CURRICULUM VITA

Name: Arthur Bob Karnuah, Ph.D.

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PERSONAL DATA

Nationality: Liberian
Marital Status: Married

CAREER OBJECTIVE

Prepared and willing to serve and utilize my knowledge and skills, backed by 30 plus years of experience in agricultural research, livestock and poultry management and production, animal science (breeding and genetics), functional genomics and molecular genetics (animal technology) for agricultural and animal industry development. Contribute and lead in a meaningful way in the development of a viable and sustainable agricultural research and development, animal industry (poultry and livestock) by serving. My research interest is in the utilization of the principles of quantitative and molecular genetics as a tool for improving the breeding value of livestock; developing appropriate breeding programs to add value to Animal Genetic Resources to increase their productivity and the development and management of the Animal Genetic Resources (AnGR) for sustainable production and conservation.

EDUCATION:

Ph.D. Kyoto University, Japan, Agricultureal Science (Animal Breeding and Genetics), 1995.
M.Sc. Central Luzon State University, Philippines, Animal Science (Breeding), 1990
B.Sc. University of the Philippines at Los Banos, Philippines, Agriculture (Animal Science), 1988.
Diploma. National College of Agriculture, The Netherlands, Tropical Animal Production, 1982.
Associate Degree (AA), Rural Development Institute, Cuttington University, Suakoko, Liberia. General Agriculture, 1980.

PROFESSIONAL STRENGTH:

Extensive agricultural experience with combing skills in research and development, livestock and poultry management and production, extension services, animal science (breeding and genetics), functional genomics and molecular genetics (biotechnology) for agricultural and animal industry development. A versatile, analytical and hard-working person with a practical hands-on approach, who always perseveres to achieve the best results. Able to collect and analyze information, digest facts and quickly grasp complex technical issues. Proven ability to manage and complete projects to the highest standard within agreed deadlines. Have the proven records of research skills with more than 30 publications in peer journals. Have the ability to write research and competitive grant proposals and win.

INTERNATIONAL EXPOSURE:

Solid grasp of international working experience and knowledge on the agricultural development programs, and livestock production systems in both developing and developed countries. Have studied and worked in the agricultural and livestock sectors of various countries; including Holland, Philippines, Japan, Liberia and USA.

KNOWLEDGE AND SKILLS

Animal breeding and quantitative genetic research:

- Heritability estimates, productive and reproductive traits measurement, genetic and Phenotypic correlations, breeding scheme, carcass estimation via computer image analysis of the cross- section.
- Have extensive production and management capabilities in livestock and poultry.

Molecular genetics and research:

Gene discovery and annotation, DNA and RNA isolation, DNA sequencing, Polymerase Chain **Swine** reaction (PCR) techniques, cDNA library construction and cloning, Expressed Sequenced Tag (EST) production and screening. High throughput sequencing, shot gun sequencing of BAC and contig assembling, Single Nucleotide Polymorphisms (SNPs) detection, DNA finger printing. Method of cell culture and transfection, Western blot analysis, endo H sensitivity, and immunofluorescence assay.

Functional Genomics and Biotechnology:

- Capable of handling most laboratory equipment for analysis, including thermal cycler, gel electrophoresis, DNA sequencer (capillary), Denature High Performance Liquid Chromatography (DHPLC), Photo spectrometer. Single Nucleotide Polymorphisms (SNPs) detection, DNA finger printing. Method of cell culture. Well acquainted with BLAST search, fragment alignment, Consed and PhredPhrap.

WORK EXPERIENCE

08/2024 - present

- **Director General**
- **Central Agriculture Research Institute (CARI), Suakoko, Liberia**

08/2018 to 12/30/2023

- **National Project Coordinator**
- **Emergency Center for Transboundary Animal Disease (ECTAD)**
- **Food and Agriculture Organization (FAO) of the United Nation**
- **One UN Building, Monrovia, Liberia**

Responsibilities: Contributed to the implementation of West and East Africa program to address the problem of emerging and re-emerging high impact zoonoses. The program, "supporting the Global Health Security Agenda (GHSA) is to address zoonotic Diseases and Animal Health in Africa". FAO-ECTAD focuses on developing capacity and supporting the GHSA Country prioritized priority zoonotic diseases.

- Supported to the achievement of the objectives of the GHSS in 14 Countries in West, Central and East Africa.
- Emergency H5N1 HPAI prevention and control in 11Countries in west and central Africa
- Supported Africa sustainable Livestock Project to address policy options to decrease health treats and potential environmental impacts of anticipated unregulated growth of livestock in sub-Saharan Africa.

- Advised the Country Team Lead (CTL) on technical decision making and allocation of required resources for efficient implementation of the USAID supported EPT-2lGHSA Country programme and other ECTAD projects.
- Acted as CTL in his absence. This includes planning and management of the ECTAD Country team, technical, and human resources need in coordination with the FAOR of the Country of assignment (Liberia) and the ECTAD Manager for West and Central Africa.
- Under my guidance and with support of the FAOR and the CTL, liaise with the Government of Liberia, Ministry of Agriculture, development partners, multi-lateral agencies and national and international non-governmental organizations, and the private sector in all matters related to high impact emerging and re-emerging zoonotic and non-zoonotic disease (rEIDs) prevention, surveillance and control programme and related activities.

10/2012 to 01/30/2018

- **Director, Livestock Research and Services**
- **Head, Department of Livestock and Fishery**
- **Senior Research Officer**

Central Agricultural Research Institute (CARI), Suakoko, Bong Country, Liberia

- Responsibilities included the estibishment of livesock (beef cattle, small ruminants, pigs) and poultry research program for sustainable livestock production in Liberia.
- Conducted, coordinated and supervised research programs and activities in livestock and poultry.
- Worked and planned the establishment of a nucleus breeding scheme for goats for within breed selection to improve and select for traits of economic importance.
- Established swine breeding and multiplication program with emphasis on the productive and reproductive traits of the indigenous pigs and their crosses (with exotic) under improved management system.
- Researched on the available and utilization of local feed ingredients and their combination in feeding pigs for profitable pig production
- Investigated the growth performances of fresh fish (Tilapia (Nile & Zilli), Heterotes, Catfish under aquaculture in Liberia.
- Secured a grant from FAO under the Techical Cooperation Program (TCP) for the survey and phenotypic characterization of livestock breeds and production systems in Liberia for the development of a National Strategy and Action Plan for animal genetic resources.
- Developed the National Strategies and Plan of Action (NSPA) for the sustainable use of Animal Genetic Resources in Liberia. Animal Genetic Resources are valuable natural assets critical to the acheivement of food security.

02/2015 to 06/2016

- **Lecturer-Part Time,** College of Agriculture and Sustainable Development, Cuttington University, Suakoko, Bong County, Liberia
- Taught Animal Breeding and Genetics, and Animal Production

10/2005 to 09/2012

- **Research Professional II**, Department of Poultry Science, University of Georgia, Athens, USA
- Research activites involved poultry genetics and feed efficiency in broilers; Genotyping and searching for markers and genes affecting feed efficiency and fat deposition. Integration of gene expression; SNP and digestibility to improve feed efficiency in meat-type chickens.
- Coordinator of the poultry processing plant and facilities, supervision, and operation of

the poultry product laboratory, researched in poultry meat quality and food safety.
- Carried out teaching and service function of the department of poultry Science.
- Supervised technical support staff and graduate students, maintaining research budgets and financial records.

5/2004 – 9/2005
- **Research Associate**, Department of Genetics, University of Georgia, Athens, GA, USA
- Researched on the mechanism that alters function of Kit ligand (growth factor) in mutant mouse and the amount of Kit ligand protein that is release into cell culture medium. Carried out comparative non-coding sequence analysis among mouse, human and cattle.

1/2003 – 4/2004
- Research **Associate**, Plant Genome Mapping Laboratory, Center for Applied Genetic Technologies, University of Georgia, Athens, GA, USA
- Researched on Single Nucleotide Polymorphisms (SNPs) detection through DNA finger printing to produce assays that genetically differentiate Bermuda grass cultivars golf course companies.

6/2001 - 12/2002

Research Associate, Department of Genetics, University of Georgia, Athens, GA
- Conducted research in functional genomics, gene discovery and annotation.
- High throughput sequenced a 7-day chick embryo cDNA library, analyzed, assembled and cataloged of the genes.
- Shot-gun sequenced Bacteria Artificial Chromosomes (BACs) that contained the entire "expression unit" of the *ovalbumin* gene from chicken and assembled the contig.

9/1998 - 5/2001
- Research **Associate,** Laboratory of Gene Function, Dept. of Animal Breeding & Genetics, National Institute of Animal Industry, Tsukuba, Japan
- Conducted research on Segregation distortion in a swine resource family; searched for gene causing mal-fetus development in pig, cDNA library sequencing; EST production and analysis; radiation hybrid (RH) panel/gene mapping.

9/1996 - 8/1998
- Postdoctoral **Research Fellow,** Laboratory of Animal Breeding & Genetics, Graduate School of Agriculture, Kyoto University, Kyoto, Japan
- Carried out research on carcass composition of Japanese beef cattle and the inheritance of carcass traits by computer image analysis technique.
- Established the methodology for estimating cascass composition using computer image analysis of the information extracted from the carcass cross-section.
- Developed several prediction equations for estimating carcass compositions in different beef cattle breeds.

1/1991 - 12/1992
- Research **Assistant (beef cattle management),** Division of Research Coordination, Azabu University, Sagamahira 229, Japan
- Worked in a team of beef cattle management experts on a large-scale (5,000 cattle) commercial farm (Nakayama Chikusan Corporation Ltd., Japan).
- Responsibilities were the collection and analysis of production and reproduction data, embryo transfer, artificial insemination, calf management, feeds and feeding.

1/1989 - 12/1990

- **Lecturer,** Dept. of Animal Science, Central Luzon State University, Nueva Ecija Philippines.
- Taught undergraduate courses in Animal Breeding & Production.
- Supervised the successful implementation of students field projects and experiments.

1/1988 - 12/1990

- **Extension Specialist**, Small Ruminant Improvement Project, Philippines Council for Agricultural Research and Rural Development (PCARRD), Central Luzon State University, Nueva Ecija, Philippines
- Developed an Integrated Livestock/Crop Farming System (goats/Tree crops) with rural farmers.
- Conducted cross breeding research with goats on the infusion of exotic genetic materials to upgrade indigenous stocks.

1/1982 to 12/1984

- **Project Officer**, Livestock Division, Ministry of Agriculture, Monrovia, Liberia

- Government beef cattle ranch project.
- Responsibilities included setting up and carrying out upgrading and cross breeding programs through controlled breeding and natural mating, pasture improvement scheme and feedlot management.
- General supervision of project personnel.

1/1977 to 12/1979

- **Livestock Extension Officer**, Livestock Division, Ministry of Agriculture, Grand Bassa Country, Liberia
- Carried out extension works with livestock and poultry farmers. Extension service responsibilities included teaching farmers on improved management principles, proper nutrition, feeding and housing, animal health program and disease control.
- Slaughterhouse management and meat inspection.

FELLOWSHIP AWARDS

a) 1981 - 1982 Netherlands Technical Assistance Fellowship
Donor: Ministry of Foreign Affairs, The Netherlands
Field: Tropical Animal Production

b) 1984 - 1985 Japan International Cooperation Agency Fellowship
Donor: Ministry of Foreign Affairs, Japan
Field: Research Studies in Animal Science (Breeding and Nutrition)

c) 1994 - 1996 Graduate Studies Fellowship
Donor: Ministry of Education, Culture and Tourism, Japan
Field: Animal Science (Breeding and Genetics)

d) 1996 - 1997 Japan Society for the Promotion of Science Fellowship

Donor: Japan Society for the Promotion of Science, Japan
Field: Cooperative research with host researcher in animal breeding and genetics in beef cattle

e) 1998 - 2000 National Institute of Animal Industry Postdoctoral Fellowship
Donor: National Institute of Livestock and Grassland Science, Ministry of Agriculture, Forestry and Fisheries, Japan
Field: Research in Functional genomics (porcine genome project)

PROFESSIONAL SOCIETIES

American Society of Animal Science
Japanese Society of Zootechnical Science
International Society for Animal Genetics (I.S.A.G.)
Philippines Society of Animal Science

CONFERENCES AND WORKSHOPS ATTENDED ON ANIMAL GENETIC RESOURCES (AnGR) DEVELOPMENT

October 4th - 6th, 2023: Participated in the Regional Workshop on the Evaluation of the Implementation of the In-Service Applied Veterinary Epidemiology Training Program (ISAVET). Held in Dakar, Senegal.

November 23rd – 25th, 2022: Participate in the 7th African Regional Emergency Center for Transboundary Animal Disease (ECTAD) Meeting (AfREM) organized by UN-FAO. Held in Dakar, Senegal.

April 15th - 17th, 2019: Participate in the 4th African Regional Emergency Center for Transboundary Animal Disease (ECTAD) Meeting (AfREM) organized by UN-FAO. Held in Nairobi, Kenya.

November 13th – 15th, 2017: Participated in the 4th General Assembly meeting of sub-regional focal point for the management of Animal Genetic Resources in West Africa. Organized by CORAF and AU-IBAR. Held in Accra, Ghana.

October 31st - November 2nd, 2017: Participated in the African Goat Improvement Network Workshop V (AGIN V). Organized by ARC, (FAO), and USDA – ARS as part of the USAID – USDA) Feed the Future Livestock Improvement Project. Held in Hatfield, Pretoria, South Africa.

July 18th – 21st, 2017: Participated in the Leadership Development Forum (LDF) in Mainstreaming Adaptation and Disaster Risk Reduction into Development (MADRiD) with a focus on integrating disaster risk reduction in the health sector. Organized by the United Nations Office for Disaster Risk Reduction (UNISDR), in partnership with WHO. Held in Dakar, Senegal.

March 5th – 6th, 2016: Participated in a validation workshop of the proposal for the development of a harmonized regulatory framework for the circulation and use of animal genetic materials in the ECOWAS regions. Organized by CORAF/WECARD. Held in Dakar, Senegal.

October 29th – 31st, 2015: Participated in the 2nd General Assembly meeting of Sub-Regional Focal Point for Animal Genetic Resources in West Africa. Organized by AU-IBAR and West and Central African Council for Agricultural Research and Development (WECARD). Held in Dakar, Senegal.
August 10th – 15th, 2015: Participated and presented in a regional training on the "Development of National Strategies and Action Plans for Animal Genetic Resources". Organized by AU-IBAR. Held in Lome, Togo.

January 29th – 31st, 2014: Participated and presented in Animal Genetic Resources (AnGR) Workshop with National Coordinators: 2nd State of the World's Animal Genetic Resources for Food and Agriculture: Preparation of Country Reports for submission to FAO. Organized by AU-IBAR. Held in Naivasha, Kenya.

October 29th - 31st, 2014: Participated in 2nd General Assembly meeting of the Sub-Regional Focal Point for the Management of Animal Genetic Resources in West Africa. Organized by AU-IBAR. Held in Dakar, Senegal.

November 5th – 9th, 2013: Participated in a Regional Workshop on Animal Genetic Resources in Sub-Saharan Africa in acquainting NC with the project, eliciting inputs and the implementation strategy in order to customize the project log frame and work plan to specific Country context. Organized by FAO-AU-IBAR. Held in Ouagadougou, Burkina, Faso.

May, 6th – 10th, 2013: Participated in a National Workshop on Reinforcing Veterinary Governance in Africa (VET-GOV); National Consultative Multidisciplinary Stakeholders Workshop (NCMSW). Organized by the Ministry of Agriculture, Liberia, and African Union-InterAfrican Bureau for Animal Resources (AU-IBAR). Held in Monrovia, Liberia.

RESEARCH GRANTS OBTAINED

June 2015-December 2016. FAO-Techical Cooperation Program (TCP) for the survey and phenotypic characterization of livestock breeds and production systems in Liberia for the development of a National Strategy and Action Plan for animal genetic resources.

January-December 2017. USAID BHEARD Institutional Support for CARI Institutional Capacity Building. Research grant for acquaculture (Talipia).

PUBLICATIONS

PATENT

Karnuah, A. B., M. Leavitt, J. Rapp and R. Ivarie. 2003. Site- Directed Avian Transgenesis Using a Chicken Ovalbumin Gene Region. United States Patent and Trademark office and the University of Georgia Research Foundation, Inc. Serial No. 60/462,953.

PUBLISHED RESEARCH PAPERS

Karnuah, A. B., R. Osei-Amponsah, G. Dunda, A. Wennah, W. T. Wiles and P. Boettcher. 2018. Characterization of local sheep Production System and morphology in Liberia. *African Journal of Rural Development, Vol. 3 (4), pp. 943-954.*
Karnuah A.B., G. Dunga, T. Rewe. 2018. Community based breeding program for improve goat production in Liberia. *MOJ Curr Res & Rev.* 1(5):216–221. http//medcraveonline.com/ MOJCRR/MOJCRR-01-0036.pdf.

Karnuah, A. B., R. Osei-Amponsah, G. Dunda, A. Wennah, W. T. Wiles and P. Boettcher. 2018. Phenotypic Characterization of the West Africa Dwarf Goats and the Production System in Liberia. *International Journal of Livestock Production (IJLP).* https://www.academicjournals.org

Karnuah, A. B., R. Osei-Amponsah, G. Dunda, A. Wennah, W. T. Wiles and P. Boettcher. 2018. Phenotypic Characterization of Pigs and their Production System in Liberia. *International Journal of Livestock Production (IJLP).* https://www.academicjournals.org

Karnuah, A. B., G. Dunda, A.. T. Wiles, E. Greaves, R. Varkpeh, R. Osei-Amponsah Wennah, and P. Boettcher. 2018. Phenotypic Characterization of Beef Cattle Breeds and Production Practices in Liberia. Tropical Animal Health and Production. https://doi.org/10.1007/s11250-018-1557-z

Lee, J., **A. B. Karnuah**, R. Rekaya and N. B. Anthony. 2015. Transcriptomic Analysis to Elucidate the Molecular Mechanisms that Underlie Feed Efficiency in Meat-type Chickens. Molecular Genetic Genomics, 290:1673-1682.

Phongpa-ngan, P., J. Jung, N. B. Anthony, **A. B. Karnuah**, J. H. Mulligan, S. E. Aggrey and L. Wicker. 2014. Quality Attributes in Breast Muscle from Broilers of an Arkansas Randombred Line Varying in Growth Rate. Journal of Poultry Science, 93; 187-193.

Aggrey, S. E., **A. B. Karnuah** and R. Rekaya. Transcriptomic Analysis in the Nitrogen Recycling Pathway of Meat-Type Chickens Divergently Selected for Field Efficiency. 2013. Sichting International Foundation for Animal Genetics, 45:215-222.

Shim, M. Y., **A. B. Karnuah**, N. B. Anthony, G. M. Pesti and S. E. Aggrey. 2012. The Effects of Broiler Chicken Growth Rate on Valgus, Varus, and Tibial Dyschondroplasia. Journal of Poultry Science, 91:62-65.

Shim, M. Y., **A. B. Karnuah**, A. D. Mitchell, N. B. Anthony, G. M. Pesti and S. E. Aggrey. 2012. The Effects of Growth Rate on leg Morphology and Tibia Breaking Strength, Mineral Density, Mineral Content, and Bone Ash in Broilers. Journal of Poultry Science, 91:1790-1795.

Shim, M. Y., M. Tahir, **A. B. Karnuah**, M. Miller, T.D. Pringle A. D. Mitchell, S. E. Aggrey and G. M. Pesti. 2012. Strain and Sex Effects on Growth Performance and Carcass Traits of Contemporary Commercial Broiler Crosses. Journal of Poultry Science, 91:2942-2948.

Aggrey, S.E., J. Lee, **A. B. Karnuah** and R. Rekaya. 2011. Pathways Underlying Feed Efficiency Phenotypes in Meat-Type Chickens. USDA Grant Holders Round Table Conference. April; Washington, DC, USA.

Aggrey, S. E., **A. B. Karnuah**, B. Sebastian and N. B. Anthony. 2010. Genetic Properties of Feed Efficiency Parameters in Meat-Type Chickens. Genetics Selection Evolution, 42:25.

Aggrey, S.E., **A. B. Karnuah,** B. Sebastian and N.B. Anthony. 2010. Genetics Properties of Feed Efficiency Parameters in Meat-Type Chickens. J Genetics Selection Evolution, 42:25-29.

Aggrey, S.E., J. P. McMurtry and **A. B. Karnuah.** 2010. Integration of Gene Expression, SNP, and Digestibility to Improve Feed Efficiency in Meat-Type Chickens. Plant and Animal Genome XVIII (conf. proceedings, pp 590), San Diego, CA, USA.

Aggrey, S.E., J. P. McMurtry and **A. B. Karnuah.** 2009. Genetic Variants of the IGF1 and IGF2 Genes are Associated with Feed Efficiency in Poultry. Plant and Genomes XVII (Conf. proceedings), Jan. 9-13, San Diego, CA, USA

Aggrey, S.E., A.P. Sangligar, **A.B. Karnuah**, and J.P. McMurtry. 2008. Molecular Basis of Feed Efficiency in Meat-Type Birds. Proceedings of the 23rd World's Poultry Congress: 30 June-4 July; Brisbane.

Karnuah, A.B., J. C. Rapp, M. C. Leavitt, R. Crooijmans, M. Groenen, and R. Ivarie. 2005. The *X, Y, Ovalbumin* Gene Region is Part of a Serpin Gene Complex Containing a Novel Repetitive DNA Element, *Galluga.* Internal. Department of Genetics, UGA.

Karnuah, A.B., E. J. Gleason and A. H. Paterson. 2004. Single Nucleotide Polymorphisms to Differentiate Bermuda grass Cultivars with DHPLC. I. Developing Standards for DNA Fingerprinting of Bermuda grass. Internal. Department of Genetics, UGA.

Karnuah, A.B., H. Uenishi, S. Kiuchi, M. Kojima, A. Onishi, H. Yasue and T. Mitsuhashi. 2001. New Regional Correspondences Revealed Between Swine and Human Chromosomes by Radiation Hybrid Mapping. Plant and Animal Genome IX (conf. proceedings, pp 77), San Diego, CA, USA.

Karnuah, A.B., K. Moriya, N. Nakanishi, T. Nade, T. Mitsuhashi and Y. Sasaki. 2001. Computer Image Analysis for Prediction of Carcass Composition from Cross-Sections of Japanese Black Steers. J. Anim. Sci. 79:2851:2856.

Karnuah, A.B., H. Uenishi, S. Kiuchi, M. Kojima, A. Onishi, H. Yasue and T. Mitsuhashi. 2000. Assignment of 64 Genes Expressed in 28-day Old Pig Embryo to Radiation Hybrid Mapping. Mamm. Genome 12, 518-523.

Karnuah, A.B., H. Uenishi, H. Yasue and T. Mitsuhashi. 2000. Radiation Hybrid (RH) Mapping of Expressed Sequence Tags from a 28-Day Old Pig cDNA Library. The 27th International conf. of Anim. Genetics (conf. proceedings, pp 29), Minnesota, USA.

Bossak N., **A. Karnuah**, Y. Yamamoto and T. Mitsuhashi. 2000. The PCR-Based Approaches for the marek's Disease Virus Sequences Determination in the Chickens. The 6th International Symposium on marek's Disease (Conf. proceedings, pp 12-13), Montreal, Canada.

Karnuah, A.B., K. Moriya and Y. Sasaki. 1999. Extraction of Computer Image Analysis Information by Desk Top Computer from Beef Carcass Cross Section. Asian-Australasian J. Anim. Sci., 12(8):1171-1176.

Karnuah, A.B., K. Moriya, K. Mitani, T. Yamazaki and Y. Sasaki. 1996. Estimation of carcass Composition by Computer Image Analysis in the Cross Sections of Cross-bred Steers. Canadian J. Anim. Sci. 76 (4): 497-506.

Karnuah, A.B., K. Moriya, Y. Sasaki, M. Mitsumoto, T. Mitsuhashi and S. Ozawa. 1995. Estimation of Carcass Composition by Computer Image Analysis in the Cross Sections of Japanese Steers. Anim. Sci., Technol. (Jpn.), 66: 987-993.

Karnuah, A.B., K. Moriya, Y. Sasaki and K. Mitani. 1995. Estimation of Beef Carcass Composition from the Cross Section Around the Longissimus Muscle in Holstein Steers by Computer Image Analysis. Anim. Sci., Technol. (Jpn.), 66: 323-329.

Karnuah, A.B; K. Moriya and Y Sasaki. 1994. Extracting Information from Beef Carcass Cross Section by Image Analysis and Its Relationship to Muscle Weight. Bioimages 2(2): 125-131.

Karnuah, A.B., K. Moriya and Y. Sasaki. 1994. Computer Image Analysis Information Extracted from Beef Carcass Cross Section and its Precision. Anim. Sci., Technol. (Jpn.), 65: 515-524.

Karnuah, A.B., M.S. Suba and B.R. Gines. 1992. Comparative Growth Performance of Goats (Capra hircus) with Varying Blood Composition Under CLSU Condition. CLSU Sci. J. Vol. 12 (1) pp. 8-19.

Karnuah, A.B., M.S. Suba and B.R. Gines. 1992. Comparative Reproductive Performance of Goats (Capra hircus) with Varying Blood Composition Under Full Grazing System. CLSU Sci. J. Vol. 13 (1) pp. 1-11.

Karnuah, A.B., A.L. Lambio, C.R. Aroboleda, E.S. Luis and M.L.B. Versa Cruz. 1987. Management System and Dietary Level Treatments on the Growth Performances of Indigenous Mallard Duck (Anas Platyrnchos). Phil. J. Anim. Science, 13(4) :(46).

REFERENCES

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