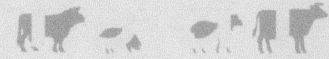


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**FACULTY OF ANIMAL SCIENCE
BOGOR AGRICULTURAL UNIVERSITY**

THE SECOND INTERNATIONAL SEMINAR ON ANIMAL INDUSTRY
**"Empowering Local Resources for Sustainable Animal Production in Adapting
to Climate Change"**

Jakarta Convention Center, Jakarta-Indonesia
5-6 July 2012

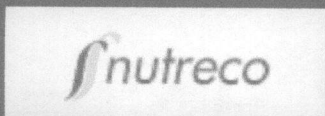
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The Second International Seminar on Animal Industry

“Empowering Local Resources for Sustainable Animal Production in Adapting to Climate Change”

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Time	Room A Moderator: Prof. Cece Sumantri (Genetic, Breeding and Reproduction)	Room B Moderator: Dr. Ir. Idat G.P. (Feed and Nutrition)	Room C Moderator: Dr. Ir. Asnath M. Fuah (Animal Manag. & Prod)
14.00 - 14.15	<i>M. A. Yaman*</i> ; <i>Yurliasni., Zulfan & M. Daud</i> Improvement The Genetic Potential of Local Chicken by Combination of Crossbreed- ing, Selection Method, Cellular Analysis and Nutritional Requirements to Produce the Candidate of Local Layer	<i>A. Hayirli*</i> Managerial and Nutritional Strategies to Minimize Lacta- tional and Reproductive Losses in Heat-Distressed Dairy Cows.	<i>V.S. Lestari* & S.N. Sirajuddin</i> Factors Affecting to Biosecu- rity Adoption on Laying Hen Farmers
14.15 - 14.30	<i>M.I.A. Dagong, *, C. Sumantri, R.R. Noor, R. Herman & M. Yamin</i> Polymorphisms of Calpastatin (CAST) Gene and It's Associa- tion with Physical Meat Quality in the Local Sheep	<i>I. Badarina*, D. Evvy- ernie, T. Toharmat, E.N Herliyana, L.K. Darusman</i> Biodegradation of Coffee Husk Substrate During The Mycelial Growth of <i>Pleurotus os- treatus</i> and The Effect on <i>In Vitro</i> Digestibility	<i>M. Ma'sum* & A. Saleh</i> The Perception of The Slaugh- ter Cattle's Farmers o Imple- mentation of Artificial Insemina- tion in Three Central Area of Slaughter Cattle in Indonesia
14.30 - 14.45	<i>A. Anggraeni*, H. Hasinah, S.A. Arta, B. Tiesnamurti, R. Misri- anti, & E. Andreas</i> Genetic Variation of the IGF and OPN Genes in Holstein-Friesian Dairy Cattle of Historical and Non-Historical Twins	<i>D. Yulistiani*</i> Ruminal Fungi Colonization of Stem Tissue of Untreated and Urea Treated Rice Straw Varieties	<i>A. Budiman, I. Herna- man*, & D. Latipudin</i> Utilization Of <i>Datura metel</i> Linn. to Decrease Transporta- tion Stress on Sheep
14.45 - 15.00	<i>E. T. Margawati*, Paskah P. Agung & Muhamad Ridwan</i> Genetic Marker Approach for Confirming the Existing Twin- ning Trait in PO Cattle	<i>M. Amizi*, A., Yazid, M.E., A. Razak, M.N, M. M. Ismail & M. A. Islam</i> Oil Palm Fronds (OPF) as Potential Affordable Source of Feeds for Ruminants for Small Holders	
15.00 - 15.15	<i>E.M. Sari*, R.R. Noor, C. Sumantri. Margawati. E. T</i> Carcass Traits Association with GH/AluI Gene Polymorphism in Indonesian Aceh Cattle	<i>Fatmawati</i> <i>In Vitro</i> Digestibility of Lam- poyangan Grass (<i>Panicum Sarmentosum</i> Roxb) in Form of Hay and Silage	
COFFEE BREAK			

LIST OF CONTENTS

Foreword from Chairperson of Organizing Committee	iii
Remarks from Dean of Faculty of Animal Science	v
Seminar Program	vii
Seminar Layout	xiv
List of Contents	xv
Invited Speaker	1
GM and Non-GM Rumen Microbes in Enhancing Animal Productivity. T.S. Park, J. K. Seo, & Jong K. Ha.....	3
Consumer Preferences in Meat. Louw Hoffman & Donna Cawthorn.....	9
Improving Local Feed Resource to Increase Nutrient Availability to Support Sustainable Agriculture. E.R. Ørskov.....	23
Planning Dairy Development Programs in Tropical Asia. J. B. Moran & J. W Brouwer.....	27
Carrier Proteins in Milk: Basic and Potential Applications. Kenji Fukuda.....	35
Indonesia Farm Animal Genetic Resources in Adapting to Climate Change. Ronny Rachman Noor.....	53
Tropical Forages in Indonesia: Past experience and Future Opportunity. H.M. Shelton.....	64
 BREEDING AND GENETICS	 75
Improvement the Genetic Potential of Local Chicken By Combination of Crossbreeding, Selection Method, Cellular Analysis and Nutritional Adjustment to Produce the Candidate of Local Layer. M. Aman Yaman, Yurliasni, Zulfan, & Muhammad Daud.....	77
Physical Meat Characteristics of Local Thin Tail Sheep based on Calpastatin (CAST) Genotype Variation. M.I.A. Dagong, C. Sumantri, R.R. Noor, R. Herman, & M. Yamin.....	85
Genetic Variation of the IGF1 and OPN Genes in Holstein-Friesian Dairy Cattle of Historical and Non-Historical Twins. Anneke Anggraeni, Hasanatun Hasinah, Santi Ananda Arta, Bess Tiesnamurti, Restu Misrianti, & Eryk Andreas.....	91
Genetic Marker Approach for Confirming the Existing Twinning Trait in PO Cattle. Endang T. Margawati, Paskah P. Agung, & Muhamad Ridwan.....	97

Carcass Traits Association With GH/AluI Gene Polymorphism in Indonesian Aceh Cattle. Eka Meutia Sari, Ronny Rachman Noor, Cece Sumantri, & Endang Tri Margawati.....	104
Identification of Holstein-Friesian Lactating Cows as Good Replacement Stocks under Small-Scale Dairy Farming in a Highland of West Java, Indonesia. Anneke Anggraeni, Tati Herawati, Subandrio, Kusuma Diwyanto, Chalid Talib, & Santi Ananda Arta.....	110
Qualitative Traits of Walik Chickens, The Rare Indigenous Chicken, in West Java, Indonesia. Maria Ulfah, Jakaria, & Restymaya Tirama Tarigan.....	117
The Classification of Body Measurement on Syrian Hamster (<i>Mesocricetus auratus</i>) Based on Factor Analysis and Principal Component Analysis. R. H. Mulyono, A. S. Tjakradidjaja, L. L. Sari, & Meliyana.....	124
Phenotypic Characteristics of Legund Chickens in West Java, Indonesia. Jakaria, Maria Ulfah, & Desha Anandya Putri.....	130
Morphometric Performances of Thin Tail Sheep with Differences Calpastatin (Cast-1) Genotypes. B.W. Putra, Nurhidayat, & C. Sumantri.....	135

FEED AND NUTRITION

Sub Theme: Agrostology 141

Production and Nutrient Uptake of Sweet Corn Treated with Manure 'plus' and Inorganic Fertilizer. Dwi Retno Lukiwati, Tri Winarni Agustini, Budi Adi Kristanto, & Surahmanto.....	143
<i>Indigofera zollingeriana</i> : A Promising Forage and Shrubby Legum Crop for Indonesia. L. Abdullah, A. Tarigan, Suharlina, D. Budhi, I. Jovinty, & T.A. Apdini.....	149
Potential of Weeds for Ruminant Feed on Rice Fields in Java. N. R. Kumalasari, E. Bergmeier, & L. Abdullah.....	155
Mineral Balance of <i>Brachiaria humidicola</i> Pasture which is Introduced with Creeping Legumes Creeping at UP3J. Karti, P.D.M.H.K., L. Abdullah, I.K.G. Wiryawan, & Heru	161
Mineral Concentration of Forage Grasses at Different Salinity Levels of Soil. Florentina Kusmiyati, Sumarsono, Karno, & Eko Pangestu.....	166

Sub Theme: Feed Technology 173

Theobromine Content in Cocoa Pod Husk (<i>Theobroma cacao</i>) Fermented by <i>Aspergillus</i> spp. in Different of Chop Sizes and Fermentation Times. F. F. Munier & H. Hartadi.....	175
Differences in Drying Method of King Grass (<i>Pennisetum hybrid</i>) Silage Samples Prepared for <i>in Vitro</i> Digestibility Analysis. A. Sofyan & H. Herdian.....	181

Indonesia Farm Animal Genetic Resources in Adapting to Climate Change

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In developing countries, most people depend on agriculture. Crops and livestock are usually produced on the same farm with small plot of land. Grazing animals in open grassland also exist but its contribution in terms of animal products is relatively much less when compared to mixed crop animal farming system (Chantalakhana and Skunmun, 2002). Furthermore they stated that most farmers in developing countries can be classified as smallholders, mostly live in rural areas and some in peri-urban. The role and contribution of animals in rural farms are far more complex than that in specialized commercial farm since there exist so close and sophisticated relationships among farm family, animals, crops, social and agriculture.

Agriculture must become more productive if it is to feed a much larger world population. In responding to the daunting environmental challenges ahead, the combined effect of population growth, strong income growth and urbanization is expected to result in almost the doubling of demand for food, feed and fiber (FAO, 2009)

The Role of Livestocks

In 2050 world population is projected to rise to 9.1 billion from a current 6.7 billion, as results it require a 70-percent increase in farm production (FAO, 2009). Based on FAO (2008) report, the livestock sector has great potential to contribute to poverty reduction and the achievement of the Millennium Development Goals (MDG). Agricultural growth can be highly effective in reducing poverty as the largest share of the world's poor live in rural areas. Livestock provide food and income to the majority of the 1.2 billion people living on less than \$1 per day. Demand for livestock products is growing fast in developing countries, faster than demand for staple crops, and will continue to do so in the foreseeable future. This demand growth can provide significant opportunities for many rural and peri-urban poor to increase returns from their livestock resources. However, effective and coherent pro-poor public policies, alleviating both institutional and technical constraints, are crucial to capitalise on the pro-poor opportunities offered by the livestock sector.

The FAO State of Food Agriculture (SOFA) 2010-2011 report stresses the importance of livestock to the livelihoods of around one billion poor people. Livestock provides income, high-quality food, fuel, draught power, building material and fertilizer, thus contributing to food security and nutrition. For many small-scale

farmers, livestock also provides an important safety net in times of need. However, the FAO stressed the need for substantial investments and stronger institutions at global, regional, national and local levels, to ensure that continued growth of the livestock sector contributes to livelihoods, meets growing consumer demand and mitigates environmental and health concerns (FAO, 2010).

The livestock sector is one of the fastest growing parts of the agricultural economy. Livestock contributes 40 percent of the global value of agricultural production and supports the livelihoods and food security of almost one billion people. Globally, livestock contributes 15 percent of total food energy and 25 percent of dietary protein. Products from livestock provide essential micronutrients that are not easily obtained from other plant food products (FAO, 2010).

Rising incomes, population growth and urbanization are the driving forces behind a growing demand for meat products in developing countries—and they will continue to be important. To meet rising demand, global annual meat production is expected to expand from 228 currently to 463 million tons by 2050 with the cattle population estimated to grow from 1.5 billion to 2.6 billion and that of goats and sheep from 1.7 billion to 2.7 billion, according to FAO estimates (FAO, 2010).

Strong demand for animal food products offers significant opportunities for livestock to contribute to economic growth and poverty reduction. But many smallholders are facing several challenges in remaining competitive with larger, more intensive production systems (FAO, 2010).

Livestock can play an important role in both adapting to climate change and mitigating its effects on human welfare, FAO said (FAO 2010). To realize the sector's potential to contribute to climate change mitigation and adaptation based on enhanced capacities to monitor report and verify emissions from the livestock production new technologies will need to be developed.

Loss of Farm Animal Genetic Resources (FAnGR) Diversity

In general, Local breeds of domestic animals are much better suited to the conditions of biotic and abiotic stress than those improved breed. In addition, the local breed also reflect the cultural and historical identity of communities that have developed and continues as an integral part of life and traditions of various societies. A long with the advance of agriculture industrialized through, the indigenous breeds are disappearing in favor of modern high productivity but low ecological plasticity (Maxim *et al.*, 2011).

In the last few decates, Farm Animal Genetic (FAnGR) diversity has rapidly decline, mainly due to changing market demand and intensification of agriculture. Agriculture is shifting away from small production system to large commercial systems, and as a result, selection goals and production environment are now very similar throughout the world (Prentice and Anzar, 2010). According to the FAO,

approximately 20 percent of the world's breed of cattle, goat, pigs, horses and poultry are currently at risk of extinction, and at least one livestock breed become extinct per month over the past several years, resulting in its genetic characteristics being lost forever (Buerkle, 2007). So it is importance to conserve and maintain animal genetic resources to ensure the ability to respond to selection plateaus, consumer demand changes but more importantly biosecurity, environmental and food safety and potentially useful genes available in the gene pool (Pereira and Marques, 2008; Andrabi and Maxwell, 2007)

Genetic erosion of domestic animal diversity has placed 30% of the world breeds at risk of extinction often as a results of government policy / programs. Conservation and sustainable development of Animal Genetic Resources (AnGR) requires a broad focus that includes the many adaptive breeds that survive well in the low external input agriculture typical of developing countries (Drucker *et al.*, 2001).

Major Indonesia FAnGR

The Bali breed is one of the four existing indigenous cattle breeds (Aceh, Pesisir, Madura and Bali) in Indonesia. The Sumban-Ongole and Javan-Ongole may also be considered local breeds. Although no official historical records exists, it is generally accepted that the Bali cattle is the domesticated direct descendant of the wild Banteng still surviving as an endangered species in three National Wild Reservation Parks (Ujung Kulon, Baluran and Blambangan) in Java (Martoyo, 2012). Bali cattle still represents 27% of the total cattle population in Indonesia, and it is considered the pillar breed for small farmers (Purwantara *et al.*, 2012). In order to study the origin of Indonesian cattle Muhamad *et al.* (2009) utilized the Y-chromosomes (Y), mitochondrial DNA (mt) and autosomal microsatellite alleles (μ st). They concluded that Bali cattle is clearly separate from other breeds of cattle. Noor *et al.* (2001a) using the isoelectric focussing method concluded that the Bali cattle has a unique β^{Bali} haemoglobin band that does not exist in *Bos taurus* cattle (Limmousin, Simmental and Brangus). Furthermore, Handiwirawan *et al.* (2003) found that The A and B alleles at INRA035 microsatellite locus are monomorphic and can be used for a specific marker for Bali cattle. Allele A at locus HEL9 that has high frequency (92.90%) in Bali cattle and 100% in Banteng can also be used as a supporting marker. All of the studies indicate that Bali cattle are native to Indonesia and have been domesticated in Indonesia.

In general, the productivity of native animals in the tropics is low, but their adaptability and survival in poor environments may be quite satisfactory. In many tropical countries, attempts to increase productivity have been made by importation of animals from temperate areas and crossbreeding with native animal. This importation and crossbreeding policy has been based on comparison of the high production of breeds from developed countries (primarily temperate) relative to

the production of native breed in less developed countries (primarily tropical), thus leading to unrealistic expectations of the potential for rapid improvement (Barker, 1995). However, while gains may be made for some traits in the crossbred progeny, their overall performance and that of subsequent generations may not be better than the native breed because of their inability to tolerate the adverse environmental conditions, for example poor nutrition and high temperature (Noor *et al.*, 1992).

Pure breeding of Bali cattle can be found at Bali Island, Sumbawa Island, Flores Island and Bone district of South Sulawesi province. Indonesian government has allocated those islands as the main source of Bali cattle. Crossbreeding program can only be conducted outside areas. However due to indiscriminate crossbreeding, the pure Bali cattle at those areas have been contaminated with other breeds., i.e. Simmental, Limousine, Brangus, Charolais, indicating by high frequency of abnormal appearances, including abnormal color patterns and horn shapes (Handiwirawan *et al.*, 2003)

The most recent study shows that the percentage of abnormal sperm on Bali cattle bulls is lower than those of Holstein, Limousine and Simmental bulls. In addition, the monomorphism for FSH sub beta, FSH receptor and GH exist in Bali cattle bulls and can be used as specific markers for the sperm quality. These three markers are closely related to the sperm quality (Ishak, 2012). This result clearly shows that native and domestic animal that experienced a long period of both natural and artificial selection can adopt the climate change. The Bali offers the advantage of a high resistance against most diseases, a remarkable ability to grow on low-quality fodder and a high fertility (McCool, 1991). The superiority of Bali cattle in extensive system and marginal conditions is also exhibit by most of native and domestic Indonesian FAnGR. List of Indonesian FAnGR that can be expected survive in the period of climate change is presented in Table 1.

Global Cimate Change

Reports have indicated that developing countries are more vulnerable to the effects of climate change due to their high reliance on natural resources, very limited capacity to adapt institutionally and financially, and high poverty level (Thornton *et al.*, 2006). Drucker *et al* (2007) stated that the harsh effect of climate change give more impact in intensive livestock production system, such as pastoral communities whose livelihoods depend on climatic sensitive resources. In the face of climate challenges, adaptation of different livestock species to tropical conditions becomes crucial. FAO's Committee on Genetic Resources for Food and Agriculture noted that the management of animals under natural selection by pastoralists in marginal area plays an essential role in their adaptation and fitness in marginal environment (CGRFA, 2009).

In terms of global climate change, increasing resistance to pathogens and

Table 1. List of Indonesia Major Farm Animal Genetic Resources (FAnGR)

FAnGR	Breed	Investigators
Cattle	Aceh	Sari <i>et al.</i> (2010); Abdullah <i>et al.</i> (2012)
	Bali	Noor <i>et al.</i> (2001a); Sukmasari <i>et al.</i> (2002); Nijman <i>et al.</i> (2003); Mohamad <i>et al.</i> (2009); Handiwirawan <i>et al.</i> (2003); Handiwirawan and Subandriyo (2004); Purwantara <i>et al.</i> (2012); Martojo (2012); Ishak (2012)
	Katingan	Utomo <i>et al.</i> (2010); Utomo <i>et al.</i> (2011)
	Madura	Winaya (2010)
	Pesisir	Sarbaini (2004); Jakaria <i>et al.</i> (2007)
	PO	Hartati <i>et al.</i> (2010)
Buffalo	Spotted	Yulnawati <i>et al.</i> (2008)
	Swamp	Sumantri <i>et al.</i> (2010); Misrianti <i>et al.</i> (2010)
Horse	Manado	Takaendengan <i>et al.</i> (2011a); Takaendengan <i>et al.</i> (2011b)
Goat	PE	Zurriyati <i>et al.</i> (2011)
	Kacang	Batubara <i>et al.</i> (2011a); Batubara <i>et al.</i> (2011b)
	Marica	Batubara <i>et al.</i> (2011a); Batubara <i>et al.</i> (2011b)
	Samosir	Batubara <i>et al.</i> (2011a); Batubara <i>et al.</i> (2011b)
	Jawarandu	Batubara <i>et al.</i> (2011a); Batubara <i>et al.</i> (2011b)
	Muara	Batubara <i>et al.</i> (2011a); Batubara <i>et al.</i> (2011b)
	Bengali	Batubara <i>et al.</i> (2011a); Batubara <i>et al.</i> (2011b)
	Jeneponto	Rahardja (2007)
	Kisar	Salamena (2006)
	Fat Tailed	Noor <i>et al.</i> (2001b); Maskur and Arman (2010)
Sheep	Thin Tailed	Dagong <i>et al.</i> (2011)
	Garut	Inounu <i>et al.</i> (2008); Inounu <i>et al.</i> (2009); Dagong <i>et al.</i> (2011)
Chicken	Kampung	Sartika <i>et al.</i> (2004); Sartika <i>et al.</i> (2005); Zein and Sulandari (2008); Sartika <i>et al.</i> (2008); Sulandari <i>et al.</i> (2009); Mu'in <i>et al.</i> (2010); Nataamijaya (2008);
	Pelung	Iskandar (2004)
Duck	Alabio	Prasetyo and Susanti (2007); Rukmiasih <i>et al.</i> (2011); Matitaputty <i>et al.</i> (2011)
	Cihateup	Matitaputty <i>et al.</i> (2011); Rukmiasih <i>et al.</i> (2011);
	Tegal	Prasetyo and Susanti (2010)
	Mojosari	Prasetyo and Susanti (2007); Prasetyo and Susanti (2010)

pests to chemical, high frequency of epidemics growing, increasingly heavy pollution, reduction of genetic diversity may compromise the sustainable of livestock production. Local breeds adapted to local conditions, are often the most suited for providing environmental services, such as management of landscape, including the maintenance and promotion of a particular type of vegetation, crossing corridor preservation of habitats and wildlife. Local breeds may contribute to the prosperity of livestock farmers, even in the poor area, the ecological and cultural tourism (Maxim *et al.*, 2011). Furthermore they emphasized that protecting local breeds can be done by identifying and promoting quality products. Many local races provide unique products of superior quality to those from commercial breeds.

The harsh effect of climate change is expected to have maximum impact on vulnerable pastoral community engaged in extensive livestock production system in dry lands. Osani and Bebe (2010) emphasized the importance of for the selection of animal in harsh environment. Analysis of progeny history records also provide inferences relating to the repeatability of kid survival and a measure of the environmental variance and can be used to predict future performance of dams (Falconer and MacKay, 1996). All these represent useful information for the selection of dams in harsh environment. Some action plan that could be applied include (i) the development of simple methods to characterize adaptive traits in marginal lands (Hoffmann, 2008); (ii) fostering participatory planning and the development of breeding goals and the design of breeding structures for community based adaptation to climate change (Osani and Bebe, 2010); (iii) understand herders perspective on how extensive livestock production system are tailored toward exploiting structural and environmental unpredictability (Kratly, 2008), and finally , this approach will contribute to the strengthening of livestock keepers' capacity and resilience (Hoffmann, 2008)

Conclusion

Global climate change represents a critical challenge to FAnGR in the 21st century. However, Indonesia has many native and domestic FAnGR that have adapted to harsh tropical climate and conditions for a long time. In order to survive the face of climate change, the FAnGR should be kept pure and utilized in sustainable way.

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