights (P <0.05) were lower in acid soils. Seed weights in acid soils are lower (P <0.05), although the percentage of filled and empty seeds is not different (P>0.05). While booting time, flowering starts and flowering time in acidic soil is longer (P<0.05). The results of this study showed that Riversdale cultivars no tolerant on acid soil, so efforts should be made to produce tolerant Riversdale cultivars on acid soils.

Study on the Use of Tin Mining Land: Analysis of land potential and constraints faced

A Agustian, E Ariningsih, K Suci I., H P Saliem, E Suryani, S H Susilowati andn E Gunawan

Indonesian Center for Socio Economic and Agricultural Policy Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

Abstract. Reclaimed ex-mining land (LBT) has the potential for agricultural business development. Reclamation is an activity aimed at improving or managing the use of disturbed land so that it can function and be effective according to its purpose. Based on this description, this study was conducted in the Bangka Belitung Islands Province in 2017. The study aims to analyze the potential of existing tin mining land for agricultural development, identify the status of existing ex-mining land and the constraints/problems in its use. The results of the analysis show that: (1) In Bangka Belitung Province, the status of the tin IUP area (in 2012) covers 473.99 thousand ha, and there are around 7,000 hectares of ex-mining land that has been reclaimed and allows for further use for food crops; (2) There are several problems faced by the community in utilizing LBT, namely: the status of land to be cultivated by the community, the level of soil fertility, the availability of farmers' resources to work on, the skills of farmers in farming on LBT land, and limited farming capital; (3) The prospect of LBT utilization as a whole is quite good between regions / villages where there is ex-mining land, if done with adequate rules / cultivation techniques.
Response of planting methods to rice productivity and greenhouse gas emissions

H L Susilawati¹, R Kartikawati¹ and P Setyanto²

¹ Indonesian Agricultural Environment Research Institute, Jl. Jakenan-Jaken KM 5 Jakenan, Pati, Central Java, 59182, Indonesia
² Directorate General of Horticulture. Jl. AUP No. 3 Pasar Minggu, South Jakarta 12520, Indonesia

E-mail: helenalina_s@yahoo.com

Abstract. Intensively cultivated rice field is one of greenhouse gases (GHG) contributors to the atmosphere. Soil cultivation of Gogorancah or direct-seeded rice (DSR) has been introduced to save water and reduce GHG emissions from rice field because rice plants grow under aerobic condition after seed germination. This study aims to evaluate GHG emissions, yield component and rice yield to different planting methods: transplanting (TPR) and DSR. The study was carried out at farmer’s field namely Dukuh Waru, Adiwerna and Kedung Banteng Sub District in Tegal District, Central Java. The closed chamber method with the unit consisted of a cubic chamber (50 × 50 × 100 cm) and a frame base (50 × 50 × 15 cm), and gas chromatography (GC) was used to determine the nitrous oxide (N₂O) and CH₄ fluxes. The results showed that the DSR increased yield components and reduced CH₄ emissions. The DSR could significantly increase grain yield than TPR at Dukuh Waru and Kedung Banteng approximately 26 and 49%, respectively. The DSR could be an option for reducing global warming potential (GWP) and maintaining rice yield. However, further studies are needed to identify suitable management practices for reducing both CH₄ and N₂O emissions without any trade-off.

The effect of sheet-pipe technology application on soil properties, rice growth, yield, and prospect to increase planting index

P Sasmita¹, N Agustiani¹, S Margaret¹, A M Yusup¹ and K Tamura²

¹ Indonesian Center for Rice Research, Indonesian Agency for Agricultural Research and Development, Subang, Indonesia
² Kyouwa Kensetsu Kogyo Co.Ltd. Japan

E-mail: wulan_bbpadi@yahoo.co.id

Abstract. Sheet pipe system is a drainage and irrigation underground system. This study aimed to understand the effect of sheet-pipe technology installation on growth, yield and prospect to increase planting index (PI) on irrigated rice field. Research conduct in Sukamandi Experimental Station, ICRR, West Java on 2019-2020. It used nested design with five replications. First was water management as nested factor, i.e.: Sheet-pipe and (2) non sheet-pipe. Second was cropping system, i.e.: (1) paddy – paddy, (2) paddy – paddy – soybean, (3) paddy – paddy – paddy, using Inpari 43 GSR Agritan. The result shown that (1) The effect of sheetpipe was strongly influenced by the season, especially in the dry season. It was assumed that the ability of sheetpipe to store water was more effective than its drainage function in the wet season. (2) Sheeptipe supported better tillering ability, leaf area index, root-leaves-stem biomass, plant height, root volume, number of panicle per
Mitigating climate change through the adaptation of new early and drought tolerant rice varieties in Majalengka Regency

I Noviana¹, R Sari¹, Y Haryati¹ and N Sunandar²

¹ West Java Assessment Institute for Agriculture Technology, Bandung Barat, Indonesia
² Indonesian Centre for Agricultural Technology Assessment and Development, Bogor, Indonesia

E-mail: irma.bptpjabar@gmail.com

Abstract. The impact of climate change greatly influences the growth and production of crops, especially rice. One of the efforts to mitigate climate change in rice is the introduction of new high yielding varieties which are drought tolerant and early maturing. The aim of this study is to examine the growth performance and potential production of several new rice varieties which are early maturing and drought tolerant in wetland on dry season. The assessment was conducted in Majalengka Regency on May to August 2019. Five varieties used were Inpari 39, Cakrabuana, Inpa go 11, Rindang 1, and Luhur 1 with through application of Aerobic-Based Organic Controlled Rice Technology. Variables observed including plant growth character (plant height and number of productive tillers), yield and yield components (number of grains per panicle, percent of empty grains, and weight of 1,000 grains). The observations showed that the average productivity was around 6-7 tons per hectare. Cakrabuana has potential to be developed in dry season due to its high yield potential and early maturing (85 days after planting).
Eni Siti Rohaeni¹, Susi Lesmayati², Lira Mailena³ and Sara Sorayya Ermuna⁴

¹ Indonesian Center for Assessment and Development of Agricultural Technology, Bogor
² South Kalimantan Assessment Institute for Agricultural Technology
³ Indonesian Center for Assessment and Development of Agricultural Technology, Bogor
⁴ Coordinating Ministry on Economics Affairs

Email: eni_najib@yahoo.co.id

Abstract. Hulu Sungai Utara Region is one of the suppliers of rice and poultry ducks in South Kalimantan Province, and swampy land is a widely available resource in this district. However, the potential of land has not been used optimally because land use is still depend on the season. Therefore, increasing the potential of swampy swamps utilization through rice farming and duck farming needs to be developed towards the sustainable agriculture. This study aims to analyze the sustainability index of rice farming and duck poultry using the Sustainability Index approach with the RAP of Lebak in Sungai Durait Hulu Village, Babirik District, Region of Hulu Sungai Utara. Measurement of sustainability index includes six dimensions namely environment, economy, human resources, social, technology and institutions. This study used 49 attributes which were divided into such six dimensions. The results showed that the sustainability index of rice and duck farming was about 52.41%, which showed that the rice and duck farming was quite sustainable. The dimension that had highest value of sustainability index in the moderately sustainable category was the social dimension, while other dimensions were included in the less sustainable category, which were the dimension of environment, economy, human resources, technology and institutional. Those five dimensions need to be improved and could be focused on the leverage attributes in each dimension. Leverage attributes of sustainability index that need to get priority were land fertility, changes in the scale of livestock business, level of welfare, livestock waste treatment technology and financial institutions.

Growth and yield improvement of maize by ACC deaminase producing bacteria under dry soil conditions

E Husen¹, S Salma¹, Husnain¹ and Sutardi²

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Yogyakarta Assessment Institute for Agricultural Technology, Indonesian Agency for Agricultural Research and Development, DI Yogyakarta, Indonesia

E-mail: edihusen@yahoo.com

Abstract. Beneficial effects of plant-microbe interactions have been widely studied, such as nutrient supply and plant stress alleviation. This study aimed to study the ability of ACC deaminase producing bacteria to increase growth and yield of maize under dry soil conditions. The study consisted of laboratory analyses, greenhouse trial and field experiment on farmers’ land in the Gunung Kidul, DI Yogyakarta. A total of 8 strains of Pseudomonas and Bacillus from previous studies were selected based on their ability to produce ACC deaminase and other benefit traits. These bacteria were further tested for their ability to grow in osmotic stress condition using Polyethylene Glycol (PEG) and formulated into 4 groups of bacterial consortia, namely PC1, PC2, PC3, and PC4. Each consortium contains 3 bacterial strains formulated into peat-based carriers for growth room
and field experiments. In greenhouse experiment, water content of potted soil with inoculated and uninoculated plant was adjusted to 50, 75, and 100% water filled pore space (WFPS). Randomized block design with 2 treatment factors, namely group of consortia bacteria (5 levels) and organic fertilizer (2 levels) was applied for field experiment. Results on laboratory analyses showed that besides producing ACC deaminase enzyme and other beneficial traits, all bacteria were also able to grow in osmotic stress condition. Better growth conditions under 75% WFPS were exhibited by inoculated plant. Yield increased of maize under field soil condition was shown by plant inoculated with PC3 and potential to be developed as a promising dry land biofertilizer.

Potential bacteria capable of remediating mercury contaminated soils

R C B Ginting1, N Solihat2, A R Hafsari2 and Irawan1

1 Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
2 Department of Biology, Faculty of Sciences and Technology, UIN Sunan Gunung Djati Bandung, Jl. A.H Nasution No 105, Bandung 40614, Indonesia

E-mail: r.cintabadia@pertanian.co.id

Abstract. Mercury content in ex-artisanal and small-scale gold mining areas in Cianjur District, Province of West Java, Indonesia was 7-36 mg/L. It has exceeded the threshold value for industrial land. Bioaccumulation of mercury using mercury-resistant bacteria is an attractive mercury bioremediation method because it is more effective and less expensive. The objective of this study was to obtain potential bacteria capable of accumulating mercury to be used to remediate mercury contaminated soils in ex-gold mining areas. Potential bacteria isolates were characterized for their phenotypic and biochemical properties using the Biolog system. Thirty-two mercury-resistant bacteria were successfully isolated from the rhizosphere of Pityrogramma tartarea growing predominantly around tailings of ex-artisanal gold mining. After screening the presence of mercury, three best isolates showing high resistances were Pseudomonas putida R2.13 and P. maculicola R4.27 that are capable to tolerate at 180 mg/L mercury and Enterobacter aerogenes R3.24 that is capable to survive at 170 mg/L. Furthermore, the three bacteria also can fix atmospheric nitrogen and to solubilize phosphate, but they cannot solubilize potassium. These indicate that P. maculicola R4.27, P. putida R2.13, and E. aerogenes R3.24 are potential as bioaccumulation agents on mercury-contaminated soils.

Effects of soil ameliorant and biofertilizer on improving soil fertility and food crops yield

Septiyana1, Husnain2, L R Widowati1, A F Siregar1 and A Samsun1

1 Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
Abstract. Ultisol occupied about 45.8 million ha or 25% of total land surface in Indonesia. It is known that Ultisols characterized with high soil acidity, Al and Fe concentration and low with organic matter content, nutrients, base saturation and CEC. In order to improve plant productivity in Ultisols, soil ameliorant, balance fertilization and biofertilizer application could be an option. The objective of this research was to study the effect of soil ameliorant and biofertilizer application on improving soil properties and food crops yield. This research was conducted at experimental station KP Taman Bogo, Lampung Timur for two planting seasons in 2019. Randomized block design was used with seven treatments and three replications. The treatments were a) control; b) recommendation dose; c) 50% of recommendation dose + 2 ton/ha of manure; d) 50% of recommendation dose + 10 ton/ha of manure; e) 50% recommendation dose + 2 ton/ha of manure + 1 ton/ha of Rock Phosphat; f) 50% of recommendation dose + 2 ton/ha of manure + 10 ton/ha of Biochar; and g) 50% recommendation dose + 2 ton/ha of manure + Agrimeth (MT-1)/Agrovit (MT-2). Recommendation dose based on Upland soil test kit (PUTK). The result showed that soil ameliorant application and biofertilizer gave significant effect on improving soil chemistry and physic properties and plant yield compared to control. Soil ameliorant and biofertilizer application increased soil P available, Ca, Mg, CEC, base saturation and decreased Al concentration. Moreover, the result showed that soil ameliorant application increased the rice and maize yield.

Determination of rate and type of ameliorant to improve soil chemical properties and yield of corn (Zea Mays) in tin-mined land

A P W Etika1, Asmarhansyah2, B Mulyanto3, and I G M Subiksa4

1 Indonesian Center for Agricultural Technology Assessment and Development
2 Indonesian Center for Land Agricultural Resources Research and Development
3 Bogor Agricultural Institute
4 Indonesian Soil Research Institute

Abstract. Tin-mined land is a degraded land with low soil fertility status. The research aimed to obtain the rate and type of ameliorant to improve the soil chemical properties and yield of corn (Zea mays) in tin-mined land, Bangka Belitung. The experimental design used was a Randomized Block Design with 7 treatments and 4 replications, namely: Control, Biochar 20 t ha\(^{-1}\), Cattle Manure 20 t ha\(^{-1}\), Mucuna Compost 20 t ha\(^{-1}\), Biochar 10 t ha\(^{-1}\) + Cattle Manure 10 t ha\(^{-1}\), Biochar 10 t ha\(^{-1}\) + Mucuna Compost 10 t ha\(^{-1}\), and Cattle Manure 10 t ha\(^{-1}\) + Mucuna Compost 10 t ha\(^{-1}\). The results showed that tin-mined soil have poor soil chemical properties as indicated by slightly acidic pH, very low organic-C, and very low macro nutrients (N, P, and K). The application of ameliorant significantly increased growth and yield of corn. The corn yield of combination of Biochar 10 t ha\(^{-1}\) + Cattle Manure 10 t ha\(^{-1}\) (9.97 t ha\(^{-1}\)) was higher compared to Control (8.20 t ha\(^{-1}\)), but it was significantly not different from other treatments. Biochar, applied both as single or combination with Cattle Manure and Mucuna Compos 20 t ha\(^{-1}\), gave higher growth and yield of corn compared to other treatments.
Application of biofertilizers to increase growth of upland rice, n-uptake, soil nitrogen and fertilizers efficiency

B N Fitriatin¹, S Febriani² and A Yuniarti¹

¹ Soil Science Department, Faculty of Agriculture, Universitas Padjadjaran, Indonesia
² Agrotechnology, Faculty of Agriculture, Universitas Padjadjaran, Indonesia

E-mail: betty.natalie@unpad.ac.id

Abstract. High application of anorganic fertilizer has a negative impact on soil health. As one of the efforts to reduce the use of anorganic fertilizers is to use biofertilizers. Biofertilizers are active inoculants made from living organisms that have the ability to mobilize, facilitate and increase the availability of nutrients through biological processes. The experiment was conducted to study the effect of biofertilizers and anorganic fertilizers application on growth of upland rice, N-uptake and soil nitrogen. Biofertilizers were mixture of N-fixing bacteria (Azotobacter chroococum, Azospirillum sp.) and phosphate solubilizing microbes (Pseudomonas mallei, P. cepaceae, Aspergillus niger and Penicillium sp.). The field experiment used a Randomized Block Design (RBD) with ten treatments and three replications. The treatments were combined of biofertilizers doses (50 kg ha⁻¹ dan 75 kg ha⁻¹) and doses of anorganic fertilizers (50%, 75% and 100% of recommended doses). The result revealed that 50 kg ha⁻¹ biofertilizers + 75% NPK fertilizer increased growth of upland rice, N-uptake and soil nitrogen. In addition, the application of biofertilizers was able to reduce the rate of anorganic fertilizers by 50%.

Application of organic liquid fertilizer and inorganic fertilizer on growth and production of hybrid maize

Maintang, Faisal Sudding, Muh Asri and Abdul Wahid Rauf

Assessment Institute for Agricultural Technology South Sulawesi, Indonesian Agency for Agricultural Research and Development, Makassar, Indonesia

E-mail : maintang80@gmail.com

Abstract. The aim of experiment is to determine the effect of application of organic-liquid fertilizer and inorganic fertilizer recommendation (Urea, NPK Phosnka) on growth and yield of hybrid corn HJ 21 Agritan variety. The experiment was conducted in Pajalesang Village, Lilirilau, Soppeng, South Sulawesi Province from September to December 2019. The experiment used Randomized Block Design (RBD) with eight level of treatments and three replications. Treatments were (P1) control/without fertilizer; (P2) inorganic fertilizer 100% recommendation, (P3) inorganic fertilizer 75% recommendation; (P4) organic-liquid fertilizer 5 ml/2 L water inorganic fertilizer 75% recommendation; (P5) organic-liquid fertilizer 10 ml/2 L water + inorganic fertilizer 75% recommendation; (P6) organic-liquid fertilizer 15 ml/2 L water + inorganic fertilizer 75%
recommendation; (P7) organic-liquid fertilizer 20 ml/2 L water + inorganic fertilizer 75% recommendation; and (P8) organic-liquid fertilizer 10 ml/2 L water + inorganic fertilizer 100% recommendation. The use of inorganic fertilization recommendation and combinations of organic-liquid fertilizer plus inorganic fertilizer produce better growth and higher production than without fertilizer treatment. The combination of organic-liquid fertilizer and inorganic fertilizer 75% recommendation (15 ml / 2 L water + NPK Phonska 300 kg / ha + Urea 150 kg / ha) can be the preferred dose for optimum corn production. This treatment also showed higher yield and yield components compared to other treatments.

Adapting land management by conserving water resources potency for sustainable strategic crop systems in Kerinci

Salwati¹ and L Izhar²

¹ Assessment Institute for Agricultural Technology in Riau, Jl. Kaharuddin Nasution No.341, Simpang Tiga, Bukit Raya, Kota Pekanbaru, Riau. Indonesia. 28284
² Assessment Institute for Agricultural Technology in Jambi, Jl. Samarinda, Paal lima, Kota Baru, Kota Jambi. Indonesia, 36128. Phone, 62 741 40174, Fax: 62 741 40413
E-mail: salwati@pertanian.go.id

Abstract. Adapting land management to climate change is very essential in for developing agricultural systems. Water accessibility and its optimal usage is also important for land management and climate change resilience. Optimal and adequate water conditions will support utmost plant growth and development. Water resources supported will increased productivity of Indonesian strategic crops such as rice, soybean, and corn. Kerinci region is one of agricultural crop production centers. Through surveys conducted in a few clicks, continuously and systematically, collecting water resources in Kerinci region during 2016-2018. Secondary and primary data were used for overlay area services and further analysis. Potential air resources The main source of river water, swamps and other water sources. Types of agricultural machinery and water buildings facility are complementary supporting these agricultural service areas. In account that, water services can be carried out optimally for wide area for more than 16,975 ha. Strategically several agricultural production centers is located in Kayuaro, Gunung Tujuh, Gunung Raya, Siulak, Danau Kerinci and Air Hangat district.

Soil amandement to solve acid sulphate soil problems to promote rice yield

M Alwi, W A Yusuf, A Fahmi and I Khaıırullahq

Indonesian Swampland Agricultural Research Institute, Indonesian Agency for Agricultural Research and Development, Banjarbaru, Indonesia
Abstract. Rice is a staple food of Indonesia and the production can be enhanced by increasing the area planted to rice. Acid sulfate soils are an alternative aspect for the sustainable rice cultivation. This soils which are acidic have mainly the Al and Fe in high quantities. That is a main cause to low of crop production because these soils have nutrient deficiency, especially phosphorus. A common treatment to reduce the solubility of Al, Fe and other heavy metals in soil is to increase the soil pH, which is done by soil amandement like application of limestone, organic materials and black-carbon material (biochar). That can be utilized for acid sulphate soil for increasing the productivity of rice. The application of soil amendement can enhance the plant growth and yield of rice by producing organic acids that can chelate Al and Fe toxicity and solubilize insoluble form of phosphorus in the soil. This study extends knowledge related to the use of a soil amendment to applied at acid sulphate soil for increasing of rice productivity.

Improving irrigated agriculture through integrated water resources management in Pusur Watershed, Central Java

A Hamdani, B Kartiwa and H Sosiawan

Indonesian Agroclimate and Hydrology Research Institute (IAHRI), Bogor, 16111, Indonesia

Email: adang_hamdani@hotmail.com

Abstract. Pusur watershed supplies water for about 3,000 ha irrigated farmlands of 12,000 smallholders. However, water shortages affecting the crop development and production are common in the farmlands within the Pusur River basin, especially during the 3rd cropping season (June-October). Tension relating to water access within the Pusur perimeters also the neighboring watershed has been increasing water conflict between farmers in the region. This research conducted a survey to describe water resources availability, hydraulic network performance, cropping calendar, canal water access, and crop development condition with objectives to improve water management and reduce water conflict in the irrigated region. The participatory and rapid appraisal results identified different condition of canal water access and crop development within the sampling area. Except in Kemiri, most of hydraulic structures were in good condition. However, water shortage and crop development problem during the 3rd cropping cycle were still observed mostly in the downstream area. Such situation was also highlighted by the result of the crop water balance model that was simulated over a series of 10 years using the canal discharge data and farmers cropping information. Therefore the simulation results showed degraded conditions of crop development in the majority of the perimeters located in downstream areas whereas crops look growing-up normally in the perimeters located in upstream zones.

Ability of microbes to solubilize both hardly soluble P and K from various sources
A N Flatian¹, I Anas², A Sutandi² and Ishak¹

¹ Center for Isotopes and Radiation Application, National Nuclear Energy Agency, Jakarta, Indonesia
² Department of Soil Science and Land Resources, Faculty of Agriculture, IPB University, Bogor, Indonesia

E-mail: nico.flatian@gmail.com

Abstract. Utilization of bio-fertilizer is an alternative option to increase available P and K in the soil which relatively cheaper and environmentally friendly. To develop such a bio-fertilizer, the ability of microbes to solubilize both unavailable P and K in the soil is an important feature. Therefore, the evaluation of this ability is required and it is one of the most important stages to make a proper bio-fertilizer. A set of experiments was conducted to evaluate the ability of microbes (bacteria and fungi) to solubilize both sparingly soluble P and K sources on both solid and liquid medium. The results showed that microbe isolates tested were capable to solubilize both hard ly soluble P and K present in solid medium (Pikovskaya agar and Alexandrov agar) with the varied size of halo zone. The isolates were also capable to solubilize both sparingly soluble P and K present in the liquid medium. The amount of released P from Ca₃(PO₄)₂, AlPO₄, FePO₄·4H₂O and rock phosphate in the liquid medium were significantly increased by isolates tested respectively up to 8.8, 69.3, 928, 26 times more than control. Some isolates also significantly increased the amount of released K from feldspar in the liquid medium, up to 2.3 times more than control. Acidification has been seen to play important role in increasing solubility of P and K. We have found the significant correlations between decreasing pH and amount of nutrient release (P or K) from Ca₃(PO₄)₂, AlPO₄ and feldspar. The results also showed that JK1 fungal isolate (Aspergillus niger) is the most promising P and K solubilizing isolate.

Improvement of robusta coffee performance with conservation and fertilizer treatment in air Naningan District, Tanggamus Regency, Lampung

N Wardani¹, Meidaliyantisyah¹, J Hendru² and A Rivaie³

¹ Lampung Assessment Institute for Agricultural Technology, Jl. ZA. Pagar Alam No. IA, Bandar Lampung, Indonesia
² West Sumatra Assessment Institute for Agricultural Technology, Sukarame, Indonesia
³ Jakarta Assessment Institute for Agricultural Technology, Jakarta, Indonesia

E-mail: wardaninila@yahoo.co.id

Abstract. Lampung Province is one of the coffee-producing centers in Indonesia, especially Robusta coffee. One of the coffee-producing centers is in Air Naningan District, Tanggamus Regency. So far, most farmers manage conventional coffee plantations without any conservation nor fertilization. This study aims to compare the performance of coffee growth between conservation and fertilization treatments with conventional treatments. Conservation treatment is carried out by making trenches around the coffee plantations, while fertilizing is given in the form of organic fertilizer as much as 10 kg/plant/year, and inorganic fertilizer in the form of Rock Phosphate 240, Urea 400, and KCl 320 gr/plant/year. The results showed that conservation and fertilization can improve the performance of coffee plants, namely good growth (canopy and leafy branches, shiny green leaves, <5% leaves
are infected with leaf rust, <5% stems and branches are attacked by stem borer). This treatment can also increase production by around 500%.

Water management with insulated drainage in swamp land (case study of Geragai Agricultural Techno Park, Jambi Province)

J Hendri¹ and R Purnamayani²

¹ Jambi Assessment Institute for Agricultural Technology, Jambi, Indonesia
² Indonesian Center for Agricultural Technology Assessment and Development, Bogor, Indonesia

E-mail: rimacahyo@gmail.com

Abstract. Water management is the most important aspect of swamp and peat land cultivation. One of them is through drainage. The insulated drainage made on a subject tertiary canal is one of technology to regulate the availability of water in the rainy season and maintain the water level during the dry season, which is done by making a block in accordance with the water level we want. Insulated drainage is made in long trenches (tertiary) with 1-2% slope. The height of the block is 10 cm below the ground with a distance of 100 m. The width of the blocking gate is adjusted to the width of the existing trench. The insulated drainage system is carried out on an area of 20 hectares in the Agricultural Technology Park (TTP) Geragai, Tanjung Jabung Timur. In addition to managing water availability, trenching is also barrier to the surrounding land. As a preparation of trenches around the land with a width of 1-1.5 m, functioned as sealed soil canal should be elevated from canal excavated soil about 10-15 cm. The canal is only made in 120 cm depth to prevent the appearance of pyrite potential. At the end of the trench, a bulkhead that is higher than the bulkhead at a distance of 100 meters should be made, it is intended to control the overall water level, also to keep the acid sulfate potential land from oxidized and poison the plant. The water control gate and the trench screen are made simply from a wooden board with a width of 1 (one) meter and filled with soil. Insulated drainage can maintain 80-197% soil moisture content of soil dry weight. This condition can support the development of rice-palawija cropping patterns in shallow-type and mid-range swampland to increase cropping index and land productivity.

Effects of peat fires on soil chemical and physical properties: a case study in South Sumatra

D Sulaeman¹, E N N Sari¹ and T P Westhoff²

¹ World Resources Institute Indonesia, Jakarta, Indonesia
² Independent Researcher, Wageningen, The Netherlands

E-mail: dede.sulaeman@wri.org
Abstract. Indonesia owns 14.93 million hectares of peatlands throughout Sumatra, Kalimantan, Papua and a little in Sulawesi. For over two decades, it is criticised by international and local activists for the (commercial) management of its extensive peat bogs/lands. Criticism pivots around the draining of peatlands for the use of (dryland) agriculture, horticulture and forestry. The brunt of it concerns the use of peatland for oil palm expansion, and the emotive global black campaigning ignores the latest sustainable practices (such as maintaining the maximum ground water depth and protecting the centre of peat domes). In contrast, Europe has (commercially) managed its peatlands since the 13th century – spanning a period of 7 decades – and accrued extensive institutional knowledge on its various management regimes. This paper explores various management regimes applied to European peatlands and extracts lessons learned as an initial guide for defining the best management practices of peatlands throughout Indonesia. A comparison of European and Indonesian trends in peatland distribution, followed by a gap analysis of management regimes, identifies interim strategies that are further explored with local experts. Based on the feedback received, these interim strategies are adopted, adapted or rejected and a roadmap for revising the current management strategies is presented.

Addition of biochar to urea and urine fertilizer for improving soil chemical properties and maize yield in acid upland, East Lampung

N L Nurida and Septiana

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: lelanurida@yahoo.com

Abstract. Some studies have shown the ability of biochar in nutrient retention, including N. Urea and Urine were fertilizers commonly used as sources of N in agricultural practices. The objective was to evaluate the application of biochar that combined with Urea and Urine on the soil chemical properties and maize yield in acid upland in East Lampung. The study was conducted at the Research station of Indonesian Soil Research Institute, East Lampung, from February to May 2016. The study used a randomized block design 4 replications, with treatments: 1) Urea, 2) biochar (BC)+Urea, 3) BC +Urea (diluted), 4) BC +Urine, and 5) Urine. The parameters measured were soil chemical properties and maize yields. Results showed that the addition of biochar combined with Urea (with and without diluted) and Urine had soil chemical properties that were significantly better than without biochar. Urine could be applied as an alternative source of N nutrients if added with biochar. The highest dry grain was obtained from application of BC 15 t/ha+Urea 300 kg/ha (7.49 t/ha) and BC+Urea (7.15 t/ha) compared to the others treatment (5.11-6.05 t/ha). The application of BC+Urine had a higher dry grain of maize 12% compared to the urine without biochar treatment. Application BC+Urea, whether diluted or not, is more effective to be applied in acid upland in East Lampung because it resulted in soil chemical properties and maize yield better than BC+Urine.
Application of organic fertilizer and biofertilizer on soil biota and organic vegetables production

W Hartatik and D Setyorini

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: wiwik_hartatik@yahoo.com

Abstract. The diversity of soil biota and vegetables production increased through application of organic fertilizer and biofertilizer. The purpose of the study was to determine the effect of organic fertilizer and biofertilizer on soil biota and vegetables production. The experiment was conducted in organic vegetable field, Permata Hati Farm, Cisarua, Bogor, West Java Province, Indonesia (06°40’31.6” N, 106°57’24.7” S; 1004 m asl), from June – August (dry season) 2009. The plot size was 4 m x 5 m, with Chinese lettuce and broccoli as crop indicator. The study was set in randomized block design, 6 treatments and 3 replications. The treatments were set as follows: T1: farmer practice (goat manure + chicken manure + banana stem dose 20 ton ha\(^{-1}\)), T2: (chicken manure + plant residue) dose 10 tons ha\(^{-1}\) + arbuscular mycorrhizal fungus, T3: (chicken manure + plant residue) dose 10 tons ha\(^{-1}\) + biofertilizer, T4: (chicken manure + plant residue) dose 10 tons ha\(^{-1}\) + Tithonia, T5: vermicompost 12.5 tons ha\(^{-1}\) and T6: vermicompost 10 tons ha\(^{-1}\) + bio fertilizer. The parameters are consists of soil biota population before and after treatment, growth and yield of Chinese lettuce and broccoli. The results that application of chicken manure + plant residue of 10 ton ha\(^{-1}\) and biofertilizer gave yield as 13.3 ton ha\(^{-1}\) of Chinese lettuce and chicken manure + plant residue dose 10 ton ha\(^{-1}\) + Tithonia gave yield as 3.1 ton ha\(^{-1}\) of broccoli and the diversity of soil biota, significant higher than other treatments. Vermicompost gave the lowest yield of Chinese lettuce and broccoli due to root disease that cause by vermicompost.

Application soil ameliorant improve soil properties, nutrient uptake, growth and production of paddy field

G A Nugroho, N Kusumarini and S Kurniawan

Soil Science Department, Faculty of Agriculture, Universitas Brawijaya, Malang, Indonesia

E-mail: gabrynaauliya@ub.ac.id

Abstract. Sustainability of rice production can be reached by proper soil management practices. The study aimed to evaluate the effect of soil ameliorant application on nutrient uptake, growth, and production of paddy field. The research was conducted using RBD with 8 treatments and 3 replications. Treatments consisted of control (S0), 100% dose of inorganic fertilizer (S1), 100% dose of inorganic fertilizer+100% dose of soil ameliorant (S2), whereas the treatments of S3 to S7 were 75% inorganic fertilizer + 50%, 75%, 100%, 125%, and 150 % dose of soil ameliorant. Variable measured include plant growth, nutrient uptake (i.e N, P, K), paddy yield, soil chemical and physical properties. It showed that nitrogen uptake and growth of paddy (i.e plant height, number of leaf, number of tillers) on vegetative phase increased from 37% to 300% by application of 75% inorganic fertilizer+100% soil ameliorant (S5) as compared to control. The application of soil ameliorant
increased soil organic carbon, the soil bulk density, and porosity. In addition, the yield of paddy also
increased 33-37% with application of 100% and 125% dose of soil ameliorant (S5 and S6). Our
finding showed the benefit of soil ameliorant for decreasing rate of inorganic fertilizer and
maintaining the sustainability of rice production.

Improving rice plant uptake on P and Si with Si materials
application in Ultisols

L Anggria¹, A F Siregar¹, I A Sipahutar¹, R Suntari², U Fitriani² and Husnain³

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and
Development, Bogor, Indonesia
² Brawijaya University, Malang, Indonesia
³ Indonesian Center for Agricultural Land Research and Development, Indonesian Agency for
Agricultural Research and Development, Bogor, Indonesia

E-mail: anggria_linca@yahoo.com

Abstract. Silica plays a role on nutrient uptake as increasing soil available P and increasing plant
resistance on abiotic and biotic stresses. The purpose of this research was to find out the effect of
silica material application on P uptake and rice growth and production. A pot experiment was carried
out under greenhouse condition. The experiment was set up in completely randomized design with
six treatments and four replications. The treatments used five silica materials, including control,
palm nut shell compost, volcanic ash, palm nut shell ash, coal fly ash, and waste media of mushroom.
Urea 200 kg ha⁻¹, SP-36 75 kg ha⁻¹ and KCl 50 kg ha⁻¹ was applied as basal fertilizer. The results
showed that the application of silica material had a significant effect on P and Si uptake in rice
plants. The highest of P uptake was in the palm nut shell compost treatment compared to the control.
Meanwhile, the highest Si uptake was in coal fly ash treatment compared to control. Silica
applications could also increase the growth and yield of rice. The highest yield for the 1000 grain
weight and the straw yield were obtained in the palm nut shell compost and coal fly ash treatments
compared to control.

Effectiveness of rice straw with biodecomposers and
biofertilizers application on three rice varieties in new land
clearing in Merauke, Papua

H S Wulanningtyas¹, Sudarsono¹, A Kasim¹, M S Lestari¹ and Y Baliadi²

¹ Papua Assessment Institute for Agricultural Technology, Indonesian Agency for Agricultural
Research and Development, Papua, Indonesia
² Indonesian Legumes and Tuber Crops Research Institute, Indonesian Agency for Agricultural
Research and Development Malang, Indonesia
E-mail: heppysuci@yahoo.co.id

Abstract. In order to fulfil the rice production, there were new land clearing programs outside Java, including Merauke, Papua. Merauke has a large potential of agriculture and it is a center for rice development in the southern region of Papua. There were several obstacles on rice cultivation in this area such as low soil fertility which has an effect on less optimal production. This study aims to determine the effect of rice straw decomposition with biodecomposers and biofertilizers application on three rice varieties in new land clearing in Merauke, Papua. The research design was factorial with two factors treatments, consist of with/without straw decomposition with biodecomposers and biofertilizers application and three kinds rice varieties. Soil analysis was carried out to determine the macro nutrients in the soil. The data were collected consist of the agronomic and yield components. The first treatment did not affect on increasing soil organic C, total N, available P, available K and soil respiration. On the contrary, from field observations it were found that the treatment affected to the growth of seedlings in the nursery. In addition, statistical analysis showed that these treatments significantly affected on plant height, number of tillers, number of productive tillers, panicle length, number of seeds per panicle, number of seeds filled, 1,000 grain weight and productivity. The highest productivity was reached by Inpari 33 of 8.20 t/ha.

Increasing productivity of rice throught control of iron toxicity at acid sulfate soils of tidal swampland

I Khairullah, M Saleh, M Alwi and M Noor

Indonesia Swampland Agricultural Research Institute (ISARI)

Email: izhar.balittra@gmail.com

Abstract. Increased rice productivity in acid sulfate soil at tidal swampland face several obstacles, including iron toxicity. Iron toxicity can reduce rice growth and yield. Decreasing in yield due to iron toxicity by 30-100 %, depending on variety tolerance, intensity of toxicity, and soil fertility status. Therefore problem of iron toxicity must be able to be controlled to increase rice productivity. Controlling of iron toxicity can be done through water management, amelioration, application of fertilization, and using of high yielding varieties of iron toxicity tolerant. Water management intermittently increased rice growth and yield higher than flooded continuously and or flushing system. Intermittent system after one week was accompanied by a delay in planting time of 14 days to 21 days after flooded. Amelioration using 5 t ha⁻¹ straw compost and 5 t ha⁻¹ purun tikus (Eleocharis dulcis) compost also increased rice growth and yield compared to dolomite 2 t ha⁻¹. Fertilization of P 90 kg ha⁻¹, P₂O₅ and K 100-125 kg ha⁻¹ K₂O combined with seed treatment using CaO 75% of seed weight increased rice growth and yield. Likewise, fertilizer application of 90 kg ha⁻¹ N, 60 kg ha⁻¹ P₂O₅ and 60 kg ha⁻¹ K₂O could also increase rice yield. Using adaptive and high yielding varieties (HYV’s) such as Margasari, Mendawak, Inpara 1, 2, 3, 6, 7, 8 and 9 also increased rice yield. By combining water management, amelioration, application of fertilizer, using of tolerant and HYV’s rice productivity at acid sulfate tidal swamplands coud increase so that rice production can be significantly increased.
The distribution and characteristics of peat lands in Central and South Bangka Regencies, Bangka Belitung Islands Province

R B Heryanto, R A Gani and Sukarman

 Indonesian Centre for Agricultural Land Resources Research and Development, Bogor, Indonesia

E-mail: bambang20@yahoo.com

Abstract. The use of Peatland for agriculture is limited due to climate change and environmental damage issues. The Peatland mapping on Bangka Island was carried out by the Indonesian Center for Agricultural Land Resources Research and Development (ICALRRD) in 2019 covering an area of 23,388 ha. The purpose of this research is for to map and study the characteristics of peat soils. The method used is The Guidelines for Soil Survey and Mapping, 1:50,000 Scale and SNI (Indonesian National Standars) 8473: 2018. The results showed the largest peat distribution occurred in Central Bangka Regency (13,673 ha) and smaller area in South Bangka Regency (5,030 ha). Peat lands in Central Bangka Regency and South Bangka Regency consist of tidal topogenic peat soils and freshwater topogenous peat soils. The decomposition rate of peat in these consists of Organosol Saprik and Organosol Hemik. Reaction of sapric and hemic peat is acidic to very acidic, CEC is high to very high, and base saturation is very low. The average carbon stocks in peat lands in South Bangka Regency and Central Bangka Regency are 582.79 tons/ha and 428.60 tons/ha, respectively. The results can be utilized by all users, especially in the framework of sustainable agricultural development.

Difference of soil tillage and application of organic fertilizers on soil water content and yield of upland rice

J Barus1 and Y Pujiharti2

1 Assessment Institute for Agricultural Technology, Lampung, Indonesia
2 Indonesian Center for Food Crops Research and Development, Bogor, Indonesia

E-mail: yunita_0106@yahoo.co.id

Abstract. Research aimed at increasing upland rice yield and balanced with efforts to conserve land to maintain sustainable land productivity has been carried out in the plantation area of Lampung AIAT in 2019. The treatments applied are A. Method of tillage, and B. Organic fertilizers. More is as follows: A1. Maximum tillage and without moat, A2. Minimum tillage by make a moat around the plot, B0. Control (without organic fertilizer), B1. Application of bio urine plus 10 l ha⁻¹, B2. Application of bio urine plus 20 l ha⁻¹, B3. Application of biodekomposer 10 l ha⁻¹, and B4. Application of biodecomposer 20 l ha⁻¹. The treatments were arranged in a factorial randomized block design with three replications and the plot size of each treatment was 10 x 10 m. The treatments were arranged in a factorial randomized block design with three replications and the plot size of each treatment was 10 x 10 m. Biourin plus used in this study is fermented cow urine and other local ingredients. biodecomposers used are made from tomatoes, star fruit, sugar, EM-4, etc. which have been fermented for two weeks. Each plot was planted with Inpago 12 varieties of upland rice. The variables observed were soil water content, growth and rice yields. The results showed that soil water
Nutrient balances under organic rice farming system as affected by different sources of organic fertilizers in Central Java, Indonesia

D Setyorini and W Hartatik

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: diahs62@gmail.com

Abstract. Understanding the net nutrient balance in a organic rice farming system is crucial to determine its ability to maintain soil fertility in the long term. The calculation of nutrient balance for all nutrients in organic agriculture is difficult because the nutrients come from a variety of organic materials. Objective of this study was to calculate nutrient balanced of N, P, K under different application of organic fertilizer on organic rice farming. Research were conducted during 6 consecutive seasons in the farmer’s field at Sukorejo, Sragen, Central Java, Indonesia with soil type Inceptisol during 2007-2009 planting seasons. Rice variety was Mentik Wangi, planted at plot size 4 m x 5 m with planting space 20 x 20cm. Experimental design was randomized block design with 9 treatments and 3 replications. The sources of organic fertilizer tested were manure from goat, cattle, chicken combined with azolla, rice straw, charcoal with doses 5t/ha manure, 500-1.000kg/ha plant residue and 300kg/ha charcoal. The results shows that partial and cumulative balanced for Nitrogen (N) and potassium (K) moslty negative for treatment without azolla and straw compost. The positive balance for N and K was achieved at treatment manure integrated with azolla and straw compost. Conversely, balanced of P was positive in all of the treatment combination. Chicken manure was the best input sources for rice organic farming, following by cattle and goat manure. Application of manure 5t/ha combined with azolla 500kg/ha and straw compost 1t/ha was give better growth, yield and NPK balanced for local rice variety Mentik Wangi.
Abstract. In Indonesia, mangosteen has high potential for export commodity, but the fruit quality is low. Yellow sap contamination is the main problem in mangosteen fruit quality. The purpose of this research was to know the potency of sub-micron dolomite to reduce yellow sap contamination. This research was conducted in Guguk district, Lima Puluh Kota regency, West Sumatera province, Indonesia, since June 2016 until March 2017. In this experiment productive mangosteen tress (12 years) were used as plant material. This study used Randomize Complete Block Design, and the treatments were the dosage of sub-micron size of dolomite fertiliser (30, 60, 90, 120, 150 g/plant). Each unit of treatments consists of three plants and four replications. The results showed that (1) the application 90 g/plant of sub-micron dolomite fertilizer increased Ca level in mangosteen leaves and reduced yellow sap contamination until 19.78%, (2) the application of sub-micron dolomite fertilizer above 90 g/plant tend to reduce the Ca level in mangosteen leaves and increased the yellow sap contamination, and 3) application 120 g/plant sub micron dolomite increased Mn level in mangosteen leaves, and increase the dosage of sub micron dolomite could reduced Mn level in mangosteen leaves.

Application of mulch and soil ameliorant for increasing the productivity of soil and shallots (Allium Cepa) in the highland dry land

U Haryati and Irawan

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: umiharyati@yahoo.com

Abstract. Upland dry land has potential for agricultural farm with high economic commodities. However, some of this land has been degraded so that technology is needed to improve soil quality. This study aims to determine the effect of mulch and soil ameliorant on soil quality and shallots yield. The study was conducted in March to June 2017 in Garut Regency, West Java Province. The experimental design used was split plot design with 3 replications. Main plot was type of mulch consisted of 3 treatments, while sub-plot was soil ameliorant application consisted of 5 treatments. The results showed that dolomite soil ameliorant increased pH, C-organic, P2O5 and Ca-dd. Straw mulch and soil ameliorant increased total pore space, rapid pore drainage, and aggregate stability index and permeability. There was an influence of the interaction of mulch and soil ameliorant treatments to the shallot ’s tuber yield. The highest tuber yield (18.8 t ha⁻¹) was achieved at treatment without mulch with farmer technology plus biochar (5 t ha⁻¹) and plastic mulch with farmer technology plus dolomite (5 t ha⁻¹) and biochar (5 t ha⁻¹). The incremental yield was about 15.0% compared to control treatment.
Technology alternative for management of paddy field which exposed to natural stone industry wastewater in Cirebon Regency

B Susanto, Wiratno, D Sugandi, Y Surdiyanto, N Sutrisna and Y Argo

West Java Assessment Institute for Agricultural Technology, Indonesian Agency for Agricultural Research and Development Bandung 40391, Indonesia
E-mail: bamsusanto40@gmail.com

Abstract. Sediment materials and chemical compounds contained in the wastewater of the natural stone industry have adversely affected the paddy fields of several sub-districts in Cirebon Regency which are close to the location of the natural stone industry. This study aims to determine the impact of natural stone industry waste on paddy fields, water, and rice plants and to provide technological alternatives to reduce the impacts. The method used was a field survey, laboratory analysis, and FGD (Focus Group Discussion). The results showed that the sediment material in the natural stone industry wastewater adversely affected the physical characteristics of the soil such as structural texture, and soil permeability that could inhibit the growth and development of rice plant roots resulting in stunting symptoms. From the chemical properties of the soil, the soil at the research location is still quite high in productivity and the level of heavy metal contamination is also still below the threshold value. Heavy metal content in irrigation water and rice plant tissue is still below the threshold value according to PP 82/2001. Even though chemically the impact is still below the threshold, it is necessary to immediately take control measures so as not to endanger the environment both soil, water, plants, animals, and humans. Some technology alternatives that recommended to reduce the impact of natural stone industry wastewater are as follows 1). Mechanical soil treatment technology; 2). Ecological engineering through the Integrated Plant and Resource Management approach; 3). Phytoremediation and Bioremediation technologies.

Effectiveness the combination of organonitrofos and inorganic fertilizers on the changes of soil chemical properties and the yields of cucumber plant (Cucumis sativus L.) in ultisols soil

Dermiyati¹, E Aprilia¹, K Hendarto¹, S B Yuwono² and Y C Ginting¹

¹ Department of Agrotechnology, Faculty of Agriculture, University of Lampung, Bandarlampung, Indonesia
² Department of Forestry, Faculty of Agriculture, University of Lampung, Bandarlampung, Indonesia
E-mail: dermiyati.1963@fp.unila.ac.id

Abstract. This study aimed to determine the effect of application a combined Organonitrofos and inorganic fertilizers on the changes of soil chemical properties and the yields of cucumber plants in ultisols. This study consisted of 11 combinations of the Organonitrofos and the inorganic fertilizers with 3 replicates arranged in a randomized block design. This study used a recommended dose of
100% Organonitrofos fertilizer which was 10,000 kg ha$^{-1}$ and 100% NPK inorganic fertilizer (Urea = 448 kg ha$^{-1}$; SP-36 = 413.5 kg ha$^{-1}$; KCl = 63.3 kg ha$^{-1}$). The treatments were various combinations of Organonitrofos and inorganic fertilizers with a range of 0, 25, 50, 75, and 100% from each fertilizer recommendation. The results showed that the application of a combined Organonitrofos and inorganic fertilizers increased the pH and the available-P of soil, but it did not affect the total-N and organic-C of soil. The best combination dose for the yields of cucumber plants was found in various combinations of Organonitrofos and inorganic fertilizers doses. All combined dose of Organonitrofos and inorganic fertilizer significantly increased all the growth and yields variables of cucumber compared to control (without fertilizer) and application of Organonitrofos fertilizer only. Application of 100% Organonitrofos + 50% NPK was the most economically effective dose because it had the highest RAE value of 101%.

Effectiveness of biofertilizer formula on soil properties and shallot productivity in tidal swamp land

Mukhlis$^1$, Y Lestari$^1$, M P Yufdy$^2$ and F Razie$^3$

$^1$ Indonesian Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjarbaru, Indonesia
$^2$ Indonesian Center for Horticulture Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
$^3$ Faculty of Agriculture, Lambung Mangkurat University, Banjarbaru, Indonesia

E-mail: mukhlisbalittra@yahoo.com

Abstract. The low productivity is one of the main problem of tidalswamp development. The use of biofertilizer that is adaptive in soil condition and its target is an alternative to increase soil fertilization, plant productivity, inorganic fertilizer efficiency, and decrease environmental pollution. The aim of this research was to test the formula of biofertilizer containing decomposer (Trichoderma sp), P-solubilizer (Bacillus sp), and N-fixer (Azospirillum sp and Azotobacter sp) to increase soil properties and shallot productivity in tidalswamp lands. This research was conducted from July – September 2018 in Wanaraya District, Barito Kuala Regency, South Kalimantan. The treatments involved (A) No fertilizer, (B) NPK (recommendation dose), (C) Biofertilizer, (D) Biofertilizer + NPK (50% of recommended dose), (E) Biofertilizer + NPK (75% of recommended dose). The treatment were arranged by randomized completely block design with four replications. Recommended dose of NPK fertilizer was NPK compound 500 kg/ha, SP-36 150 kg/ha, dan KCl 200 kg/ha. Research results showed that biofertilizer formula combined by inorganic NPK fertilizer as much as 50 – 75 % of recommended dose could increase soil properties and yielded as many as 12.40 – 12.86 t/ha. These treatments increased the yield as much as 2.39 - 6.19% compared to NPK fertilizer with recommended dose and also the efficiency of inorganic fertilizer by 50-75%.

The use of soil ameliorant to improve soil quality and crop productivity of degraded dryland in Gunung Kidul, Yogyakarta
Abstract. Water availability in dry land is a major limiting factor to increase crop productivity. This factor is more difficult to overcome if the dry land is still suffering from degradation process. Besides fulfilling nutrient requirements, the efforts to improve soil quality are urgently needed. The purpose of this research is to study the effect of balanced fertilization and soil ameliorant on soil quality and crop productivity. The study was conducted on degraded dryland in Gunung Kidul, Yogyakarta at the beginning of the dry season in 2018. Randomized block design with five treatments and four replications was applied. The treatments consisted of T0=control (farmer management), T1=balanced fertilization, T2=T1+biochar SP-50, T3=T1+biosilica, T4=T1+biochar SP-50+biosilica, and T5=T1+volcanic ash. Balance fertilization accompanied by biochar SP-50 application without (T2) and with bio-silica (T4) gave a positive effect on the content of soil organic C and K-potential. T4 treatment also significantly affected bulk density. Soil ameliorant treatment (biochar SP-50, bio-silica, and volcano ash) has a positive effect on water aggregate stability. Balanced fertilization and soil ameliorant significantly affected corn growth and increased dry shelled production. Addition of soil ameliorant alone did not significantly increase corn production. It seems likely take a relatively long time and continuing process to improve soil quality and crop productivity in degraded land.

Long-term impact of single biochar and compost application on soil aggregation

L S Schnee1,2, H Koehler1, A Ngakou3 and T Eickhorst2

1 General and Theoretical Ecology, University of Bremen, Bremen, Germany
2 Soil Microbial Ecology, University of Bremen, Bremen, Germany
3 Department of Biological Sciences, University of Ngaoundéré, Ngaoundéré, Cameroon

E-mail: laura.schnee@yahoo.de

Abstract. Soil aggregation is an important indicator of soil quality and highly responsive to management such as application of organic amendments. Compost generally increases aggregate stability and enhances soil microbial activity, while the effects of biochar on these factors remain inconclusive. We investigated the effect of biochar and compost on soil aggregation and microbial abundance at an experimental soil rehabilitation site in Ngaoundéré, Cameroon. Sampling was carried out 3.5 years after installation of the site. Both amendments improved bulk density, hydraulic conductivity, pH, and base saturation. Cation exchange capacity and soil organic matter (SOM) content were rather a function of soil texture than influenced by the amendments. Bacterial abundance increased in the compost, but not in the biochar treatment. Fungi were more frequent in smaller aggregates, but did not respond to the treatments. Macroaggregates 400 – 2000 µm contributed ca. 75 % of the soil functions assessed. Yet, SOM content was 4 times higher in microaggregates < 50 µm than in macroaggregates throughout all treatments. We conclude that even single applications of organic amendments can have positive long-term effects on soil aggregation in undisturbed degraded soils, particularly in the macroaggregate fraction. Microaggregates harbour fungal hyphae and are very rich in SOM, independent of amendments.
The effect of fly ash application to acacia growth and heavy metals leaching on peatland

I G M Subiksa¹, I W Suastika¹ and Husnain²

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia.

E-mail: igm_subiksa@yahoo.co.id

Abstract. Research on the effect of fly ash application on peatland to the growth of acacia and heavy metal leaching on peatland has been carried out in peatland of Pelalawan Regency, Riau. The research objectives were to compare the effect of 3 types of fly ash to the growth of Acacia crassicarpa and to investigate the potential on heavy metal pollution in groundwater of peatlands. The study was conducted using a randomized block design with 8 combined treatments with the type and rate of fly ash, which they were applied to the 9 weeks old of acacia. Groundwater quality was monitored from a piezometer installed in the middle distance of 4 acacia trees. The results showed that the application of all 3 types fly ash significantly affect to acacia plant growth as indicated by the increased of stem diameter and plant height. Biomass fly ash is better compared to coal and mixed fly ash. The higher rate of fly ash the better acacia growth. The results of water quality measurement taken from piezometer showed that there were 5 types of heavy metals detected in ground water namely Pb, Co, Ni, Mo and Zn, but the concentration was still below the threshold of regulation. There was no significant difference in heavy metal content among treatments both with and without fly ash application.

Projection of climate change impacts based on rainfall pattern analysis for crop water availability in Indonesia

Misnawati and Y Apriyana

Indonesian Agro-climate and Hydrology Research Institute, Ministry of Agriculture, Bogor, Indonesia

E-mail: misnawati.msaleh@gmail.com

Abstract. Climate change has been a major global concern for the last century. The increase in temperature and changes in rainfall has significant affect the agricultural sector in Indonesia. This study assesses the impact of climate change on water availability and crop evapotranspiration (ETc) changes in seven locations based on three rainfall patterns; monsoonal, equatorial, and local. The historical data (1981-2010) and The GCM data (ACCESS1-0) for CMIP5 project for forty years (2011-2050) for the scenarios RCP 4.5 and RCP 8.5 used here to analyse and predict the future
changes. The Mann-Kendall test and Thiel-Sen's Slope estimator (TSS) analysis was applied on crop growing season to analyse the effects of climate change. The projection of future climatic conditions shows an increase in temperature and a decrease in water availability in both scenarios RCP 4.5 and RCP 8.5 for each rainfall pattern. Water availability and evapotranspiration show a significant trend in scenario RCP 8.5, while on scenario RCP 4.5 shows an insignificant trend. Increasing Impacts of water availability for crop, consequences of reduction due to environmental and climate mitigation constraints, need to be further evaluated.

Red chilli performance on gliocompost biofertilizer application in acid dryland

L Pramudyanî, W Yaniî, A Saburî and M Yasinî

1 Assessment Institute for Agricultural Technology, Indonesian Agency for Agricultural Research and Development, South Kalimantan, Indonesia
2 Ornamental Plant Research Center, Indonesian Agency for Agricultural Research and Development, Cipanas, Indonesia

E-mail: lelyahya@yahoo.co.id

Abstract. The purpose of this study was to determine the effect of the use of Gliocompost biological fertilizers on the growth and yield of red chili plants in acid dry land. The assessment was carried out in Harapan Masa Village, Tapin Selatan District, Tapin District, South Kalimantan Province at an altitude of 25 m above sea level, from May 2016 to December 2016. The varieties used were pillars. The area of land used is 1 hectare. The study was arranged using a randomized block design with 4 treatments and 5 replications. The treatments consist of: P1 = manure application with gliocompost + NPK fertilizer at a dose of 100%, P2 = manure application with Gliocompost + NPK fertilizer with a dose of 75%, P3 = manure application with Gliocompost + NPK fertilizer at a dose of 50%. Variables observed included percentage of dead chilli seeds, plant height, fruit length, fruit diameter, percentage of dead plants and crop production. The results showed that the use of biofertilizer Gliocompost on manure used + NPK fertilizer with a dose of 75% can increase plant height and increase the production of chilli fruit in acidic dry land compared with manure that is used not given Gliocompost.

Rice yield relationship to soil physics and factors affected the productivity of tidal swamp rice in South Sumatra

S S Girsangî and B Raharjoî

1 North Sumatera AIAT
2 South Sumatera AIAT

Email: girsang313@gmail.com
Abstract. Land extensification in tidal swamp rice is an important program in increasing national rice productivity (Oryza sativa L.) that has not been optimally utilized. The purpose of this study is to examine the relationship of soil, climate, and other factors that affect rice productivity improvement and calculate the benefits of tidal swampy rice farming. The study was conducted in Sumber Hidup Village (2.674074 South latitude and 104.8591 East Longitude, elevation 1.25-1.50 m.a.s.l.) and Telang Makmur (2.691339 South latitude and 104.8899 East Longitude, elevation 1.50-1.75 m.a.s.l.), Muara Telang Sub-District, Banyuasin District, South Sumatra province in July-December 2019. This study uses purposive sampling method in collecting data from farmers and soil sampling of 30 respondent farmers and secondary data from Meteorology, Climatology, and Geophysical Agency and Food Crops and Horticultural Protection Agency South Sumatra Province for climate, pest and disease data during the 17 seasons of the 2011/2012-WS 2019/2020 period. Soil analysis was carried out at ICALRRD and Sriwijaya University in 2019 by compositing four points in each farmer. Analysis of primary data obtained from survey data and soil analysis is tabulated into Excel and analyzed with STAR and Excel. The results showed that rice production was lower in DS than WS which was closely related to water availability. Mean grain yields in WS 2018/2019 are inversely related to total pore space (r = -0.41, P <0.05) but are directly related to clay content (r = 0.40, P <0.05), Ksat (r = 0.37, P <0.05), and mean P₂O₅ applications (r = 0.70, P <0.001) while rice yields at DS 2019 are directly related to N applications (r = 0.37, P <0.05) and P₂O₅ (r = 0.43, P <0.05). A low percentage of total pore space and availability of P₂O₅ have an impact on rice yield and a large yield decrease. Furthermore there was a negative correlation between temperature with Cnaphalocrocis medinalis (r = -0.75 = 6, P <0.001) and Gryllotalpa brachyptera (r = -0.53 = 6, P <0.01) while relative humidity were positively correlated with rat (r = 0.61) = 6, P <0.01), Bacterial leaf blight (r = 0.60 = 6, P <0.01), and Helminthosporium Oryzae (r = 0.50 = 6, P <0.05). Low temperatures have a positive impact on the presence of Cnaphalocrocis medinalis and Gryllotalpa brachyptera but high humidity has a major impact on the presence of rats and bacterial leaf blight. Furthermore, the income received by farmers is doubled in WS compared to DS (R/C ratio 2.4 Vs. 1.2). The study suggested that nutrient management, soil pore space, and climate information can affect rice productivity in tidal swamp rice fields that are economically beneficial in WS but need to be reviewed for DS plants that are suitable and of high economic value.

The cellulolytic activity and symbiotic potential of dark septate endophytic fungus Phialocephala fortinii to promote non-mycorrhizal plants growth

Surono¹ and K Narisawa²

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Graduate School of Agriculture, Ibaraki University, Ami-machi, Ibaraki, Japan

E-mail: Surono54@pertanian.go.id

Abstract. Fungi have an important role in nutrient cycling and promoting bioconversion of cellulose in nature. The endophytic fungi have attracted much attention to investigating their ability to degrade cellulose and to promote plant growth as double functional roles. The objective of this study was to investigate the cellulase activity and the ability of dark septate endophytic fungus Phialocephala fortinii to promote non-mycorrhizal plants. This study consisted of carboxy-methylcellulose degradation of dark septate endophytic fungal isolates (DSE) compared to white-rot fungus Pleurotus eryngii as a control, cellulase activity assay using High-Performance Liquid
Chromatography, and the effect of cellulolytic DSE to promote non-mycorrhizal plants growth. The results showed *P. fortinii* III.Pi.I8 had the largest cellulolytic index than *P. fortinii* CKG.II.10.1 and *P. eryngii* for 7 days incubation time. The cellulase activity pattern of all *P. fortinii* isolates rather similar to *P. eryngii* for the incubation time of 7 to 35 days. *Phialocephala fortinii* III.Pi.I8, CKG.II.10.1, and CKG.I.11 increased the growth of *Brassica oleracea* var. capitata by 7.63%, 92.5%, and 47.7%, respectively over to the control plant. *Phialocephala fortinii* III.Pi.I8, CKG.II.10.1 and CKG.I.11 increased the growth of *Spinacia oleracea* by 58.5%, 283%, and 303%, respectively over to the control plant. Heavy colonization occurred both in *B. oleracea* var. capitata and *S. oleracea* roots inoculated with *P. fortinii* isolates especially within the epidermal and cortical cells. This study proved that although *P. fortinii* has cellulase activity but did not cause disease symptoms in non-mycorrhizal plants so that it can potentially be multifunctional as cellulose decomposer and plant growth promoter.

---

**Exploration Mycorrhiza from soil Lombok on plants sorgum, with carriers of zeolite that have been sterilized by gamma radiation**

Nurrobifahmi, A N Flatian, T Bachtiar, A Citraresmini, M Hanani and S Slamet

The Center for Isotope and Radiation Applications of the National Nuclear Energy Agency

E-mail: nurrobifahmi@gmail.com

**Abstract.** Mycorrhiza plays a role in helping to increase uptake P of plants, as a soil conditioner, rehabilitating degraded lands. This study aims to isolate, characterize, and purify mycorrhizae from a variety of different soil types. Based on the results of the research mycorrhizal genus found consisted of three genera namely *Glomus etunicatum, Gigaspora margarita, Sclerocytis rubiformis*. This study used a Completely Randomized Design (CRD) composed of 6 treatments and each treatment was repeated 3 times so that the number of experimental units was 36 experimental units. The treatments given include: (1) Without mycorrhiza and without P source (Control), (2) SP 3 fertilizer (3) Mycorrhiza mycofer (4) Mycorrhiza mycofer + SP 36 fertilizer (5) Mycorrhiza mikorbi from Lombok (6) Mycorrhiza mikorbi from Lombok + SP 36 fertilizer. Stover weight, root weight on Lombok soil and root weight on Parung soil showed no significant difference, while root weight on Parung soil showed significantly different results. Mycorrhiza mikorbi and SP 36 fertilizer on Parung soil gave the second highest yield compared to other treatments. Mycorrhiza are suitable for use in soils that have low P element content, so they can help increase the availability of P in the soil.

---

**Amelioration to improve soil chemical properties and rice yields in actual acid sulphate soils**

E Maftuah, Y Lestari, E Berliana P and V Mayasari
Indonesian Swampland Agriculture Research Institute (ISARI)
E-mail: eni_balittra@yahoo.com

Abstract. The research aims to study the effect of ameliorant material to improve soil chemical properties and rice production in actual acid sulphate lands. The study was conducted in Tamban Baru Tengah village, Tamban Catur Subdistrict, Kapuas, Central Kalimantan, from April-September 2019. The research design used a Randomized Block Design with treatment (A1) 3 t/ha of lime given once at the beginning, (A2) 2 t/ha lime + 1 t/ha lime given at the rice age of 1 month, (A3) 2 t/ha ‘Porre’ organic fertilizer + 1 t/ha lime, (A4) 2 t/ha rice husk ash + 1 t/ha lime. Each treatment was repeated 4 times. Periodic soil observations included pH H2O, EC, SO4^2-, Fe^{2+} and Al^{3+}, plant height and number of tillers, at the end of the study rice yields were observed. The results showed that the ameliorant 3 t/ha was able to reduce concentration of Fe^{2+} at planting from 6400 ppm to 1000-1500ppm, SO4^2- from 8000ppm to 2100-4300ppm, Al^{3+} from 16.31 cmol(+) /kg to 5.2-6.7 cmol(+) /kg. Lime combined with “Porre” organic fertilizer (A3) gave the highest rice yield (> 17% higher from A1). The use of “Porre” organic fertilizer was able to reduce the use of lime in tidal swampland.

Amelioration and variety selection to increase red onion yield in peatlands

Y Lestari and E Maftuah
Indonesian Swampland Agriculture Research Institute, Indonesian Agency for Agricultural Research and Development, Banjar Baru, Indonesia

Abstract. Amelioration in peatlands is needed to improve peat soil fertility. Increased productivity can be achieved through improving land fertility, using adaptive varieties and high yields. The research was carried out on degraded peat land in Kalampangan, Palangkaraya, Central Kalimantan from April to September 2017. The study design used a factorial randomized block design with four replications. The first factor was the soil ameliorants type (A1=100% cow manure, A2=combination of 50% cow manure and 50% rice husk ash, A3=combination of 50% cow manure and 50% rice husk biochar, A4=compost), the second factor was the variety of red onion ie Bima and Bauji. Observation variables included available P, K-exc, plant growth and yields. Cow manure was better than others for increasing the availability of P and K in peat soils. Bauji variety more better performance in peatlands than Bima Arjuna. The highest yield of red onion obtained at a combination of ameliorant 100% of cow manure and Bauji varieties. Red onion yields in peatland was more influenced by ameliorant type than varieties.

Soil fertility evaluation and quality of gambier (Uncaria gambir Roxb) in Kundur, Kepulauan Riau

Asmarhansyah1 and B Hafif2

1 Indonesian Center for Agricultural Land Resources Research and Development
Abstract. Gambier is the main export commodity of Kepulauan Riau. The quality of gambier is highly affected by soil and climate characters. The research aimed to study the potency of gambier crop based on the soil fertility evaluation and the quality of gambier product in Kepulauan Riau. The study method was a survey to characterize the land, identify the performance of gambier crop, and collect secondary data and gambier product samples. The survey was conducted in 2-3 gambier farms in Kundur, West Kundur, and North Kundur. Results revealed that soil fertility of the study area is low-moderate indicated by low soil pH, low-moderate soil organic C, Total-N, P2O5, and K2O, and low-very low Ca2+, Mg2+, K+, and CEC, and soil texture is sandy loam – sand clay loam. Evapotranspiration of productive gambier crop is moderately high causing water deficit in January, February, and March. Based on SNI, catechin content of gambier product from West Kundur (52.98%) and North Kundur (50.14%) meet the Quality Standard 2, while from Kundur (13.19%) does not meet the both Quality Standard 1 and 2. The study areas have a potency for developing the gambier crop by providing fertilizer and ameliorant, and technology of water supplement is applied.

The effect of extension towards community knowledge in peatland management: case in Rasau Jaya Village, Kubu Raya, West Kalimantan

Sanudin and E Fauziyah
Agroforestry Technology Research and Development Institute

Abstract. Farmers already understand crop cultivation on peatland. Some efforts needed to increase farmers’ income from peatland management, they are community knowledge towards plant pest and disease, post-harvest processing of products from peatland, facilitation of product marketing by related agencies, and peatland fish farming. These efforts can do through the extension and mentoring farmers. This study aims to analyze the effect of extension towards community knowledge in peatland management. The study was conducted in Rasau Jaya Village, Kubu Raya Regency, West Kalimantan Province from October to November 2018. This research used a survey method with a sample of 33 farmers from five farmers groups using random sampling techniques. The implemented research design was using pre-test and post-test group design. The scores of pre-test and post-test were examined using paired sample t-Test at 95% confident level. The result showed that the effect of extension towards community knowledge level in peatland management was evidently effective. This was proved by the score of post-test was higher compared to the pre-test score from 47% to 83.13% of plant pest and disease, from 35,8% to 91,67% of facilitation of product marketing, from 66,47% to 83,13% of peatland fish farming.
Integrated farming system of cattle and oil palms plantation increasing population and diversity of soil fauna in ultisols soils

A Niswati1, S Romelah2, Dermiyati1 and Tugiyono3

1 Department of Soil Science, Faculty of Agriculture, University of Lampung, Bandarlampung, Lampung, Indonesia
2 Postgraduate Study Program of Environmental Sciences, University of Lampung, Bandarlampung, Lampung, Indonesia
3 Department of Biology, Faculty of Mathematics and Natural Sciences, University of Lampung, Bandarlampung, Lampung, Indonesia

E-mail: ainin.niswati@fp.unila.ac.id

Abstract. Integrated farming system is an agricultural practice that must be done for sustainable agriculture. The objectives of the research were to compare the population and diversity of soil mesofauna in the oil palm plantations applied with integrated farming system of cattle and oil palm plantation (IFSCO) and without IFSCO (non-IFSCO) in ultisols soil. The research was conducted in two oil palm plantations, i.e. an oil palm plantation applied with IFSCO (5 ha) and an oil palm plantation without IFSCO application (non-IFSCO) (5 ha), located in the Karya Makmur Village, Tulang Bawang District, Lampung, Indonesia. The research was arranged using a survey and systematic sampling methods for earthworm, soil mesofauna and soil samples. Population of earthworm and soil mesofauna were enumerated by hand sorting methods and trapped with Barlese-Tullgreen funnel, respectively. The results showed that the application of IFSCO had a higher population and biomass of earthworm as well as abundance and diversity of soil mesofauna than that non-IFSCO. There are two types of dominant earthworms in IFSCO soil and 12 species of mesofauna on IFSCO and 9 species on non-IFSCO. Several physical and chemical properties of soil are positively correlated with the presence of these soil fauna.

Preliminary of isolation and selection of methane oxidizing bacteria on three rice agricultural agroecosystems

T A Adriany1, A Wihardjaka1, A Akhdiya2 and A Pramono1

1 Indonesian Agricultural Environment Research Institute, Pati, Central Java, Indonesia
2 Indonesian Center for Agricultural Biotechnology and Genetic Resources Research and Development, Bogor, West Java, Indonesia

E-mail: terry_jaa@yahoo.com

Abstract. The agricultural sector contributes to releasing methane (CH4) as greenhouse gas emissions from lowland rice cultivation. One effort that can reduce CH4 emissions in paddy fields is to utilize methane oxidizing bacteria from paddy fields. The research aims to isolate and select methane oxidizing bacteria from 3 different rice cultivation agroecosystems. The study was conducted at the Laboratory of the Indonesian Institute of Agricultural Research, Pati, Central Java. Soil sampling was carried out in 3 different rice cultivation agro-ecosystems, technical irrigated rice field (SI), rainfed lowland (TH) and lowland rice with organic rice cultivation (OF). The research
The effectiveness of compound and single fertilizer on the growth of coffee seedling in the nursery

Nurjaya, H Wibowo and T Rostaman

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: nurjaya_2608@yahoo.com

Abstract. Fertilizer is one of the factors production which is very important in increasing crop productivity. The problem by coffee planters was the low level of productivity caused by the use of seeds that are still lacking in quality and cultivation techniques that are still not optimal. The experiment was conducted in the field of Installation, Sindangbarang, Bogor. Field experiment aimed to study NPK 12-12-17 compound fertilizer for growth and determining the optimum dose of coffee seedling in the nursery. The experiment was arranged by Randomized Complete design with 6 replications. Coffee seeds were used as an indicator. The treatment consisted of (1) control, (2) NPK single fertilizer (20 g urea/plants, 25 g SP36/plants, KCl 21 g/plants) equal NPK-12-12-17 compound fertilizer dose 2 g/plants, and 5 level of NPK 12-12-17 compound fertilizer : 37.5; 56.25; 75; 93.75; and 131.25 g/plants in nursery. The observed parameters are plant height, stem diameter, gross weight, dry weight, and Relative Agronomic Effectiveness (RAE) value. The result showed that the application of compound NPK fertilizers was not significantly from single NPK fertilizers on plant height and stem diameter but significantly from the wet weight of coffee plant seedlings. Agronomically application of NPK 12-12-17 fertilizer equal with single fertilizer effective can increased gross weight compared to single NPK fertilizer indicated by RAE value 165% to NPK single fertilizer, with the optimum dose was 70 g/plants.

Dynamics of acidity and electrical conductivity due to seawater amelioration in total reclaimed acid sulphate soils, South Kalimantan

Y Lestari¹, B H Purwanto² and M Noor¹

¹ Indonesian Swampland Agricultural Research Institute (ISARI), Banjarbaru South Kalimantan

Abstract. Productivity of acid sulphate soil is classified as low due to high acidity affect to pyrite oxidation. Amelioration is one solution to increase the productivity of acid sulphate soils. This study aims to determine the effect of amelioration of acid sulfate soils using sea water on acidity (pH) and electrical conductivity (Ec). This study consisted of 2 stages, an incubation experiment carried out in the Greenhouse, Indonesian Swampland Agricultural Research Institute (ISARI), Banjarbaru South and in the field, namely in the village of Handil Maluka, Kurau District, Tanah Laut Regency, South Kalimantan. The incubation experiment used a randomized complete design with 3 replications. As a treatment is the concentration of sea water, namely: 0%, 12.5%, 25%, 37.5% and 50%. In experiments in the field using a surjan system with treatments namely (i) not application with sea water and (ii) application with sea water. The results of the incubation experiment show that the longer the incubation and the higher the concentration of sea water caused the soil pH decreases, while Ec increases. Conversely, incubation of potential acid sulphate soils using well water results in increased pH and Ec. Field experiments have shown that amelioration by seawater on acid sulfate soil can extract soil acidity. Extracting acidity and continued leaching can increase acid sulphate soil productivity.

Dry land optimization through intercropping planting system application to corn and rice in Pemalang District, Indonesia

F D Arianti, Samijan, S Minarsih and E Nurwahyuni
Assessment Unit for Agricultural Technology, Central Java, Indonesia
Email: dforita@yahoo.com

Abstract. Limited land requires intercropping as one of the corn cultivation strategy solutions for high productivity. Corn is one of the food crops used as the second staple food after rice in Indonesia. Efforts can be made to increase not only corn crop production but also cropping index by utilizing sub-optimal land such as dry land through intercropping. Intercropping scheme is a land management technology that can minimize the risk in the use of dry land for developing cropping systems. This study aims to determine the production of corn intercropped with rice. The study was conducted on farmers' land in MT 2 in Kwasen Village, Bodeh Sub-District, Pemalang District. The results showed that the intercropping system of corn and upland rice both has a better effect on growth and can increase the cropping index from IP 100 to IP 150. Thus, intensive and wise management of dry land is able to increase land productivity.
Design an IoT-based control of field irrigation system

E R Widjaya, Harsono and U Budiharti

Indonesian Center for Agricultural Engineering Research and Development, Indonesian Agency for Agricultural Research and Development, Tangerang, Indonesia

E-mail: elitar.ER@gmail.com; elitarrahmarestia@pertanian.go.id

Abstract. The development of agricultural 4.0 leads to the use of the internet to control automatically works in agriculture. Irrigation systems based on the Internet of Things (IoT) have been designed and developed for the application in the field irrigation system. The concept design was to control the watering up to the field capacity of the soil, and the fertigation is a programmable model inputted by the user based on the references of the vegetation needs. Two designs of the IoT based field Irrigation are analysed. The first model utilizes an ARDUINO UNO as the microcontroller, and a developed web-based server to control the system. The second model applies PLC (Programmable Logic Controller) as the microcontroller regulated by its manufactured based program. Advancement in the development of sensor ability and compatibility with the microcontroller is still required to result in high accuracy of the IoT based control application in agriculture.

The effect of the number row and varieties soybean of land equivalent ratio and soybean yield on the soybean-corn intercropping system

Hawania Hafid1, Syatrianty A. Syaiful2, Kaimuddin2, Abdul Fattah3 and Fajdry Djufry4

1 Post Graduate Program of Hasanuddin University, Faculty of Agriculture, Hasanuddin University, Makassar, Indonesia
2 Department of Agronomy, Faculty of Agriculture, Hasanuddin University, Makassar, Indonesia
3 Assessment Institute for Agriculture Technology of South Sulawesi, Indonesian Agency for Agricultural Research and Development, Makassar, Indonesia
4 Indonesian Agency for Agricultural Research and Development, Jakarta, Indonesia

E-mail: hawaiyahafid@gmail.com

Abstract. Soybean-corn intercropping is an environmentally friendly farming method because nutrient substitution occurs. This study aims to determine the effect of soybean-corn intercropping of land equivalent ratio and soybean yield. This study uses a separate plot design (Split Plot Design), as the main plot is soybean varieties: Dena-1 (V1), Detap-1 (V2) and Deja-1 (V3), while subplots
are the number of soybean planting lines: Monoculture (B0), 3 rows of soybean-3 rows of corn (B1), 4 rows of soybean-3 rows of corn (B2), and 6 rows of soybean-3 rows of corn (B3). The combination of varieties and number of soybean treatment rows so that there are 12 treatments and the treatment is repeated 3 times, so there are 36 treatment plots. The results obtained showed that the highest land equivalent ratio (LER) is high in the treatment of Deja-1 varieties with 6 rows of soybean (V3B3) with LER 1.45 while the lowest is in the treatment of Dena-1 varieties with 6 rows of soybean (V1B3) (1.12) and the treatment of Deja-1 varieties with 3 rows of soybeans (1.12). So for plant height, the highest was in the Detap-1 variety (87.82 cm), the highest number of soybean rows was in 3 soybean rows (92.75 cm). The highest number of filled pods was Detap-1 Monoculture (V2B0) (78.53 pods) and significantly different from Detap 1 with 6 rows of soybean (V2B3) (71.77 pods) and the lowest was in Deja-1 with 3 rows of soybean (V3B1) (42.98 pods). The highest weight of 100 seeds was at Detap-1 (17.34 g) and the lowest was at Deja-1 (13.26 g). The highest seed yield was in the Dena-1 variety (1.43 t ha⁻¹) and was not significantly different from Detap-1 (1.25 t ha⁻¹). In the number of soybean rows, the highest seed yield was in monoculture (B0) (2.61 t ha⁻¹) and significantly different from all treatment of rows soybean, and the lowest was at 3 rows of soybean (B1) (0.59 t ha⁻¹). The conclusion of varieties and number of soybean rows affect or land equivalent ratio and yield of soybean which are intercropped with corn. According to the calculation results, all treatments have land equivalent ratio (LER) of more than 1, meaning that soybean-corn intercropping is more profitable than monoculture.

Soil erosion prediction in Cilebak-Cirasea Watershed, Indonesia

R D Yustika¹, R Ariani¹ and I Mandaya²

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Gadjah Mada University, Yogyakarta, Indonesia

E-mail: rd_yustika@yahoo.com

Abstract. Soil erosion impacted on land degradation could threaten soil dan water quality. In mountainous area, soil erosion resulted on loss of top soil which containing high nutrient. The location of study area was located in Cilebak-Cirasea Watershed, Bandung Regency. Dominant landuse in this area was dry land agriculture. The objective of study were to assess soil erosion and apply best management practices to reduce soil erosion. Universal Soil Loss Equation (USLE) was applied to assess soil erosion. This equation consists information about erodibility, erodibility, length slope, crop, and soil management. Integration USLE and Geographic Information System (GIS) assess erosion in watershed scale. The result showed that erosion rate exceed the tolerable soil loss. To conserve environment for long term, application of best management practices could minimize land degradation. Application of cover crop, contour, and terraces effective reduced soil erosion.

Soil organic carbon and total nitrogen dynamics in paddy soils on the Java Island, Indonesia
Heri Wibowo and A Kasno

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: masherizal@gmail.com

Abstract. Java Island with a dense population that requires food support is quite high which must be supported by the availability of quality land. Soil organic carbon is a representation of soil organic matter content and is one of the parameters of soil quality. Soil organic carbon and total nitrogen play an important role in soil physico-chemical fertility, and will increase agricultural productivity. From a total of 860 secondary data collected from 1990 to 2018 in five provinces in Java showed a strong correlation between soil organic carbon content and total nitrogen. More than 77% of the paddy soil in Java have low soil organic carbon content as well as more than 80% have a low total nitrogen content. The positive correlation between soil organic carbon content and total nitrogen is quite strong with correlation value of 0.842 in Banten, 0.900 in West Java 0.895 in Central Java, 0.798 in East Java, and 0.898 in Yogyakarta. The relationship between total nitrogen (y) and soil organic carbon (x) follows a linear regression equation y = 0.0855x + 0.0125, R² = 0.7091 for Banten; y = 0.0805x + 0.0198, R² = 0.8098 for West Java; y = 0.0786x + 0.0233, R² = 0.8007 for Central Java; y = 0.064x + 0.0319, R² = 0.6371 for East Java; and y = 0.0636x + 0.0441, R² = 0.8071 for Yogyakarta. From this relationship it can be seen that the higher the soil organic carbon content, the ability of the soil to retain nitrogen will also be higher.

Model development of sustainable wetland rice farming based on rice estate community and smart farming

L M Rachman1, A Saleh2, J D Wetik3 and A Q Ain3

1 Expert Staff of Research Centre for Human Resource Development, and Lecturer of Department of Soil Science and Land Resource, Faculty of Agriculture, IPB University, Bogor, Indonesia
2 Head of Research Centre for Human Resource Development, and Lecturer of Department of Communication and Community Development Sciences, Faculty of Human Ecology, IPB University, Bogor, Indonesia
3 Researcher of Research Centre for Human Resource Development, IPB University, Bogor, Indonesia

E-mail: latiefra@apps.ipb.ac.id

Abstract. Crucial issues in Indonesia to increase production in rice fields are narrow planting area, small-scale farming and inappropriate cultivation techniques in each region. Related to income and welfare aspect, the farmers confront weak marketing and sales (especially during the massive harvest) and disguised unemployment due to too small workloads if they only focused on on-farm activities on a narrow rice fields. Nationally, the government is also confronted with the intensive rice fields conversion to non-agriculture. Efforts to develop integrated and sustainable rice field agriculture are needed to overcome the threat of rice fields reduction, increase the productivity of rice fields for rice production, and increase farmers' income and welfare. The intention of this study was to develop a model and/or system for developing rice production in rice fields in an integrated and sustainable manner based on smart farming and Rice Estate Community (REC). This model or system is part of IPB-University Rice Roadmap 2015-2030 to support IPB-University Industrial Smart Agro-system 4.0 Program. REC model consists of land consolidation to reach minimum rice
field area for favourable economic scale, strengthening of institutional system, productivity target along with inputs and cultivation techniques required, information technology system support, agroindustry involved, and marketing-selling reinforcement.

Statistical model for remediation plan of endosulfan-contaminated lowland rice fields with agricultural waste

E S Harsanti, A N Ardiwinata and I Zulaehah

Indonesia Agricultural Environment Research Institute, Jl. Raya Jakenan-Jaken Km 5, Jaken Pati, 59184, Indonesia

Email: esharsanti@gmail.com

Abstract. Organochlorine compounds are still found in agricultural land in Indonesia. One of them is endosulfan which is a potent insecticide and is liked by farmers in the era of the green revolution. Endosulfan is persistent, bio-accumulative, and very toxic. Remediation of agricultural land contaminated by pesticide residue is needed to be of sustainable benefit. The purpose of this study is to develop a statistical model of sustainable remediation with agricultural waste in endosulfan-contaminated rice fields. The study was conducted in June 2015-May 2016 with survey and experimental methods in the screen house. Experiment use a randomized complete trial design with seven combinations of biochar-compost manure treatments, and three replication. The results showed different equation models in the first planting season and the second planting season. The first model, \( \hat{Y} = 0.787 - 0.0274X_1 - 0.00817X_2 - 0.369X_3 - 0.00199X_4 - 0.00311X_5 \), where, \( \hat{Y} \) = endosulfan residue in paddy soil; \( X_1 \) = soil pH; \( X_2 \) = soil temperature; \( X_3 \) = C organic soil in roots; \( X_4 \) = total bacterial population (105 SPK g\(^{-1}\) soil); \( X_5 \) = Total fungi population (104 SPK g\(^{-1}\) soil), with the number of observations (n) = 21. The model illustrates that endosulfan contamination conditions around 0.16 mg g\(^{-1}\) can be reduced by endosulfan residues to below BMR by adding biochar-compost ratio 1: 4. The availability of organic matter and total bacteria in the soil can reduce endosulfan residues. Both factors should be managed by increasing their availability in the soil. Second model, \( \hat{Y} = -0.0001 + 0.00869X_1 - 0.00152X_2 + 0.0106X_3 - 0.0003X_4 - 0.000052X_5 \). In the second season, organic C content in the soil did not significantly affect \( \alpha \)-endosulfan residues that had been below BMR. The statistical model of endosulfan contaminated-land remediation can be used to plan the remediation of a pesticide-contaminated land, especially endosulfan.

A dynamic model for managing urban waste in Bogor City West Java Province

Arif Budiyanto

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: arifbudiyantobudiyanto@yahoo.co.id
Abstract. In Bogor City, Indonesia, urban waste is threatening the natural environment and sustainability of the city. To overcome this issue, the government have tried several short-term approaches and implemented several long-term policies as a countermeasure. There also other stakeholders that helped in solving this issue, including universities and private sectors. However, the large amount of daily waste and its unpredictable pattern have made trash management difficult. As a continuation in terms of looking further for sustainable solutions to this problem, this study aimed to establish its dynamic model, which is expressed as a system approach study of the interrelations among the related elements. The study method used consisted of a simulation model using a dynamic system. The system model was created with the help of the Powersim Studio 10 Express software. Causal Loops Diagrams (CLD) and Flow Diagrams are used to study the structure and system. A cause circumference diagram is created by determining the significant cause variables in the system and connecting them using the up arrow, and the arrow lines can be used both ways if the two variables influence each other. After running the system model, it will be able to see tables and graphs. Afterwards, a validation system needs to be done on the system model. In the end, this research is expected to be useful for various parties related to urban waste management.

Comparison of various extraction method that are suitable at several regions in Indonesia

Laili Purnamasari, Linca Anggria, Tia Rostaman and Ladiyani Retno Widowati

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: Laili.purnamasari@gmail.com

Abstract. Cation exchange capacity (CEC) is an indicator of the ability of the soil to absorb and supply nutrients so that CEC is used as one of the soil chemical fertility index. The factors that influence the CEC are the amount of clay texture, organic matter content, and pH. At present the type of CEC determination generally uses the method of ammonium acetate 1 N pH 7, while the distribution of variations in soil pH in Indonesia is very wide-ranging from pH 4 to pH 8. In addition, there are differences in factors that influence the CEC causing measurement of CEC values to be biased. The purpose of this study was to obtain the best soil CEC extraction method. The research began with a soil inventory based on pH, CEC and clay texture criteria. A total of 97 soil samples were analyzed by ammonium acetate 1 N pH 4.8; 6; 7 and compulsive cation exchange extraction method. The results show that the four extracting methods have a real correlation coefficient for the CEC values between extractors. Ammonium acetate extract pH 4.8 and pH 7 are better than other extractors based on the correlation coefficient of CEC with pH and clay content.

Sorption capacity of chelating agent to adsorp lead and arsenic

B N Sulastri, W Purbalisa, A N Ardiwinata, S Apriyani and H Zu’amah

Indonesian Agricultural Environment Research Institute, Pati, Central Java, Indonesia
Abstract. The contamination of soils with heavy metals due to rapid industrialization, modern farming practices, and poor treatment of waste can damage the environment include agricultural lands. The excess concentration of heavy metals in soil should be minimized and removed for environment safety and agriculture sustainability. Remediation using adsorbent to remove heavy metal is a beneficial method for rehabilitating the contaminated site. The purpose of this study was to determine the adsorption capacity of several chelating agents to adsorb heavy metals Lead (Pb) and Arsenic (As). The chelating agents used are chitosan, biochar-compost, zeolites, ammonium thiosulfate, and EDTA. This experiment performed using batch adsorption techniques. The adsorption capacity was determined by applying the Langmuir isotherm model by varying the concentration of Pb and As at (0, 25, 50, 75, 100, 200, 400) mg/kg. The adsorbed concentration of Pb and As was measured by AAS. The results revealed that biochar-compost has the highest maximum adsorption capacity for Pb of 13715.58 mg/kg, and ammonium thiosulfate has the highest maximum adsorption capacity for As of 2763.39 mg/kg.

Analysis of landscape changes using high-resolution satellite images at former rice fields after earthquake, tsunami, and liquefaction in Palu City and Sigi Regency, Central Sulawesi Province

G I Nanda and A Mulyani

Indonesian Center for Agricultural Land Resources Research and Development, Bogor, Indonesia

Abstract. An earthquake, followed by tsunami, and liquefaction hit Palu and Sigi on September 28, 2018. The disaster caused serious damage in material and infrastructure, including to agricultural infrastructure and rice fields. Analysis of landscape changes at rice fields has been carried out to see the impact of disasters by using high-resolution satellite images before and after the disaster. The results showed that 6,467 ha of rice fields affected by the disaster. The rice fields heavy impacted are caused by an earthquake, followed by damaged river embankment, and liquefaction. The land surface is undulating with a height difference of 1-5 m, reversed soil surface, crack width > 100 cm, the irrigation system is destroyed, sand boiling, and naturally it cannot be used again for rice fields. Whereas rice fields which are undulating with a height difference about 20-100 cm, crack width 20-100 cm, and sand boiling appears are classified as moderate. The lightly affected rice fields could not be planted because irrigation system is destroyed. Heavy impact rice fields are recommended to be used as agro-tourism sites with annual crops and natural landscape. The others can be used as rice fields after the availability of water by repairing irrigation system.
Smart agriculture practice for intensively rice cultivation in both irrigated and rainfed rice field

R Kartikawati, I F Yuniarti, D M W Paputri and A Wihardjaka

Indonesian Agricultural Environment Research Institute, Pati, Central Java, Indonesia

E-mail: rinak_iaeri@yahoo.com

Abstract. Smart agricultural practice called by “Panca Kelola Ramah Lingkungan” has been developing by Indonesian Agricultural Environment Research Institute (IAERI). The smart practise was applied in intensively rice cultivation both in irrigated and rainfed rice field in Pati district, Central Java province. Objective of the study was to identify plant performing and rice productivity both in irrigated and rainfed rice field. Five component of Panca Kelola Ramli consisted of high yielding rice variety, urea coated by charcoal, charcoal-compost, botanical pesticide and water management. The botanical pesticide, owl as natural predator of rat and light trap powered by solar cell for insect trapping were used in this integrated pest and diseases management. Observation was carried on methane emission, plant growth and rice yield. The activity in irrigated rice field showed that methane emission was 170 kg ha\(^{-1}\) season\(^{-1}\), an effective tiller number and plant height was 16 tiller and 100 cm, respectively and productivity of rice was 4.6 t ha\(^{-1}\).

The comparison of numerous machine learning algorithms performance in classifying rice growth stages based on Sentinel-2 to enhance crop monitoring in national level

F Ramadhani\(^1\), Y Apriyana\(^2\) and Harmanto\(^3\)

\(^1\) Geosciences, Massey University, Palmerston North, New Zealand
\(^2\) Indonesian Agroclimate and Hydrology Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: fadhullah.ramadhani@gmail.com

Abstract. The rice monitoring based on Sentinel-2 (SC-S2) has been developed for over nine months. It has been observed as the first and only system which generate rice growth stages maps in 10 m spatial resolution using machine learning in Indonesia. However, the SC-S2 use Support Vector Machine to separate the rice growth stages, which may have poor performances. Therefore, the objective of this study is to investigate the performance of other classifiers to increase the performance of SC-S2. We used survey data from the field campaign in 2018 and synchronized with Sentinel-2 bands. The dataset was trained using 61 machine learning algorithms to create 61 models. The models were applied to the Sentinel-2 image of part of Indramayu area. The accuracy and processing time were collected. The results are the highest accuracy is Localized Linear Discriminant Analysis with 92.1% (p<0.001) and the average accuracy of all classifiers is 76.2% (p<0.05). The implication of this study is to propose some changes in classification process into the SC-S2 for increasing the overall performance and other machine learning system in the remote sensing area.
The mentoring of livestock areas in East Nusa Tenggara

S Ratnawaty¹, A Rubianti¹, Y Yusriani² and Yusuf³

¹ East Nusa Tenggara Assessment Institute for Agricultural Technology
² Aceh Assessment Institute for Agricultural Technology
³ Indonesian Centre for Horticultural Research and Development, Bogor, West Java, Indonesia

E-mail: sophiaratnawaty@yahoo.com

Abstract. There are three targets of mentoring program: (1) farmers, as well as farmer groups, who want to apply new technology to their businesses; (2) extension workers for field area; (3) the agricultural officer; and (4) other parties who involved in technology innovation and decision making for recommend and utilize the new technology. East Nusa Tenggara Assessment Institute has applied several mentoring formats for Agricultural Technology, including (1) coordination, coordination, socialization, and also synchronization with local government; (2) becoming the a resource person and giving the workshop, including as the invited speaker in local government’s event of developing livestock area and also the meeting of local farmer group with stakeholder; (3) the demonstration of technology innovation through demonstration plot or farming demonstration as the example of technology dissemination; (4) Becoming the initiator and facilitator for discussion; (5) the provider of dissemination material. Site-specific technological interventions are used in animal technology assistance activities to support beef self-sufficiency programs in East Nusa Tenggara. The technology intervention program makes the differences indicated by the increase in each stage of assistance. The indication of the program is a better cattle production performance compared to existing farmers. The Mentoring on livestock area in East Nusa Tenggara had been reaching eight districts, 11 sub-districts, 16 villages, and 22 farmer groups.

Baseline survey on supporting and accompanying horticulture technology of dry land dry climate (case study on Sugian Village, Subdistrict of Sambelia, District of East Lombok)

N Q Hayati, A M Kiloes, S Prabawati and Hardiyanto

Indonesian Center for Horticulture Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: Nur_qh@yahoo.com

Abstract. The objectives of this study are (1) Obtain data on the socio-economic characteristics of agriculture on dry land (2) Analyze vegetable farming on dry land. The number of respondents was 31 people. Intercropping between chili and shallot is the best choice for chili cultivation on dry land and the productivity of chili is 10.67 t/ha, and the yield of shallots one crop with productivity of 17.33 t / ha of wet bulbs. The results of the survey showed that the average income obtained by
farmers with a scale of 0.5 ha was IDR 62,587,500, while the costs incurred were IDR 20,813,000, the income received by farmers was IDR 41,774,500. The feasibility level of the R/C ratio is 3.01, meaning that every IDR 1 issued receives revenues of IDR 3.01. However, in certain planting periods, especially in rainy season the value of the R/C ratio has decreased. Drastic reduction in chili yields, because the disease has begun to appear and the attack rate is very high, so that the R/C value ratio is less than 1, so the intercropping farming is not feasible.

Reappearance of the early shoot borer *Chilo infuscatellus* in Java’s sugarcane

K S Wijayanti, Garusti and N Asbani

Indonesian Sweetener and Fiber Crops Research Institute, Indonesian Agency for Agricultural Research and Development, Malang, Indonesia

E-mail: nurasbani@pertanian.go.id

Abstract. Early shoot borer *Chilo infuscatellus* is one of the earliest identified borer species from Java’s sugarcane. However, only limited information is available regarding this borer species since it was first reported by Snellen from Tegal, Java in 1890. Further reports by Diakonof (1940), this borer species was almost disappeared from sugarcane plantation in 1939-1940 and it was supported by Hong’s (1955). The latest survey by Sallam et al. (2010) in more than 930 sampling sites that cover sugarcane plantation across Java also did not find this borer species. It was challenging why the borer could not be found in those reports. The survey was in several sugarcane fields in Malang and Pati in 2019-2020. Samples were taken from sugarcane at the early growth period of plant cane as well as ratoon cane. Death hearth plants were taken from fields then observed and identified in the laboratory. The finding of *Chilo infuscatellus* in all field samples confirmed that this species did not disappear from the sugarcane crop in Java. Along with this borer species, other species were also be discovered namely *C. sacchariphagus, C. auricilius, Tetramoera schistaceana, Sesamia inferens, and Scirpophaga excerptalis*.

Salibu cultivation technology of Rojolele local rice (*Oryza sativa* l.) to drought anticipates

Kristamtini, S Widyayanti, E W Wiranti and Sudarmaji

Assessment Institute for Agricultural Technology, Indonesian Agency for Agricultural Research and Development, Yogyakarta, Indonesia

E-mail: krisniur@yahoo.co.id

Abstract. Salibu was a breakthrough technology of location-specific rice cultivation as a modified ratun technology. One of the advantages of salibu technology is that the plant life is shorter so that it can utilize water in limited conditions or drought as a result of climate change. Rojolele is a local
Effect of chlorpyrifos in the soil on the onion cultivation and its declining

A Kurnia, I F Dewi, R F Makmur, Sarwoto, E S Harsanti

Indonesian Agricultural Environment Research Institute, Indonesian Agency for Agricultural Research and Development, Pati, Indonesia

E-mail: asep_balingtan@yahoo.co.id

Abstract. Onion is one of the commodities that are of concern to the government in terms of increasing production and quality. Pest attack is one of the obstacles in cultivating onion. To control these pests, farmers usually use insecticides. Based on reports, the use of insecticides to control pests in onion is very high. Insecticides are widely used by farmers, one of which is chlorpyrifos. Based on the results of the study, the use of chlorpyrifos has caused pesticide residues in the soil. This study aims to 1) To determine the effect of chlorpyrifos residues in the soil on the growth of onion 2) To determine the effect of chlorpyrifos residues on pest attacks and onion damage 3) To determine the level of declining of chlorpyrifos in the soil. The study was conducted in June-August 2018 at the Indonesian Agricultural Environment Research Institute by using a lysimeter as a test site. In this study using nine lysimeter plots where 6 plots were polluted with 100 ppm of insecticidal formulation solution with active ingredients chlorpyrifos and 3 plots not polluted. The results showed that contamination of 100 ppm of insecticidal formulations with active ingredients of chlorpyrifos into the soil did not inhibit the growth of onion plants, pest attack and damage. Chlorpyrifos insecticide residue was still detected on the soil on day 7th with a decrease rate between 20-87% and day 30th with a decrease rate of between 97-100%.

The role of peat layer decomposition stage on iron solubility and distribution in tidal swamps

A Fahmi and A Susilawati

Indonesian Swampland Agricultural Research Institute (ISARI), Jln Kebun Karet, Loktabat Utara, Banjarbaru, Kalimantan Selatan, Indonesia
Abstract. Most peat layer which lies above on sulfidic material has important role in the geochemical cycle in tidal swampland. Depletion of the peat layer increase metal solubility and acidity from sulfidic material. Furthermore, potentially polluting and decreasing the quality of the surrounding environment. This paper aimed to describe the influence of peat layer thickness and its humification stage on iron distribution in the profile of peat soils and acid sulphate soils that are located around peatlands. This paper uses observational data from a number of articles from peatlands with varies thickness and acid sulphate soils. The highest Fe$^{2+}$ concentration was found in the sulfidic material layer below the peat layer. The presence of peat layer above the mineral layer played a role in reducing Fe$^{2+}$ solubility. Most of the Fe in peatlands were in the form of organic complexes, they tend to accumulate in the lowest soil layers. Based on peat decomposition stage, organic Fe concentration in sapric peat layer was higher than hemic peat layer.

Financial benefits of using soil test kit of PUTS for determining dosage of lowland rice fertilizer

Irawan, A Kasno and Nurjaya

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: irawan1109@gmail.com

Abstract. Determination of a balanced fertilizer dosage on lowland rice can be done as quickly as possible using a paddy soil test kit (PUTS). The soil test kit has been developed by Indonesian Soil Research Institute (ISRI), Agency for Agricultural Research and Development. This study aims to convince farmers on the financial benefits of using PUTS in determining balanced fertilizer dosage for lowland rice. The study was conducted in dry season 2018 in technical irrigation paddy fields in collaboration with farmers’ group members of Cibentar and Mulya Sanepa, Buahdua Sub-district, Sumedang Regency, West Java. The results showed that fertilizer dosage applied by farmers was higher than PUTS dosage, especially for NPK Phonska 15:15:15 fertilizer. On the other hand, the productivity of Inpari 33 rice with PUTS fertilizer dosage was higher than the farmers’dosage. Additional net benefits of using PUTS to determine fertilizer dosage of lowland rice was IDR 4,028,888/ha in Mulya Sanepa and IDR 2,160,506/ha in Cibentar farmers’ group, respectively. Based on the results of this study it is recommended that the use of PUTS needs to be more promoted nationally to save fertilizer use while increasing rice productivity and farmer’s income.

Effects of amelioration on peatlands to increase red chili plant production

A Susilawati, A Fahmi, E Maftuah and H Sosiawan
Abstract. Red chili is a strategic commodity, production consistency in quality and quantity is needed. Peatland with all its limitations has the potential to be used as an area for chili crop development, but appropriate land management technology is needed. The purpose of this study is to compile amelioration and fertilization for chili plants. The study was conducted on peatland, Landasan Ulin, Banjarbaru. The treatments in this study were: the use of mulch (without mulch and silver black plastic mulch) and a combination of inorganic fertilizer and amelioration doses (P1 = Model 50% inorganic fertilizer + Manure 15 t / ha), P2 = Model 50% Inorganic fertilizer + Manure 30 t / ha), P3 = Model 100% Inorganic fertilizer + Manure 15 t / ha), P4 = Model 100% Inorganic fertilizer + Manure 30 t / ha, P5 = Farmer Model. The results showed that the use of silver black mulch combined with 325 kg / ha urea, 225 kg / ha SP 36 and 200 kg KCl kg / ha KCl and manure 30 t / ha showed the yield of chili fruit production reaching 15 t / ha.

Application of biochar to improve maize performance at volcanic and sediment dry land

A Krismawati1, Z Arifin1, C Tafakresnanto2 and C Hermanto1

1 East Java Assessment Institute for Agricultural Technology
2 Indonesian Center for Agricultural Land Resource Research and Development

E-mail: krismawati_amik@yahoo.com

Abstract. Biochar application as soil amendment is one of the approaches to improve soil fertility and crop productivity in dry land. Dry land soil is characterized by low organic matter, low buffering capacity, and macro nutrient deficiency. The objective of this study was to evaluate the effects of biochar to increase dry land productivity. The study has been conducted in dry land in Jatisari Village - Arjas Subdistrict - Situbondo District (volcanic land), and in Mambulu Barat Village - Tambelangan Sub District - Sampang District (sediment land) during the Dry Season (DS)-I 2018. The research was designed in Randomized Block Design (RBD), 3 replicates, and 9 treatments, namely: A = 200 kg Urea/ha + 200 kg NPK/ha + 1,000 kg organic fertilizer/ha, B = 200 kg Urea/ha + 200 kg NPK/ha + 1,000 kg rice husk biochar/ha, C = 200 kg Urea/ha + 200 kg NPK/ha + 1,000 kg corn cobs biochar/ha, D = 200 kg Urea/ha + 200 kg NPK/ha + 500 g biological fertilizer/ha, E = 250 kg Urea/ha + 300 kg NPK/ha (Recommended Rates of Inorganic Fertilizers/RRIF), F = 250 kg Urea/ha + 300 kg NPK/ha + 1,000 kg organic fertilizer/ha, G = 250 kg Urea/ha + 300 kg NPK/ha + 1,000 kg biochar rice husk biochar/ha, H = 250 kg Urea/ha + 300 kg NPK/ha + 1,000 kg corn cobs biochar/ha, and I = 250 kg Urea/ha + 300 kg NPK/ha + 500 g biological fertilizer/ha. The results showed that the application of 250 kg Urea + 300 kg NPK/ha + 1,000 kg corn cobs biochar/ha in Situbondo District obtained yields of dry shelled corn 7.87 tons/ha (increased of 36.16%), C-organic (increased of 19.40%), soil CEC (increased of 42.27%), obtained the highest profit of IRD 15,486,000 (1.076,5 USD) or increased of 42.21% and R/C ratio 2.28 from the RRIF, while in Sampang District obtained yields of dry shelled corn of 7.63 tons/ha (increased of 28.89%), C-organic (increased of 46.51%), soil CEC (increased of 22.96%), obtained the highest profit of IRD 14,421,000 (1.002,5 USD) or increased of 25,60% and R/C ratio 2.17 from the RRIF. The application of corn cobs biochar has a significant effect on dry shelled corn yield and is able to increased C-organic and CEC in dry land.
Application of mycorrhiza biofertilizer to increase yield of several varieties of small chili additively intercropped with peanut or shallot

W W Wangiyana, I K D Jaya and H Suheri
Faculty of Agriculture, University of Mataram, Mataram, Lombok, Indonesia
E-mail: w.wangiyana@unram.ac.id

Abstract. This study aimed to examine the effect of mycorrhiza biofertilizer application and additive intercropping with shallot or peanut on growth and yield of several varieties of small chili (*Capsicum frutescens* L) following rice crop in entisol paddyfield. The experiment was arranged according to the Split Split Plot Design with three blocks and three treatment factors, namely chili varieties as the main plot (V1= “Siung”, V2= “Sret”, V3= “Dewata F1”, V4= “Pelita F1”), mycorrhiza biofertilizer as the subplots (M0= without; M1= with biofertilizer applied in the nursery), and intercropping as the sub-subplots (T0= monocrop, T1= intercropping with peanut, T2= intercropping with shallot). The results indicated that variety differences significantly affected all observation variables, intercropping affected all observation variables except average fruit weight, and nursery application of mycorrhiza biofertilizer significantly increased chilli plant height, leaf number, fruit number and yield per plant in the field. However, there were significant three-way interactions on fruit number and yield, with the highest fruit yield average of 55.96 g/plant (± 2.41 g) was in “Dewata F1” chili inoculated in the nursery and intercropped with shallot, and the lowest average of 7.72 g/plant (± 1.07 g) was in monocropped “Sret” chili without mycorrhiza biofertilizer application.

Biodegradation of antibiotic residues in chicken manure by composting processes

S Salma¹, R E Junita², E Handayanto², Husnain¹, Irawan¹, N L Nurida¹ and E Husen¹

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Faculty of Agriculture, Brawijaya University, Malang, Indonesia
E-mail: sellysalma@gmail.com

Abstract. Chicken manure is rich in macro and micro nutrient nutrients compared to other livestock manures. Unfortunately, it also contains higher antibiotic residues that has to be minimized before applying as a manure. The objective of this research was to eliminate antibiotic residues in chicken manure using three kinds of decomposer. The experiment was conducted in Greenhouse conditions. A completely randomized design with 6 replications was applied. The treatments consisted of chicken manure (CM), CM with 40% water content, composting of CM with local microorganisms
(MOL), composting of CM with Consortium of Cellulolityc Fungi (CCF), and composting of CM with commercial decomposer. Parameters measured were the content of Tetracyclcline, C, C/N, and CO$_2$ evolution. The results showed that by applying microbial decomposer eliminated 100% Tetracyclcline residues after 4 week composting. The C content and C/N decreased 34.8% to 41.8% and 15.46% to 20.30% after 6 weeks composting, respectively. The highest CO$_2$ evolution resulted from the application of CCF and commercial decomposers. Composting chicken manure by CCF or commercial decomposer prior to be used as organic fertilizer are promising to eliminate antibiotic residues.

Effect of NPK fertilizer incorporation on the characteristics of nanocellulose-based hydrogel

C Winarti, K S Sasmitaloka and A B Arif

Indonesian Center for Agricultural Postharvest Research and Development Indonesian Agency for Agricultural Research and Development, Jln. Tentara Pelajar No. 12A, Bogor, 16114

E-mail: christina.winarti01@gmail.com

Abstract. Hydrogel are cross-linked polymers networks with high absorbing water capacity and good biocompatibility. It has been widely used as agrochemical delivery system as well as sanitary products. They are also used to increase the efficiency of fertilizer by releasing lower dose at a time thus protecting the environment. This research was conducted to study the effect of NPK fertilizer concentration on hydrogel characteristics. Raw material used in this study was corn cobs nanocellulose. The experiment was set up in one way completely randomized design with various kinds of dose fertilizes (0, 5, 10, and 15%) and repeated three times. Parameters observed were swelling ratio, moisture content, nitrogen content, potassium content, phosphorus content, and texture as well surface morphology of hydrogel. The enriched hydrogel was applied as soil conditioner as well as soil fertility for shallot plants. Results showed that the various kind of NPK fertilizer concentration produce hydrogel with a significantly different (p <0.05) of physicochemical properties. The higher of the fertilizer concentration added, the lower of swelling ratio. The addition of fertilizer with dose 5% can result the highest swelling ratio. This product consists of 15.82% moisture content, 1.81% of nitrogen content, 1.57% of potassium content, 0.04% of phosphorus content, and 25.17 mJ of hardness. Implementation this material will help farmer to reduce the number of watering and increase soil fertility of sandy soil, since sandy soil is lack of nutrition and has high porosity.

Increasing P-uptake by providing P, Zn and crop residue return on direct seeded rice

N A Viandari, B N Sulasstri and AWihardjaka

Indonesian Agricultural Environment Research Institute, Pati, Central Java, Indonesia
Abstract. Climate change greatly impacts agricultural cultivation, including in rainfed rice fields. Extreme weather and climate event such as flood and drought impact on soil functions and soil fertility directly and indirectly. Improving rice crop performance and productivity in rainfed fields can be done by adaptation in dealing with climate change. This study aims to determine the effect of providing P, Zn and Crop Residue Return (CRR) on direct seeded rice. This study was conducted at the Jakenan Experimental Station in Pati District from September 2012 to January 2013. Randomized Block Design was used and this treatment consisted of various doses of P fertilizer (0P, ½P, P), providing Zn, and incorporation of crop residue. The observed parameters were plant height, maximum tillers per hill, productive tillers per hill, filled grain per panicle, grain yield, weight of dry straw, P-uptake. The results of this study indicated that providing P, Zn, and CRR have positive effects to plants growth and grain yield. The treatment of ½P+ CRR + Zn took the maximum plant height, the highest of the grain yield at 14% MC, and the highest weight of dry straw and the treatment of P+Zn took the highest P-uptake both in straw and in grain.

Utilization of biochar cacao shell and compost to improve growth media of small chili pepper (*Capsicum frutescens* L.) in acidic dryland

R Ariani, N L Nurida and A Dariah

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

E-mail: aidariah@yahoo.com

Abstract. Despite having several limitations as growth media, acidic dryland could be a potential area for agricultural development of horticulture, such as small chili pepper (*Capsicum frutescens* L.). This study aimed to study the effect of the use of biochar cacao shell and compost to repair growth media and increased productivity of small chili pepper (*Capsicum frutescens* L.) in acidic dryland. The research conducted in acidic dryland on field experiment Taman Bogor, Lampung, during dry season 2017. This research used a randomized block design with seven treatments and three replication. The treatment consisted of P1= biochar, P2=P1+mulch, P3=Compost, P4=P3+mulch, P5=Biochar+Compost, P6=P5+mulch. The raw material of biochar was from cacao shell, while compost was from manure decomposition. The result showed that soil bulk density of biochar, compost, and a combination of biochar and compost treatment lower than control. Biochar with or without compost had soil water content higher than other treatments. Besides, biochar with or without compost had not impacted on soil chemical characteristics. The use of biochar and compost had positive effects on plant height, the diameter of canopies, and crop productivity.
Ameliorant engineering to elevate soil pH, growth and productivity of paddy on peat and tidal land

R A Saputra and N N Sari
Faculty of Agriculture, Lambung Mangkurat University, South Kalimantan, Indonesia
E-mail: nukhak.sari@ulm.ac.id

Abstract. To support the government's program towards world food barns in 2045, the use of sub-optimal wetlands such as peatlands and tidal land is a viable alternative. The problem of acidity in both types of land can be controlled, one of which is by providing ameliorant. Thus, the purposes of this study were to examine the effect of giving ameliorant in increasing soil pH, as well as its influence in increasing the growth and production of rice plants. The study was conducted using a nested factorial completely randomized design, i.e. soil (peat soil/l1 and tidal swampland/l2) and ameliorant types (without ameliorant/p0, dolomite/p1, chicken manure/p2, rice husk ash/p3, rice husk charcoal/p4, and baglog oyster mushroom waste/p5) that given 10 t ha⁻¹ each. The results showed that all ameliorants applied could increase soil pH, growth, and rice production. Dolomite, chicken manure, and baglog oyster mushroom waste significantly elevate the pH of peat and tidal soils. Chicken manure could enhance the highest rice productivity in peat and tidal soils. The application of ameliorant increased soil pH to be suitable pH for paddy growing on peat and tidal soils.

Biochar and improvement of water quality in tidal swampland

A Hairani, A Susilawati, M Alwi and M Noor
Indonesian Swampland Agricultural Research Institute (ISARI), Indonesian Agency for Agricultural Research and Development, Banjarbaru, Indonesia
E-mail: annagp8@gmail.com

Abstract. Water quality of tidal swampland is influenced by tides, seasons and human intervention. At the beginning of rainy season the water quality of tidal swampland is poor (pH 2-3). Although there are 5-6 hours of tidal water for irrigation, only 3 hours of good quality is available. In dry season, it is quite good (pH> 5), except in areas with poor drainage. The solubility of toxic elements as well as high salt content is also a water quality problem. Using biochar is one of efforts to solve problem. Biochar is created by heating biomass to high temperatures under low oxygen conditions in a process known as pyrolysis. Similar to the shape and color of charcoal from natural combustion, biochar differs in its manufacturing process and function. Biochar can be made from a variety of feedstock such as crop residues, plant and animal waste. Most of research report the positive effect of biochar as soil amendment. There are also reports of biochar application as adsorbent. Biochar can effectively reduce contaminants including heavy metals, organic contaminants such as pesticides, medicines and daily chemical products. This paper is compile to highlight the potential of biochar regarding water quality improvement in tidal swampland.
Applications of guano and K$_2$CO$_3$ on soil potential-P, potential-K, and growth of potato on Andisols

Kiki Zakiah$^1$, Mochammad Reza Maulana$^2$ and Ladiyani R. Widowati$^1$

$^1$ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
$^2$ Faculty of Agriculture, Garut University, Garut, Indonesia

E-mail: kiki.alzakia@gmail.com

Abstract. The source of phosphorus and potassium for plant which commonly from inorganic fertilizer can be replaced from another sources such are guano and K$_2$CO$_3$. Guano is organic material rich in P and other soil nutrient, which has function as well as rock phosphate. Furthermore potassium carbonate (K$_2$CO$_3$) has a 56% of K, higher than KCl which only has 52% so it has potential as a source of K for plants. The aim of this study was to find out the dose of guano and K$_2$CO$_3$ as a substitution of P and K fertilizer on soil potential-P, potential-K, growth, and yield of Potato on Andisol Soil. The experiment was conducted at Situgede Garut – West Java with an altitude of 1200m above sea level with soil reaction 6.05. The experiment was conducted in April to July 2018. The method used was Randomized Block Design with nine treatments and three replications. Experiment result showed the value of soil potential-P (P2O$_5$ HCl 25%) and potential-K (K$_2$O HCl 25%) due to treatment of guano and K$_2$CO$_3$ statistically no difference to an inorganic fertilizer treatment. There was no significant effect between treatment of guano and K$_2$CO$_3$ with treatment of NPK standard on growth and of potato.

Social behavior and institutional support on the swamp rice sustainability

R Yusuf$^1$, I N Istina$^1$, A Fahri$^1$, V Zulfia$^1$ and I Fuadi$^2$

$^1$ Researcher of Riau Assessment Institute for Agricultural Technology Kaharuddin Nasution Street no. 341 Pekanbaru, Riau
$^2$ Plant Pest and Diseases Controller of UPT Proteksi, Dinas Pangan, TPH Riau Hang Tuah Ujung Street no. 71 Pekanbaru, Riau

E-mail: rachmi_2608@yahoo.co.id

Abstract. Social behavior of the community and supporting institutions that support farming facilities and infrastructure affect the success of farming. The study was conducted at the rice production centre in Siak Regency using a survey method with a structured questionnaire. 203rd farmers have selected purposively sampled random sampling in four districts namely Bunga Raya, Sungai Apit, Sungai Mandau and Sabak Auh, with parameters observations: education, training, age, motivation farming, land tenure and experience in agriculture. The collected data tabulated and analyzed descriptively. The results showed that the successful implementation of activities determined by farmer's rice farm safety protection such as farmers' groups, financial institutions, agricultural equipment and machine service unit and Agricultural Extension Centers and supported by formal regulations, namely regional regulations and regent regulations.
Soil bacteria abundance in application of biopesticides (*Bacillus Aryabhattai*) in swampland, South Kalimantan

S Wahyuni, R Kartikawati, B N Sulastri, Sarah and M T Sutriadi

Indonesian Agricultural Environment Research Institute, Pati, Central Java, Indonesia

E-mail: swahuni@gmail.com

**Abstract.** In rice cultivation, farmers tend to use agrochemicals like chemical fertilizers and pesticides. The prolonged intensive use of agrochemicals can decrease soil quality. Chemical pesticides can be replaced with biopesticides to maintain and improve soil fertility, also to prevent the attack of plant-disturbing organisms on crops. The purpose of this study was to determine the total population abundance of soil bacteria and soil quality in the tidal swampland. This research was accomplished in Jejangkit District, Barito Kuala Regency, South Kalimantan, which started from June to December 2019. The study used a Completely Randomized Block Design (RCBD) with three treatments and six replications. The treatments are RAISA (P1), biopesticide produced by IAERI (P2), *Melaleuca leucadendron* – based biopesticide (P3). The rice variety used is Inpari 42, a plot size of 900 m² per treatment by applying the Jarwo planting system. The results revealed that the application of biopesticides could increase the total population of soil bacteria from $10^4$ to $10^6$. Moreover, N and P nutrient content increase from low to moderate (0.19 to 0.4%) and (13.25% to 38.87%) respectively.

Total root dry weight per volume in the maize soil by application dose of bokasi to reduce the use of fertilizer N, P, and K on the terrace land

N Istiqomah¹, E Fidiyawati¹, A Prayitno¹ and Purwanto²

¹ Assessment Institute for Agricultural Technology (AIAT) East Java
² Soil Department on Agriculture Faculty Brawijaya University Jl. Veteran Malang East Java

E-mail: istiqomahnurul1973@gmail.com

**Abstract.** The study carried out at Tegalweru Village Sub district of Dau in District of Malang with the altitude 685 m above sea level on the land with the terrace contour. The study use Randomized Block Design with 3 replications. Treatment consisted of 10 level ie : (A) Plot without fertilizer (without both bokashi and an-organic fertilizer) (B) 0 ton ha⁻¹ bokasi dan 400 kg ha⁻¹ NPK + 200 kg ha⁻¹ Urea, (C) 2 ton ha⁻¹ organic fertilizer Petroganik dan 400 kg ha⁻¹ NPK + 200 kg ha⁻¹ Urea (D) 2 ton ha⁻¹ bokasi dan 0 kg ha⁻¹ NPK fertilizer + 0 kg ha⁻¹ Urea (E) 2 ton/ha bokasi dan 100 kg ha⁻¹ NPK fertilizer + 50 kg ha⁻¹ Urea, (F) 2 ton ha⁻¹ bokasi dan 200 kg ha⁻¹ NPK fertilizer + 100 kg ha⁻¹ Urea, (G) 2 ton ha⁻¹ bokasi dan 300 kg ha⁻¹ NPK fertilizer + 150 kg ha⁻¹ Urea (H) 2 ton ha⁻¹ bokasi
Effect of inorganic and organic fertilizer to soil properties, growth, and yield of rice in rainfed lowland Central Java

M T Sutriadi, S Apriyani, S Wahyuni, H Zu’amah and E S Harsanti

Indonesian Agricultural Environment Research Institute, Pati, Central Java, Indonesia

E-mail: dwiazizah39@yahoo.com

Abstract. Application of inorganic fertilizer for a long term can damage soil structure, soil health, and cause environmental pollution. Organic fertilizer can be a good alternative for sustainable agriculture. This study was conducted at rainfed lowland in Central Java. As plant indicator was Inpari 42. The objective of the study was to know the effect of organic and inorganic fertilizer on soil quality, growth, and rice yield. This study used a Randomized Block Design with six treatment and three replications. The treatments were P0 (control), P1 (NPK), P2 (cow manure 10 ton ha\(^{-1}\)), P3 (Combination NPK+cow manure 10 ton ha\(^{-1}\)), P4 (cow manure 20 ton ha\(^{-1}\)), P5 (Combination NPK+cow manure 20 ton ha\(^{-1}\)). The result showed the application of inorganic and organic fertilizer for the longterm had been a significant effect to improve soil quality, growth, and yield. The soil that was applied NPK+ 20 ton ha\(^{-1}\) cow manure (P5) showed contents carbon organic (0.98%), N-total (0.44%), available P (290.27 ppm), available K (27.26 ppm), potential P (12.30 ppm), and potential K (7.80 ppm) higher than other treatments. Application of 20 ton ha\(^{-1}\) cow manure gives the best growth (83.3 cm) and yield (9.4 ton ha\(^{-1}\)) than other treatments.

Evaluation of the use of plant organic components and probiotics on ruminal characteristics and as a decrease of methan

Yenny NA, D Pamungkas, Mariyono, N H Krishna, R Antari, A S Putri and M N Apriliza

Indonesian Beef Cattle Research Station, Jl. Pahlawan 2 Grati, Pasuruan, East Java
Abstract. The reduction of CH$_4$ from the digestive tract of ruminants can be done through the use of organic components of plants such as tannins and saponins and through the use of probiotics. This study aims to evaluate the addition of tannin-saponin and probiotics to the characteristics of rumen fluid and its ability to reduce methane in Ongole Cros Breed cattle. Dried saponin extract from *Paraserianthes falcataria* (Sengon) and tannin extract from *Samanea saman* (Trembesi). Probiotics contain *Acetobacterium notarai* and *Saccharomyces cerevisiae*. This research used total mixed ration. A total of 24 PO cows were divided into 4 treatments, namely: T1 = control treatment in the form of complete feed; T2 = T1 + Sengon leaf flour + Trembesi leaf flour, T3 = T1 + Probiotics and T4 = T1 + Sengon leaf flour + Trembesi leaf flour + probiotics. The research design is a randomized group design. The combination treatment of the addition of plant organic component and probiotic caused a decrease in C$_2$: C$_3$, the percentage of acetic acid, the concentration of CO$_2$ and CH$_4$, but increases the percentage of propionate acid. The combination of organic components and probiotics is the greatest decrease in methane production.

The assay of biofertilizer carrier material and isolate formula for soybean in Inceptisols from West Java

D Aksani, J Purwani and Surono

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia

Abstract. Biofertilizer carrier material is one of the important factors in maintaining the viability and effectiveness of microbes when it is applied to soil and plant. This research aimed to assessed several carrier materials and isolate formulas for the growth and productivity of soybean. The experiment conducted in greenhouse was arranged in a randomized block design with 2 factors and 3 replications. The first factor is the combination of carrier material (peat, dolomite, zeolite, kaolin, biochar, rock phosphate) B1, B2, B3 until B12, while the second factor is the isolate formula, i.e.: I0 (Control), I1 (Rhizobium sp.+ Azotobacter sp.), I2 (Rhizobium sp.+Azotobacter sp.+Bacillus sp.). The result showed that every carrier material formula tested were suitable for isolate formula I1 and I2, microbes population > 108 cfu g$^{-1}$ for three months in the storage period. The carrier material and microbial formula did not interact significantly with plant height and root dry weight. However, it gives significant interaction to the number of root nodules, plant dry weight, number of filled pods, soybean seed weight. The formulas of B3I1, B4I1, and B11I2 were consistent in increasing the number of filled pods and the weight of soybean seeds compared to other formulas.

Effect of Peatphos fertilizer formula to the growth and yield of sweet corn on peatland

E-mail: yennysahim@gmail.com
J Purnomo and I G M Subiksa

Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia.

E-mail: purnomo0204@gmail.com

Abstract. Indonesia has 14.93 million ha of peatlands spread across Sumatra, Kalimantan, and Papua. Peatland productivity is very low due to its characteristics do not support optimal plant growth. Research on the effect of Peatphos fertilizer formula to the sweet corn growth and yield has been carried out on drained peatland in Rasau Jaya, Kubu Raya Regency West Kalimantan. The research objective was to assess the effect of Peatphos application on peatland to the growth and yield of sweet corn. The research used a randomized complete block design with nine treatments namely: Control, NK, NPK, NPK+Mg, ¾ NK+700 kg Peatphos/ha, and four rates of Peatphos 350, 700, 1050, and 1400 kg/ha. The results showed that Peatphos application has significantly affect to plant growth, ear length, ear diameter, biomass, and yield of fresh sweet corn ear. The application of NK+700 kg peatphos/ha produce higher biomass by 77% and 47% compared to NPK+Mg treatment and NK treatment respectively. The application of 700 kg peatphos also significantly increased fresh ears by 51% and 43% compared to NPK+Mg treatment and NK treatment respectively. The optimum rate of Peatphos for sweet corn cultivation on peatland is 680 kg/ha.

Does biochar enhance soil organic matter formation in tropical soils?

L S Schnee¹, A Ngakou² and J Filser¹

¹ General and Theoretical Ecology, University of Bremen, Bremen, Germany
² Department of Biological Sciences, University of Ngaoundéré, Ngaoundéré, Cameroon

E-mail: laura.schnee@yahoo.de

Abstract. Tropical soils are often deeply weathered and vulnerable to degradation. Biochar is a promising means to improve physico-chemical characteristics such as pH or bulk density. Sustainable soil amelioration is best achieved by improving biological activity, resulting in enhanced soil organic matter (SOM) stocks. In a meta-analysis, we investigated, if biochar amendment to tropical soils led to SOM increases additional to biochar C. We found a mean additional C accumulation (MAC) of 0.29% soil dry weight (%dw). MAC was independent of study duration, climate, and biochar addition rate, but strongly linked to soil type and nutrient status prior to the experiment: In Nitisols, MAC was highest (0.99%dw) and initial C and N contents were higher in these soils. MAC was negative in Ferralsols and Oxisols* (−0.01%dw and −0.2%dw respectively). MAC as a percentage of initial C content was < 50% for most soil types, but ~ 50% in Ferralsols, Oxisols* and Ultisols*. We conclude that while biochar can enhance SOM stocks, attention has to be paid to the soil environment it is amended to. In low-activity clay soils, biochar amendment can lead to C mining and should therefore be co-amended with nutrient-rich organic amendments.
The effect of cyanobacteria on the rice yield and nitrogen efficiency under different levels of nitrogen fertilizer on alluvial West Java

J Purwani¹, E Pratiwi¹, I A Sipahutar¹ and Husnain²

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Indonesian Center for Agricultural Land Resources Research and Development, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
E-mail: jati_purwani6243@yahoo.com

Abstract. Cyanobacteria or blue-green algae play an important role in rice cultivation. Nitrogen-fixing bacteria Cyanobacteria are found in rice fields, some of which can fix N₂ up to 30%, produce some phytohormones, vitamins, amino acids, and organic acids that can increase soil fertility and rice productivity. The study was conducted in Alluvials wetland rice in Jatitujuh, Majalengka Regency, West Java. The purpose of this research was to analyze the influence of cyanobacteria in increasing rice yield and the efficiency of inorganic N fertilizers. The study was arranged in a randomized block design with two factors. The first factor is the cyanobacteria formula, i.e.: (1) without cyanobacteria, (2) Pseudanabaena sp. + Chlorogloea sp., (3) Pseudanabaena sp. + Nostoc sp., (4) Chlorogloea sp. + Nostoc sp. While the second factor was the dose of urea fertilizer (0%, 50%, 75%, 100%). Application of Pseudanabaena sp. + Nostoc sp. increased rice yields and straw biomass by 11.47% and 48.76%, reduced urea fertilizer by 25-50%, and increased nutrient uptake of N, P, K by 43.73%, 34.80 %, 34.40%.

Application of nano inorganic fertilizer on rice plant productivity (Oryza sativa L.)

T Rostaman, H Wibowo and Nurjaya
Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
E-mail: rostamantia@yahoo.com

Abstract. Lowland rice production has experienced fluctuations and stagnation over the past decade, in addition to uncertain climate factors also influenced by changes in soil fertility. Nano inorganic fertilizer is a nanometer secondary inorganic fertilizer containing nanometers containing Ca which can help increase the photosynthesis of paddy fields. The research aims to test the effectiveness of inorganic fertilizers on plant growth and rice yield and percentage (%) increase in yield. The research was carried out at PT. Sang Hyang Seri (Persero) at the Constitutional Court. 2018. The study used a randomized block design, 8 treatments, and 4 replications. The treatment consists of two levels of dilution of nano inorganic fertilizers, 200 and 400 times, which were applied to treatments without fertilizer, NPK + Urea fertilization 100%, and 75%. Nano inorganic fertilizers are given by spraying on the lower rice leaves, in sunny weather conditions between the hours of 07.00 - 10:00 WIB. The treatment plot was 5 m x 5 m, Inpari 30 variety of rice planted with a distance of 25 cm x 25 cm.
The results showed that the use of nano inorganic fertilizers without NPK + urea fertilization could not increase the growth and yield of lowland rice. However, when used in conjunction with NPK + urea fertilizer, nano inorganic fertilizers are effective against rice yields. Application of nano inorganic fertilizer with 400 times dilution in NPK + Urea fertilization 75% recommendation can increase the weight of milled dry grains by 11.3% when compared to that which is only fertilized NPK + Urea 100%. Thus, nano inorganic fertilizers with 400 times dilution combined with NPK + Urea fertilization 75% recommended effective use for rice plants.

Analysis of peat bacterial diversity in oil palm plantations and in logged forest in Jambi, Indonesia, using PCR-DGGE technique

E Pratiwi¹, T D Satwika², and F Agus¹

¹ Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
² Department of Biology, Jenderal Soedirman University, Purwokerto, Indonesia

E-mail: ettypratiwi@yahoo.com

Abstract. Jambi Province has around 617,000 hectares of peatlands spread across six districts, including Tanjung Jabung Timur. Reports on microbial diversity under different land cover, especially those using molecular techniques, were very limited. The study aimed to evaluate the impact of peatlands conversion on soil bacterial biodiversity, through the analysis of 16S-rDNA gene employing polymerase chain reaction combined with denaturing gradient gel electrophoresis (PCR-DGGE). Peat soil samples were taken from the topsoil (rhizosphere) of 3 sites, i.e., (A) conventional drained (50-70 cm) oil palm plantation, (B) shallow drained (30-50 cm) oil palm plantation, and (C) logged-over peat forest. Sequential analysis based on the 16S rRNA gene showed that 15 operational taxonomic units (OTUs) could be grouped into 3 phyla, namely Proteobacteria, Acidobacteria, and Actinobacteria. The alignment result of nucleotide shows that 4 of 15 bands of DGGE were identified as the uncultured bacterium (Sulfospirillum, Acidobacteria, Rhodoplane, and Magnetospirillum). Overall, Shannon-Weaver biodiversity index showed that the conversion of peatlands to oil palm plantation increased bacterial biodiversity. This could be attributed to drainage, fertilization, and biomass inputs under the oil palm plantations. The higher biodiversity under oil palm plantations also implies a higher rate of peat decomposition under this land use, relative to the forest.

The efficacy of biofertilizer contains some Bradyrhizobium japonicum isolates on soybean yields grown in inceptisols, Bogor, West Java
J Purwani\textsuperscript{1}, D Sucahyono\textsuperscript{2}, and I P Wardana\textsuperscript{3}

\textsuperscript{1} Indonesian Soil Research Institute, Indonesian Agency for Agricultural Research and Development, Bogor, Indonesia
\textsuperscript{2} Indonesian Legumes and Tuber Crops Research Institute, Malang, Indonesia
\textsuperscript{3} Indonesian Center for Food Crops Research and Development Bogor, Indonesia

E-mail: jati_purwani6243@yahoo.com

\textbf{Abstract.} The use of biofertilizers is growing rapidly and promising for food crops and horticulture, they are capable to improve soil fertility, increase crop growth and yield, and environment friendly. Soybean is a strategic commodity in Indonesia, to improve the yield of soybean, various ways of cultural practice have been reported especially rhizobium inoculation. The biofertilizer contains of six \textit{Bradyrhizobium japonicum} isolates uses husk charcoal powder carrier material has been tested on soybean, were conducted in Cibungbulang Bogor. Our objective was to evaluate the efficacy of \textit{Bradyrhizobium japonicum} biofertilizer on soybean growth and yield on inceptisols Cibungbulang Bogor. The experiment was randomized block design consists of seven treatments with four replications. The treatments included were (1) Control, no fertilizer (2) 100% NPK (3) Biofertilizer, (4) 25%NPK+Biofertilizer, (5) 50% NPK+Biofertilizer, (6) 75%NPK+Biofertilizer, (7) 100% NPK+Biofertilizer. The results recorded that the application of Biofertilizer gave a positive result both on growth and yield of soybean. The promising treatment to improve on soybean yield were (50%NPK+Biofertilizer) and (75%NPK+Biofertilizer) as indicated significantly increase yield of soybean at 18.56- 25.77% compared 100%NPK, reduce NPK fertilizer 25-50%, and the value of Relative Agronomic Effectiveness (RAE) of 191% and 165%.

---

**Vague property status and future risk of mangroves: lesson learned from South Sulawesi, Indonesia**

S Suharti, L Andadari, I Yeny, D Yuniati and R Agustarini

Forest research and Development Centre, Bogor, Indonesia

E-mail: suharti23@gmail.com

**Abstract.** Mangrove forest management in South Sulawesi is challenging due jurisdictional boundaries in relation with biophysical processes, resource characteristics and dynamics in community development. The research aims to study the future risk of mangrove forest management growing on accretion land due to its vague status. Data and information were collected through in-depth interviews involving 17 key informants selected by using snow-ball method. Mangrove forest in the research site grows on accretion land and it is classified as state property with common pool resources (CPRs) characteristics. Due to late attendance of the government has instigated “de jure” status of accretion land becomes illegitimate as local community does not recognize it as state property. The situation leads to ambiguity of mangrove forest property status resulting the formulation of multilayer property for several products/services/benefits resulted. The status of mangrove forest in the research site is very vulnerable for the conversion into settlement, ponds and other uses which in the long run can threaten its existence. Several strategies to prevent conversion of mangrove forest into other uses i.e. provide understanding to the community on the economic value of mangrove resource and the risk of disasters if mangrove vanish; strengthening regulations both at the local level and at a higher level through intensive socialization; and provide legal access...
N, P and K fertilization response on maize in Vertisols in Central Java, Indonesia

Samijan, Sri Minarsih and Yulis Hindarwati

Assessment Institute for Agricultural Technology (AIAT) of Central Java, Semarang, Indonesia

E-mail : samijan_bptpjg@yahoo.com

Abstract. Maize is one of the strategic food commodities that needs more attention in efforts to increase yield. One of the key success factors in the production of maize is the level of plant nutrient sufficiency to achieve optimal results. Effective and efficient fertilization is an effort to provide sufficient nutrients for plants so that production is optimal and profitable. To obtain maximum effectiveness and efficiency of fertilization, information is needed about the response of corn plants to fertilization. Based on these considerations, research has been carried out to determine the effectiveness of N, P and K fertilization in Vertisol lowland. The assessment was conducted in the Districts of Toroh and Purwodadi, Grobogan Regency, Central Java for 3 growing seasons (2014-2016). The assessment method uses an omission plot approach with 5 replications distributed in 5 villages. Fertilization treatments were tried during the 3 growing seasons using the ratio N, P and K in the 1st season (200: 30: 75) kg ha\(^{-1}\), the 2nd season (200: 35: 100) kg ha\(^{-1}\); and the 3rd season (229: 92: 40) kg ha\(^{-1}\). Observations were made on climatic conditions, physical properties and soil clams, and yields. The data obtained were analyzed in a comparative descriptive manner. Maize planting is carried out in rice fields in the dry season (June-October) after the cropping pattern of rice. Location characteristics in Grobogan are dominated by Vertisol soil types with heavy clay textures; neutral to basic of soil pH (7-8); low content of soil organic C and N; high Ca, Mg content and base saturation; and serious soil cracking in the dry season. The results of the assessment during the 3 growing seasons showed that the average yield of minus N plots only reached around 1.8 tons / ha of grain (MC 15.5%), minus P about 8.5 tons ha\(^{-1}\), and minus K reaches the highest yield of 8.9 tons ha\(^{-1}\). Whereas in NPK complete fertilization plots reached 10 tons ha\(^{-1}\). Based on the results of data from the omission plots, it can be seen that the maize has the highest response to N fertilization, then followed by P and K fertilizers. The response of N, P and K fertilizers to maize in Vertisol in Grobogan Regency, Central Java, each is N 8.1ton ha\(^{-1}\), P\(_2\)O\(_5\) 1.5ton ha\(^{-1}\) and K\(_2\)O 1.0 ton ha\(^{-1}\). Based on the yield response and fertilizer rate, N and P fertilization has an agronomic efficiencies (AE) which is 41 and 44 kg kg\(^{-1}\), whereas K fertilization has a low AE which is 11 kg kg\(^{-1}\).
Abstract. Rice as a staple food for more than half of the world’s population is commonly grown by transplanting seedlings into puddled soil. Looming water crisis and lack of labour drive the search for alternative management methods to increase efficiency and maintain yield. Combination of dry-wet land preparation using farming bulldozer (FD) and direct seeded rice (DSR). A field experiment was carried out in the 2020 Wet-season at the Sukamandi Experimental station; ICRR to examine 2 methods of puddling and different planting system. The study was arranged in a fractional factorial design. The first factor was land preparation which were (L1): combination of dry and wet land preparation using farming bulldozer D21PL and (L2): land preparation using hand tractor. The second factor was crop establishment, (D1); DSR using drum seeder with iron-coated seed, (D2) DSR using drum seeder with non-coated seed and (D3): transplanting. Each treatment was set in 5000 m², with 4 replications. The results showed that (1) combination of dry-wet land preparation and DSR non-coated yielded at 4078kg/ha, significantly higher compare to hand tractor (HT) and DSR non-coated seed which yielded at 3698kg/ha. (2) The number of productive tiller per m² (NoPT) was strongly significantly affected by the land preparation and planting system. The NoPT was recorded at 468 and 447 for FD-DSR Coated seed and FD-DSR Non-coated seed respectively, increased by 71 and 72% compare to HT-DSR-Coated seed and HT-DSR-Non coated seed.