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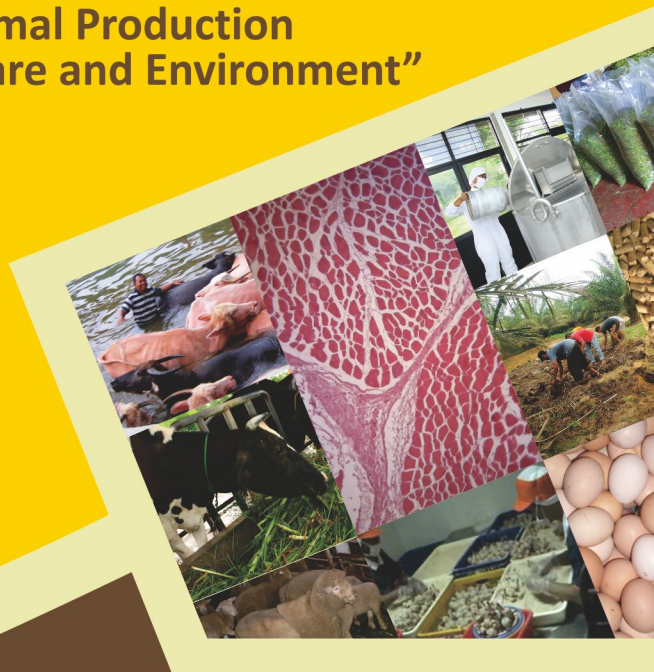
## THE THIRD INTERNATIONAL SEMINAR ON ANIMAL INDUSTRY

### “Sustainable Animal Production for Better Human Welfare and Environment”

September, 17-18 2015

IPB International Convention Center

Bogor-Indonesia



Organized by:



Sponsored by:



FACULTY OF ANIMAL SCIENCE  
BOGOR AGRICULTURAL UNIVERSITY  
2015

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## FOREWORD FROM CHAIRPERSON OF ORGANIZING COMMITTEE

Good morning,

Selamat pagi, salam sejahtera bagi kita semua

Rector of Bogor Agricultural University, Prof. Dr. Ir. Herry Suhardiyanto, M.Sc.

Director General of Livestock and Animal Health, Ministry of Agriculture, Republic of Indonesia, Prof. Dr. Ir. Muladno, MSA.

Dean of Faculty of Animal Science, Bogor Agricultural University, Prof. Dr. Ir. Luki Abdullah, M.Sc.Agr.

All participants of the International Seminar on Animal Industry 2015

Distinguished guests, ladies and gentlemen.

It is my great pleasure to welcome you all, our distinguished guests, speakers and participants, to the Third International Seminar on Animal Industry (ISAI 3<sup>rd</sup>, 2015) held at the IPB International Convention Center Bogor Indonesia. This seminar with the theme “**Sustainable Animal Production for Better Human Welfare and Environment**” is organized by Faculty of Animal Science, Bogor Agricultural University in collaboration with Association of Indonesia Animal Scientist (HILPI).

Following the recommendations from ISAI 1 and ISAI 2, which were held in Indonesia in 2009 and 2012, the strategic issues of ISAI 3<sup>rd</sup> is emphasized on animal production systems and technology and the wise use of natural resources in relation with environmental aspects, toward a sustainable animal production. There will be 98 papers presented during the two days seminar; 9 by invited speakers, 69 for oral and 29 for poster presentations. The speakers came from different countries including Australia, Egypt, France, Korea, Germany, Netherland, Indonesia, Malaysia, Nigeria, Pakistan, Thailand and USA.

This is a great opportunity for scientist, researchers, private sectors and policy makers to discuss, share information and experiences on interesting topics in animal production in a broad sense, including good farming practices, recent technologies and save animal products. I believe, there is an open window for initiating and strengthening collaboration amongst scientist and institutions during and after the seminar.

On behalf of the Organizing Committee, I would like to express my sincere appreciation and thanks to IPB, and some units within, including Institute of Research and Community Empowerment, Faculty of Animal Science, Department of Animal Production and Technology, Department of Nutrition and Feed Technology, Diploma Program, Management and Business Program for all advice and funding support.

The success of this seminar could only be achieved with all the valuable supports and sponsorship we received from some recognized parties and institutions in this country. In this regards, I would like to address my grateful thanks to Directorate General of Livestock and Animal Health, Ministry of Agriculture Republic of Indonesia for participation and funding support, Infovet and Trobos, Green TV as promotion agency. To: PT. Sierad Produce, Tbk, PT. Kaltim Prima Coal, Tbk, PT. BRIngin Life, PT. Adaro Indonesia, Tbk, PT. Trouw Nutrition Indonesia, PT. Nutricell Pasific, PT. Sweni Transfer Indonesia, PT. Charoen Phokphand Indonesia, Tbk, PT. Wide & Pin, PT. Pupuk Kujang, Tbk, and PT. ANTAM, Tbk, thank you so much with big appreciation, for having being part of this important event and such enormous contributions.

My recognition and gratitude are also forwarded to the Steering Committee for advice and assistance, to international and national reviewers and the Scientific Committee for hard working and such great support. Last but not least, to all my dear colleagues of the Organizing Committee members, who have been working smartly and full of dedication and passion, to make this seminar a great successful event.

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To all participants, hopefully, the two days seminar may bring fresh ideas, and enhancing collaborations for future success toward sustainable animal production and industry. Big appologies for any inconveniences during the seminar, wish you all having fruitful discussions and good times.

During your short stay, please enjoy the surrounding of Bogor city, the Museum of Presidential Palace and Historical Botanical Garden of Bogor.

Bogor, September 17<sup>th</sup>, 2015

17<sup>th</sup> - 18<sup>th</sup> September 2015,

Chairperson of Organizing Committee

Asah M. Fua

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## REMARKS FROM DEAN OF ANIMAL SCIENCE FACULTY

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Prof. Dr. Muladno, MSA  
Director General of Livestock and Animal Health-Ministry of Agriculture Republic of Indonesia,

Prof. Dr. Ir. Herry Suhardiyanto, M.Sc.  
Rector of IPB

Dr. Ir. Asnath Maria Fuah  
Chairperson, The 3<sup>rd</sup> International Seminar on Animal Industry

Our Colleagues from Indonesian universities and research institutes,  
Distinguished foreign participants and speakers,

Representative of livestock services officers of local government from all over Indonesia,

Distinguished guests, ladies and gentlemen.

Assalamu'alaikum warahmatullaahi wabarakatuh,

I am pleased to welcome you all to Bogor city for attending "The 3<sup>rd</sup> International Seminar on Animal Industry 2015" held at Faculty of Animal Science, Bogor Agricultural University (IPB). As the Dean of Faculty, I am also really honored to host this conference.

First, let me introduce briefly about Bogor city. Bogor is one of the major scientific and educational centers in Indonesia. A significant part of academic and research base was laid in the period of Dutch colonization. In particular, since the beginning of the 19<sup>th</sup> century there were established laboratories and professional schools focused primarily on improving the efficiency of the colonial agriculture. Similar to the prevailing profile of research and academic activity was retained in Bogor after gaining independence. As in the second half of 20<sup>th</sup> century, and in the 2000s strongest areas were Agricultural sciences, Biology, Animal and Veterinary Sciences. The main educational and scientific center with the utmost national importance is the Bogor Agricultural University (IPB). It is therefore the city regularly hosted various international events, such as international seminars and conferences.

I would like to express my gratitude to IPB for supporting us to hold this conference, and also to the organizing committee of the present conference for their hard work and persistence. I convey my sincere gratitude to all the parties which is supporting this event, such as Directorate General of Livestock and Animal Health-Ministry of Agriculture Republic of Indonesia, Infovet Trobos, Agrina, Green TV as promotion agency and Sierad Produce, Kaltim Prima Coal, BRIngin Life, Adaro Indonesia, Trouw Nutrition Indonesia, Nutricell Pasific, Sweni Transfer Indonesia, Charoen Phokphand, Wide & Pin, Pupuk Kujang, and ANTAM thank you so much with big appreciation, for having being part of this important event and such enormous contributions. I am very pleased to see here the delegates from various foreign countries as well as representatives from many domestic institutions.

I hope you find this conference and the city, both interesting and stimulating and that you enjoy meeting up with your professional colleagues as well as having pleasure time during your stay in Bogor.

Thank you very much and  
Wassalamu'alaikum warahmatullaahi wabarakaatuhu.

Bogor, September 17, 2015  
Prof. Dr. Ir. Luki Abdullah, MSc.Agr  
DEAN

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# SEMINAR PROGRAM

## Conference Program Thursday, September 17, 2015

Time Slot	Venue : ICC Ballroom	
	Event	Speaker
08.00-09.00	Registration	Committee
09.00-09.05	Opening Ceremony	Master of Ceremony
09.05-09.15	Report from Organizing Committee	Dr. Ir. Asnath M.Fuah, MS
09.15-09.25	Welcome Address from Dean Faculty of Animal Science	Prof. Dr. Ir. Luki Abdullah, M.Sc.Agr.
09.25-09.35	Welcome Address from Rector of Bogor Agricultural University	Prof. Dr. Ir. Herry Suhardiyanto, M.Sc
09.35-10.00	Opening and Keynote Speech by Ministry of Agriculture / Directorate General of Livestock and Health Services	Prof. Dr. Ir. Muladno, MSA
10.00-10.05	Appreciation for Keynote Speakers from Dean Faculty of Animal Science	Prof. Dr. Ir. Luki Abdullah, M.Sc.Agr.
10.05-10.20	Sponsorship Appreciation from Chairman of Organizing Committee	Dr. Ir. Asnath M.Fuah, MS.
10.20-10.25	Photo session	Photographer
10.25-10.40	Coffee break	
	Plenary Session 1 <i>Moderator: Prof. Dr. Ir. Komang G. Wiryawan</i>	
10.40-11.00	Invited speaker 1	<b>Prof. Dr. Ir. Bas. Kemp</b> Preserving Health, Welfare and Productivity in a Challenging Environment
11.00-11.20	Invited speaker 2	<b>Dr. Jean Pierre Bidanel</b> Genomic Selection for More Sustainable Livestock Production
11.20-11.40	Invited speaker 3	<b>Ir. Yunus Triyonggo, MM</b> Building Human Resources Competency Model in Poultry Industry
11.40-12.00	Discussion	
12.00-12.05	Invited Speaker Appreciation from Scientific Committee	Prof. Dr. Ir. Dewi Apri Astuti, MS.
12.05-12.15	Sponsorship Appreciation from Vice Dean Faculty of Animal Science	Dr. Ir. Moh. Yamin, M.Agr.Sc.
12.15-12.25	Student Plenary	
12.25-13.20	Lunch	
13.20-13.50	Poster session	

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	Room A (Theme D)	Room B (Theme B and C)
1. Session 1	<b>Moderator : Dr. Rajesh Jha</b>	<b>Moderator : Umni Noorhakimah</b>
14.00-14.10	<b>Thongsuk Jetana</b> Rain Tree Pod in Livestock Feeds: Opportunity, Challenges and Possibility	<b>Yeni Widiawati</b> Fermentation Kinetics Of Palm Oil Plantation By-Product Based Diet
14.10-14.20	<b>Supriyati Kompiang</b> Effect of Different Protein and Energy Levels in Concentrate Diets on Performances of Anglo-Nubian Goat During Pregnancy and Lactation Periods	<b>Ainissya Fitri</b> Utilization Of Haylage Of Local Agro-Industry By product Pretreated With Afex Method
14.30-14.40	<b>Rusdi</b> Evaluation of Eleutherine ( <i>Eleutherine americana</i> ) as Feed Additive for Poultry	<b>H. A. Sukria</b> Physical Quality And Storage Time Pellet Indigofera Spleaves
14.40-14.40	Discussion	Discussion
Session 2	<b>Moderator :Thongsuk Jetana</b>	<b>Moderator : Imana Martaguri</b>
14.45-14.55	<b>Utsav Prakash Tiwari</b> Nutrient Profile And In Vitro Digestibility Of Fresh And Ensiled Cassava In Swine	<b>Moh Ali Hamdan</b> Potential Of Dwarf Elephant Grass ( <i>Pennisetum Purpureum</i> Schum. Cv. Mott) In Dry Land Areas Of Bojonegoro As Forage-Based Feed Sustainability
14.55-15.05	<b>Alif Putri</b> Effect of Combination Silkworm Pupae Meal and Garlic Meal on Blood Profiles, Visceral Organs and Carcass Broiler	<b>Rido Pande Pardede</b> Development Of Indigofera Zoolingeriana And Pueraria Javanica On Dry Land Integrated With Teak Forest In Bojonegoro
15.05-15.15	<b>Burhanudin Sundu</b> The effect of NaOH Concentrations and Polysaccharides Extract of Palm Kernel Meal on Performance of 4 Weeks Old-Broiler Chickens	<b>Malcky Telleng</b> Growth and Productivity of Different Sorghum Varieties Cultivated with Indigofera in Intercropping System
15.15-15.25	Discussion	Discussion
15.25-15.40	Coffee break	
Session 3	<b>Moderator : Anis Mukhtiani</b>	<b>Moderator : Lisa T. Praharani</b>
15.40-15.50	<b>Muhamad Nasir Rofiq</b> Combination Effect of Nutritech Feed Additive Containing Saponin, Tanin and Eugenol Essential oils on In Vivo Rumen Methane Production in Dairy Cattle Using Open Circuit Respiration Chamber Technique	<b>Imana Martaguri</b> Carbon Storage Capacity of Forage Native Grasses Growing in Palm Plantation at Transformation Forest Ecosystem in Jambi
15.50-16.00	<b>Dwi Yulistiani</b> Nitrogen Utilization and Ruminant Fermentation of Five Breed of Sheep Fed Concentrate Containing Different Levels of Rumen Undegradable Protein	<b>I Gusti Ngurah Jelantik</b> Herbage Production and Nutritive Value of Some Forage Legumes as Calf Feed Supplement
16.00-16.10	<b>Sutresniwati</b> A Willingness to Pay Evaluation for Silage Implementation for Small Dairy Farmers	<b>Riesi Sriagtula</b> Evaluation of Growth and Production of Sorghum Lines (Sorghum Brown Midrib) at Different of Harvest Time as Feed
16.10-16.20	Discussion	Discussion
Session 4	<b>Moderator : Rusdi</b>	<b>Moderator: Veronica</b>
16.25-16.35	<b>Anita S. Tjakradidjaja</b> Fermentability and Digestibility of Rice Straw - Concentrate Base Ration Added with Probiotic	<b>Nur Rochmah Kumalasari</b> Modelling of Forage Availability Response to Landuse Exchange in Bogor

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Time	Room A (Theme D)	Room B (Theme B and C)
16.35-16.45	<b>Gusti A. Gultom</b> Effects of Solid or Liquid Probiotic Supplementation on Rumen Microbial Population and Enzyme Activity	<b>Khalil</b> The Diversity and Quality of Forages Used for Feeding of Goat in Payakumbuh of West Sumatra
16.45-16.55	<b>Eissa M. M</b> Effect Of Ammoniated Straw On Methane Production In An In Vitro System And On Growth Performance	<b>P.D.M.H. Karti</b> The Addition of Arbuscular mycorrhizal Fungi in Enhancing Productivity and Drought Tolerance Mechanisms of <i>Indigofera zollingeriana</i>
16.55-17.05	Discussion	Discussion

Time	Ballroom (Theme A)
<b>Session 1</b>	<b>Moderator : Iis Arifantini</b>
14.00-14.10	<b>Fuah A.M</b> Beef Cattle Production, Constraints and Opportunities for Small Farmers in South Central Timor Regency West Timor
14.10-14.20	<b>S.N. Sirajuddin</b> The Application of Tesang Sharing System at Cattle Farms in Indonesia
14.20-14.30	<b>Niken Ulupi</b> Production Performance of Laying Hen in Cage System with Different Housing Temperature
14.30-14.40	<b>Lucia Cyrilla</b> Evaluation of Good Dairy Farming Practice Implementation in Dairy Goat Farm
14.40-14.50	Discussion
<b>Session 2</b>	<b>Moderator : Prof. Cece Sumantri</b>
14.55-15.05	<b>Lindawati Doloksaribu</b> Constraints to, Challenges of, and Opportunities for Rearing Goats in Bali Province. A case study: Rearing Kids in Karangasem Regency
15.05-15.15	<b>Hearty Salatnaya</b> Trigona Spppropolis, Pollen, And Honey Production In Two Different Agroecosystem
15.15-15.25	<b>Prabowo, S</b> Distribution of Thermal Body Surface Ettawah Grade in Different Tropic Microclimates
15.25-15.35	<b>Bram Brahmantiyo</b> Hycole and Hyla Rabbits Performance were Raised in Indonesia
15.35-15.45	Discussion
15.45-16.00	<b>Coffee break</b>

### Welcoming dinner. Venue IICC Ballroom

Time Slot	Event
18.20-19.00	Registration and Dinner (Instrument from Gentra)
19.00-19.05	Opening by Master of Ceremony
19.05-19.15	Speech from Chairman of Committee
19.15-19.25	Speech from Dean of Animal Science Faculty
19.25-20.00	Gentra Kaheman
20.00-20.20	Prof. Singer
20.20-21.20	Spontaneity from Country Representative
21.20	Closing

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Friday, September 18, 2015

Venue : IICC Ballroom		
Time	Event	Speaker
08.00-08.30	Registration	Committee
08.30-08.35	Opening Ceremony	Master of Ceremony
Plenary Session 2 <i>Moderator: Dr. Jean Pierre Bidanel</i>		
08.45-08.55	Invited speaker 1	<b>Prof. Wayne Pitchford</b> Outcomes of Selection for Residual Feed Intake in Australian Beef Cattle
08.55-09.15	Invited speaker 2	<b>Prof. Myunggi Baik</b> Molecular Mechanisms Regulating Beef Quality in Korean Cattle
09.15-09.35	Invited speaker 3	<b>Prof. I Wayan Teguh W.</b> Vaccination and Subclinical Manifestation of Avian Influenza in Indonesia
09.35-09.50	Discussion	
09.50-10.00	Appreciation to Invited Speaker	Prof. Luki Abdullah
Coffee Break		
Plenary Session 3 <i>Moderator: Prof. Wayne Pitchford</i>		
10.10-10.30	Invited speaker 1	<b>Dr. Kai J. Kuehlmann</b> The Role of Feed Additive in Animal Industry under Tropical Condition
10.30-10.50	Invited speaker 2	<b>Dr. Anjas Asmara Samsudin</b> Recent Advances in Gut Microbiology Research in Relation to Animal Nutrition
10.50-11.10	Invited speaker 3	<b>Prof. Bustanul Arifin</b> Social Economic and Policy in Animal Industry
11.10-11.25	Discussion	
11.25-11.30	Appreciation for Invited Speaker	Prof. Dr. Ir. Sumiati, M.Sc.
11.30-13.20	Lunch and Prayer	
13.20-13.50	Poster session	

Time	Room A (Theme D and G)	Room B (Theme F and J)
Session 5	<i>Moderator: Sutresniwati</i>	
13.50-14.00	<b>Sumiati</b> Effect of drinking gambir extract ( <i>Uncaria gambir Roxb</i> ) as Antioxidant on Performance of 40-43 Weeks Old of Laying Hens	<b>Rudi Afnan</b> Weight Loss And Mortality Of Broiler During Transportation From Different Distances To Slaughterhouse
14.00-14.10	<b>Muktiani, A</b> Live Weight Gain of Beef Cattle Fed on Complete Feed Silage of Water Hyacinth Supplemented with Mineral Zinc-Proteinate	<b>Suharyanto</b> Skim Milk Powder Substitution With Soymilk Powder Could Improve Physical Properties Of Beef Surimi-Based Sausage
14.10-14.20	<b>Putri O. N</b> The Effect of Adding Fermented Waste Cabbage in Calf Starter Pellets on Total Lactic Acid Bacteria And <i>Escherichia coli</i>	<b>Iwan Prihantoro</b> The Potency of <i>Azollapinnataas</i> A High Protein Forage for High Productivity Livestock
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14.35-14.45	<b>Ninasari Ra</b> Substitution of Fish Meal by Cricket or Indigofera Shoot Leaf Meal on Japanese Quail ( <i>Coturnix japonica</i> ) Performance	<b>Lilis Suryaningsih</b> Effects Of Local Flour Types On Physical Properties And Acceptability Of Beef Sausage



Time	Room A (Theme D and G)	Room B (Theme F and J)
14.45-14.55	<b>Tresia G.E</b> Benefit of Kemuning Leaves Meal ( <i>Murraya paniculata</i> [L.] Jack) Addition in Ration Containing Date Fruit Waste to Suppress Gastrointestinal Parasites Infestation of PE Goat	<b>Soenarno Ms</b> Characteristic Of Lactic Acid Bacteria Isolated From Dangke From Sinjai, South Sulawesi
14.55-15.10	<b>Sri Suharti</b> Rumen Microbe, Protein Microbial Synthesis, Cellulase Activity and Nutrient Digestibility of Bali Cattle Rumen with the Addition of Calcium Soap-Soybean Oil In vitro	<b>M. Aman Yaman</b> Increase on Commercial Weight, Carcass Quality and Economic Benefit of Selected Local Meat Chicken Fed on Fermented Diet Contained Digestive Enzymes and Probiotics
15.10-15.15	Discussion	Discussion
15.15-15.30	Coffee break	
Session 7	<b>Moderator : Dr. Lindawati Doloksaribu</b>	<b>Moderator : Dr. Asnath Maria Fuah</b>
15.30-15.40	<b>G. F. Bira</b> Incremental Level Of Chromolaena Odorata In Complete Diet Does Not Impair Intake, Rumen Fermentation And Microbial Protein Synthesis Efficiency In Cattle	<b>Salina A.B</b> An Analysis Of Cattle Traders Practices On Animal Traceability In Malaysia
15.40-15.50	<b>Arini NMJ</b> Substitution Of Fish Meal By Cricket Or Indigoferasp Shoot Leaf Meal To Evaluate Protein Balance Of Japanese Quail (Coturnix Japonica)	<b>Hotnida C H Siregar</b> Effect Of Moisture Reduction Method, Storage Period And Temperature On Honey Quality
15.50-16.00	<b>Mokhamad Faesal R. Hakim</b> Feeding Ecology of Sumatran Orangutan ( <i>Pongo abelii</i> , Lesson 1827) in West Batang Toru Forest Block, North Sumatra	<b>Iman Rahayu</b> Biodiversity Based On Fatty Acid And Amino Acid Profile Of Indonesian Local Chickens
16.00-16.10	Discussion	Discussion
Session 8	<b>Moderator : Mokhamad Faesal Rakhman Khakim</b>	<b>Moderator : Dr. Burhanudin Sundu</b>
16.15-16.25	<b>D. Latipudin</b> Level Of Malondialdehyde (Mda), Uric Acid And Lymphocyte: Neutrophil Ratio Of Laying Hen In The Different Temperature Humidity Index (Thi)	<b>I M. A. Sudarma</b> Weight Loss Of Inter-Island Transported Cattle From Kupang Is Reduced By Feeding High Protein-Mineral Mix Block During Quarantine And Sea Transportation
16.25-16.35	<b>Windi Al Zahra</b> The Using Of Thermograph As Non-Invasive Method To Observe Subclinical Mastitis In Tropical Dairy Cattle	<b>Ummi Noorhakimah Abdullah</b> Cattle Importation And The Trend Of Fmd Occurrence In Peninsular Malaysia From 2000-2010
16.35-16.45	<b>A. Sudarman</b> Physiological Responses And Blood Profiles Of Sheep Fed Cassava Leaves Silage ( <i>Manihot Esculenta</i> Sp.) Reared Traditionally In Petir Village	<b>Moh Yamin</b> Harmony Between Livestock Behaviors: Birth Time and Sites Selection Behaviors in Sheep and Goats
16.45-17.00	Discussion	<b>Erika B Laconi</b> Strategy of Beef Cattle Development Based on Agricultural Product in Kuningan District, West Java
17.00-17.10	Discussion	Discussion

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14.00-14.10	<b>Parsaoran Silalahi</b> Effects Of Selection On The Efficiency And Variability Of Sow Reproduction And Maternal Abilities
14.10-14.20	<b>Oktora Dwi Putranti</b> Effect Of Caffeine On Morfology Of Epididymis Spermatozoa Of Bali Bull
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14.45-15.00	<b>Maria Haryulin Astuti</b> Service Per Conception In Beef Cattle With Artificial Insemination In Kapuas Basarang District of Central Kalimantan
15.00-15.10	<b>Anneke Anggraeni</b> Association Of Growth Hormone (Gh Mspi) And Growth Hormone Releasing Hormone (Ghrh Iaeiii) Genes With Milk Components Of Hf Cows Under Small Farmers In Lembang, West Java
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15.20-15.30	Coffee break
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16.25-16.35	<b>Aslina Asnawi</b> Financing Preferences For Cattle Farmers In Bone Regency South Sulawesi
16.35-16.45	<b>Sumarti T</b> Women, Gender Equality In Livestock Development: Case Study From Papua and Central Java
16.45-16.55	Discussion

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17.15-17.25	The Best Presenter (Oral and Poster) Announcement
17.25-17.35	Presence of Presents
17.35-17.45	Speech from Representative Invited Speaker: Prof. Wayne Pitchford
17.45-17.55	Speech from Representative Invited Speaker: Thongsuk Jetana
17.55-18.05	Closing Speech from Dean of Animal Science Faculty

Bogor Agricultural University



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# INVITED SPEAKER

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# Potential of Dwarf Elephant Grass (*Pennisetum purpureum* Schum. cv. Mott) in Dry Land Areas of Bojonegoro as Forage-Based Feed Sustainability

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## Abstract

Animal industry especially stockers needs forage as their fibre and protein resource to maintain its quality and productivity. However, in several dry climate area, forage production is still low when it is dry season. So, the study about forage is very urgently and importantly needed. This study was conducted to evaluate the potency of dwarf elephant grass (*Pennisetum purpureum* Schum. cv. Mott) that has been planted on dry land areas of Bojonegoro. This research consists of two phase. The first phase of this research carried out on green house to evaluate the impact of drought stress by using 16 dwarf elephant grass, four water level of treatment (P1=100% KL; P2=75% KL; P3=50% KL; P4=25% KL) in completely randomized experimental design. The result showed that *Pennisetum purpureum* Schum. cv. Mott survived in those treatment without decreasing their dry matter (DM) productivity ( $P < 0.01$ ). It means that *Pennisetum purpureum* Schum. cv. Mott can be planted on drought areas of Bojonegoro. The second phase of this research carried out on dry land areas of Bojonegoro by using 320 dwarf elephant grass. Grasses were panted by using 2 x 5 completely randomised design. The first factor was the location (opened area and teak forest) and the second factor was the five fertilizer level (LEISA model). The result showed that both of two factor affected the DM production ( $P < 0.01$ ). The correlation between two factors also affected the DM production ( $P < 0.01$ ). The best result of planting the *Pennisetum purpureum* Schum. cv. Mott using 100 % anorganic fertilizer (Urea, SP36, and KCl) ( $P < 0.01$ ). This research conclude that *Pennisetum purpureum* Schum. cv. Mott has capability to be planted on dry land areas as forage-based feed sustainability.

**Keywords:** dry matter, drought stress, forage-based feed sustainability, LEISA, *Pennisetum purpureum* Schum. cv. Mott

## Introduction

Feed is one of main factor for livestock. One of ruminant feed is forage in a good quality contained protein, energy, vitamin and mineral (Herlina, 2003). However, Indonesia as a tropical country, has varied climates that affect forage production. Quantity, quality, and continuity of forage affects the ruminant productivity (Widiati, 2003). Dwarf elephant grass (DEG) (*Pennisetum purpureum* Schum. cv. Mott) has high productivity level. On rainy season, it has 2-2.5 tons/ha and 1.6 tons/ha on dry season (Olivo *et al.*, 1992 and Coser *et al.*, 1997). It means that DEG has a potency as drought resistant plant.

Bojonegoro is one of regency on east java that has high amount of ruminant population. On 2013, it has 160 037 cows, 19 dairy, 1 026 buffalo, 105 013 goats, 129 990 sheeps (BPS Bojonegoro, 2013). However, Bojonegoro has a long drought season. It has monthly average rain interval of 142 mm that classified as drought areas (Goenadi, 2003). Therefore Bojonegoro needs drought resistant forage to fulfill the ruminant needs. This research aimed to get several informations about the potency of DEG as drought resistant forage. Furthermore, it has purpose to get information about DEG as a part of integrated planting system between forage and teak forest.

## Materials and Methods

This research consists of two stages. The first stage take place on green house of agrostology unit, IPB, starting on October to December 2014. And the second stage take place on Sambeng, Bojonegoro, starting on December 2014 to January 2015.



### First stage

This study was carried out to evaluate the drought respon of DEG with four water level treatments (25%, 50%, 75%, and 100% field capacity). The treatments used completely randomized design and 2 replication. Each of them planted on 5 kg polybag that contained 10% of manure. The field capacity determined by using freely drainage model (Jury *et al.*, 2001). The first stage observed the morphological responses (height of plant, diameter of plant, root weigh and amount of leaves), physiological resons (water consumption, level of relative water content, and dissolved sugar level), and nutrientcontent (crude fibre and crude protein).

### second stage

This study was carried out to evaluate the productivity of DEGthat planted in Bojonegoro. The treatments used competely randomized design. The location consist of opened area and integrated area (ek). There were five fertilizer level and composisiton. They were 100% organic, 75% organic and 25% anorganic, 50% organic and 50% anorganic, 25% organic and 75% anorganic, 100% anorganic. Anorganic fertilizer consist of Urea, SP36, and KCl. The fertilizing method using LEISA model (Low Eksternal Input sustainable Agriculture) to get the lowest fertilizer input but earn the highest productivity (Giovannucci, 2007). After harvesting, the biomass were analyzed to get nutrient information by Proximate (AOAC, 2005) and Van Soest (1991).

## Results and Discussion

### First stage (drought respons of *Pennisetum purpureum* Schum. Cv. Mott)

#### Morphological responses

Morphological response of *Pennisetum purpureum* Schum. Cv. Mott observed height, diameter, root weight, and number of leaves. Drought stress treatment significantly affected ( $P < 0.05$ ) on plant height and number of leaves of the plant, excepted the plant diameter. Plant height of P1 treatment showed the best response. Water used by the plant for cell metabolism process (Liu and Stutzel, 2008). The number of leaves P1, P2, and P3 showed the best response. However, the quantity of leaves P1 was less than P3 due to adaptation to defend themselves from the drought. Liu and Stutzel (2002) stated that in order to response drought stress, the lower the rate of growth to reduce the rate of water loss. Weight roots influenced ( $P < 0.05$ ) by treatment of water stress. Root weight at P1, P2, and P3 showed a greater response than P4. However, at average, P1 showed greater results than P2, and P2 was greater than P3. This was caused by the growth of roots in drought stress tends to be greater to find the source of water. On the condition of drought stress, plants tend to decrease the production of biomass and increase the production of roots to find water sources (Yin *et al.*, 2005). In P4 treatment showed that no growth of roots due to the water concentration in soil was sufficient so water coming into the plant tissues by diffusion.

Table 1. Morphological resons of *Pennisetum purpureum* Schum. cv. Mott

Parameter	Treatment			
	P1	P2	P3	P4
Plant height (cm)	106.00±5.00c	83.37±17.81b	107.00±7.21bc	4.70±0.81a
Stem diameter (cm)	2.00±0.26	1.86±0.32	1.89±0.24	1.79±0.09
Amount of leaves	4.00±1.71b	4.00±2.40b	5.00±1.73b	1.00±0.50a
Root weight (gram)	0.38±0.13b	0.35±0.09b	0.30±0.19b	0.00±0.00a

Values with different letters differ significantly within column (upper case) or within line (lower case) at  $P < 0.05$ . P1:25% field capacity; P2:50% field capacity; P3:75% field capacity; P4:100% field capacity.

#### Physiological responses

Drought stress affects plant physiology mechanism to maintaining itself. Table 2 shows that the drought stress on *Pennisetum purpureum* Schum. cv. Mott significantly different ( $P < 0.05$ ). The increasing of water capacity in soil media would increased the leaf relative water content. Drought stress treatment has no significant effect ( $P > 0.05$ ) on water consumption. Drought stress affected on total production of sugar dissolved on stem. Nofyangtri (2011) stated that the physiological response of stressed plants showed a



decline in value of relative water content of leaves. Otherwise, total dissolved sugar would increased when drought stress level increased.

Table 2. Physiological respons of *Pennisetum purpureum* Schum. cv. Mott

Parameter	Treatment			
	P1	P2	P3	P4
Relative water content	13.30±2.66a	79.88±27.24b	84.89±6.46b	91.73±6.76b
Dissolved sugar level	2.25±1.5b	1.75±1.92ab	1.65±0.3ab	0.00±0.00a

Values with different letters differ significantly within column (upper case) or within line (lower case) at P<0.05.

P1:25% field capacity; P2:50% field capacity; P3:75% field capacity; P4:100% field capacity.

### Nutrient contents

Range of crude protein of *Pennisetum purpureum* Schum. cv. Mott is 15.40% to 21.94%. At the same time crude fiber content ranging from 22.51% to 25.77%. Crude protein content in P1 to P4 decreased respectively but the crude fibre in P1 to P4 increased respectively. Lutfi (2000) stated that nitrogen intake from the soil would increased the protein content of plant and phohibit the celulose and hemi-celulose on plant cell wall.

Table 3. Nutrient content of *Pennisetum purpureum* Schum. cv. Mott

Parameter	Treatment			
	P1	P2	P3	P4
Crude protein %	21.94	19.94	16.06	15.40
Crude fibre %	23.24	24.99	22.51	25.77

Analyzed by Pusat Antar Universitas (PAU) laboratory (IPB 2015)

P1:25% field capacity; P2:50% field capacity; P3:75% field capacity; P4:100% field capacity.

### Second stage (forage integrating system of *Pennisetum purpureum* Schum. cv. Mott)

The planting of *Pennisetum purpureum* Schum. cv. Mott along 40 days on Bojonegoro showed different result between opened field and integrated field.

### Morphology responses

*Pennisetum purpureum* Schum. cv. Mott that planted by integrated model with teak forests (Table 4) showed the greatest response rates to treatment with 100% inorganic fertilizers (N5) in the production of dry weight. Whitehead (2000) stated that nitrogen was essensial element for plant growth.

Table 4. Morphology of *Pennisetum purpureum* Schum. cv. Mott planted by integrated system with teak

Parameter	N1	N2	N3	N4	N5
Plant height (cm)	95.50	98.88	99.38	92.00	86.88
Dry matter production (cm)	31.43a	30.13a	44.40ab	83.88b	117.00c

Values with different letters differ significantly within column (upper case) or within line (lower case) at P<0.05.

N1:100% organic fertilizer; N2:75% organic and 25% inorganic fertilizer; N3:50% organic and 50% inorganic fertilizer; N4:25% organic and 75% inorganic fertilizer; N5:100% inorganic fertilizer.

*Pennisetum purpureum* Schum. cv. Mott planted in open fields (Table 5) showed the greatest response rates to treatment with a combination of 75% fertilizer organic + 25% inorganic (T4). However, for the production represented by the largest of dry weight in the treatment of 100% inorganic fertilizers (T5). Whitehead (2000) fertilizer that content nitrogen would increased the plant produktivity.

Table 5. Morphology of *Pennisetum purpureum* Schum. cv. Mott planted on opened field

Parameter	T1	T2	T3	T4	T5
Plant height(cm)	62.00	61.13	62.13	76.00	73.38
Dry matter production (cm)	172.93a	234.30b	379.63c	185.15a	369.98c

Values with different letters differ significantly within column (upper case) or within line (lower case) at P<0.05.

T1:100% organic fertilizer; T2:75% organic and 25% anorganic fertilizer; T3:50% organic and 50% anorganic fertilizer; T4:25% organic and 75% anorganic fertilizer; T5:100% anorganic fertilizer.

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Nutrient analyzed only occurred on highest response of morphology of *Pennisetum purpureum* Schum. cv. Mott. The highest result of morphology showed on 100% inorganic fertilizer treatment on integrated field open field. The analyzed to fulfill the nutrient information of the highest productivity level of DEG. Dry matter and crude fibre at N5 treatment in the integrated field has lower value than open fields. However, the value crude protein of N5 in the integrated field has higher value than open fields. Quality fibre fraction (Van Soest, 1991) in N5 treatment on integrated field has lower value of ADF, NDF and cellulose than open field. However, lignin value on integrated field was higher than on open field.

Nutrient content of *Pennisetum purpureum* Schum. cv. Mott

Parameter	Integrated field (N5)	Open field (T5)
Moisture (%)	90.53±0.16	93.22±0.16
Water content	16.53±0.69	24.80±2.07
Crude protein	5.20±0.03	3.86±0.13
Crude fat	1.91±0.45	0.64±0.13
Crude fibre	27.09±0.87	29.69±1.33
Van Soest (%)		
ADF	36.64±2.01	47.67±2.06
NDF	58.15±0.36	61.87±0.25
Celulose	16.96±2.56	30.91±0.70
Lignin	19.78±2.50	16.76±1.40

Analyzed by Feed Biotechnology Laboratory of LIPI (2015)

### Conclusion

*Pennisetum purpureum* Schum. cv. Mott has potency to be planted on drought area to fulfill the ruminant forage need. *Pennisetum purpureum* Schum. cv. Mott also has a good morphologic and physiological responses to drought stress. By using LEISA model, *Pennisetum purpureum* Schum. cv. Mott gave the best growth respond on integrated fields.

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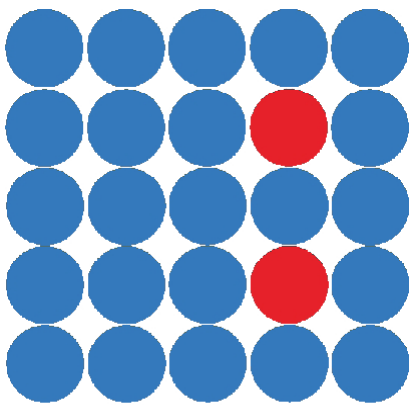


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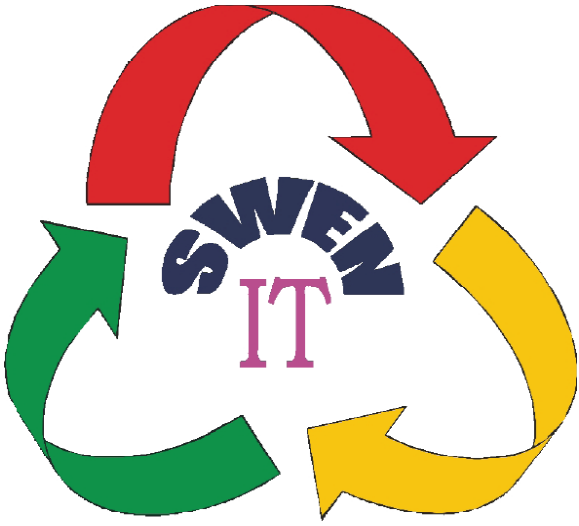
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