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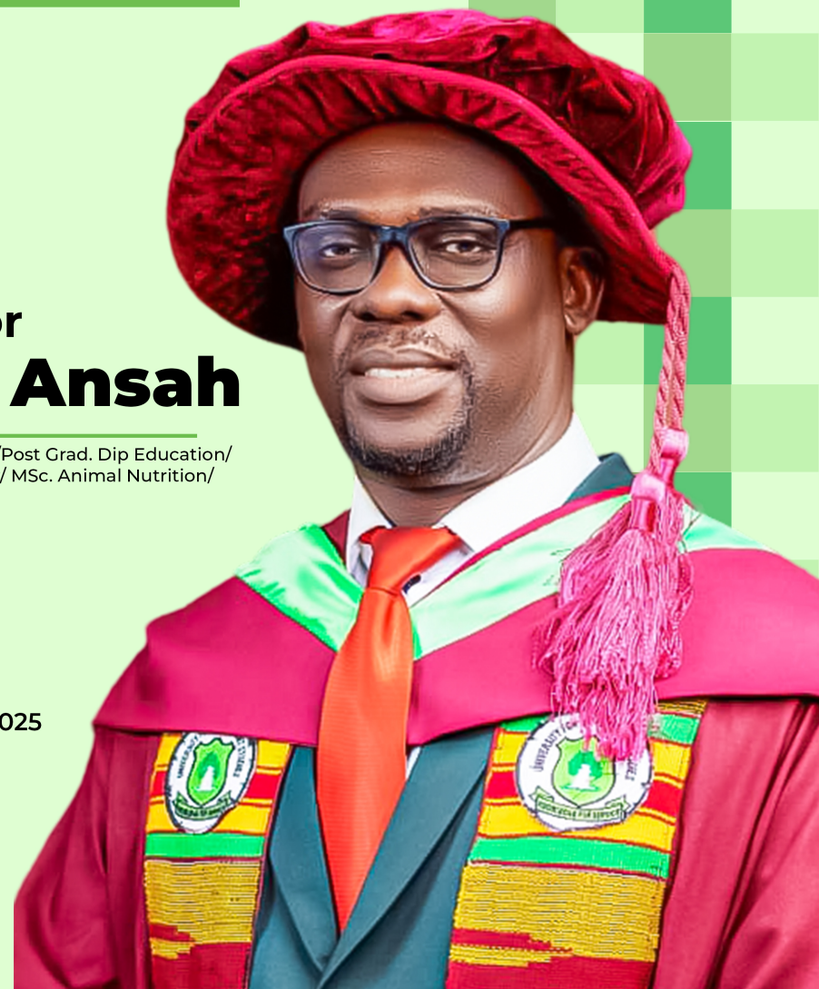
Feeding the Future:

Transforming Sheep and Goat Farming in the Arid and Semi-Arid Zones through Innovative Feed Solutions

Inaugural Lecture By



Professor

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BSc. Agric. technology/ MSc. Animal Nutrition/
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Friday, April 4, 2025

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Professor Terry Ansah

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2025

Inaugural Lecture Delivered under the Chairmanship of

Professor Seidu Al-hassan
Vice-Chancellor, UDS

Venue: Dr. Andani Andan Academic Chamber, Central Administration Block, Tamale Campus, Dungu

Friday, April 4, 2025

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Professor of Animal Nutrition

Profile

PROFESSOR TERRY ANSAH (PhD)

Prof. Terry Ansah is an esteemed academic and researcher in Animal Science, with a focus on animal nutrition, livestock production, and sustainable agricultural systems. A proud Ghanaian, he currently holds the position of Professor in the Department of Animal Science at the University for Development Studies (UDS) in Tamale, Ghana. With a deep commitment to enhancing livestock production and sustainability, Prof. Ansah has made significant contributions to both smallholder and commercial farming systems. Born on **1st January 1980** in Nima, a traditional Zongo community, to Rev. Francis Yaw Ansah and Mrs. Judith Ansah Sappor, he is the second of five siblings: Stanley Ansah, Stephen Nana Ansah, Gladys Ansah, and Naomi Ansah. Prof. Ansah has been married to Janet Ansah since 2009, and they are blessed with three children: Michelle Awo-Oparebia Ansah, Graham Nana Adjei Ansah, and Gabriel Nene Adugah Ansah.

Academic Background and Professional Training

Prof. Terry Ansah's academic journey is a testament to his commitment to excellence and continuous learning. He began his education at Sal-Valley Preparatory School in Kanda, attended Knada ACC and Providence JSS at Kotobabi for his junior secondary education, and completed his senior secondary education at Winneba Secondary School. Prof. Ansah holds a **PhD in Animal Science (Nutrition Option)**, earned through a collaborative program between the University for Development Studies (UDS), Ghana, and Harper Adams University, UK (2011-2015). Prior to this, he completed an **M.Phil. in Animal Nutrition** at the Kwame Nkrumah University of Science and Technology (KNUST), Ghana, in collaboration with Copenhagen University, Denmark (2007-2010). He also holds a **BSc in Agricultural Technology** (2000-2004) and a **Postgraduate Diploma in Education** from UDS (2019-2020).

Beyond his formal academic qualifications, Prof. Ansah's commitment to broader personal development is reflected in his completion of a **Diploma in Pastoral Ministry** from the Northern Ghana Baptist Theological Seminary (2020-

2021). His academic and personal growth continues to shape his work in academia and beyond.

Academic and Research Career

Prof. Ansah's academic journey at the University for Development Studies spans over a decade, during which he has progressed from Senior Research Assistant to his current role as Professor. His contributions to animal science have had a profound impact, particularly in livestock nutrition, feed formulation, and sustainable farming systems.

Prof. Ansah's research focuses on optimizing livestock nutrition across both smallholder and commercial systems. He has significantly advanced the understanding and enhancement of forage quality, developed efficient feed formulations to boost ruminant productivity, and explored sustainable forage cropping practices to ensure year-round feed availability. His work extends to evaluating the agronomic performance of various forages, including *Cenchrus purpureus* (elephant grass), Brachiaria spp, *Megathyrsus maximus* (Guinea grass), and *Cajanus cajan* (pigeon pea), as well as assessing the potential of rumen digesta as an alternative feed resource.

A major aspect of his research involves mitigating enteric methane emissions from ruminants, supporting environmental sustainability in livestock farming. Furthermore, he has examined the potential of crop residues—especially those from improved legume varieties—in enhancing feed efficiency and ruminant productivity. Prof. Ansah's goal is to create more sustainable and resilient livestock systems that cater to the needs of both smallholder and commercial livestock producers.

Major Research Projects and Collaborative Work

Prof. Ansah's research projects reflect his commitment to addressing key challenges in livestock production. Notable projects include investigating forage yield and nutritional quality, developing feed formulations for improved ruminant productivity, and studying forage cropping patterns that promote sustainable livestock feed production. His ongoing work on rumen digesta as a

cost-effective and sustainable feed resource highlights his focus on alternative feed solutions to improve ruminant nutrition.

Prof. Ansah has also contributed to several collaborative funded research projects, including the Innovate UK Scoping Grant for goat production in Africa, the Technology Establishment for Regional-Adapted Regenerative Agriculture in Africa (TERRA Africa), and the Sustainable Intensification of Key Farming Systems in the Guinea-Sudano Sahelian Zone of West Africa, among others. These collaborations have allowed him to address global challenges in livestock production and agricultural sustainability, particularly in the context of climate change and its impact on food security.

Supervision and Mentorship

Throughout his career, Prof. Ansah has supervised a significant number of students, including 12 postgraduate students (PhD and MPhil) and over 50 undergraduate students. His mentorship has played a pivotal role in shaping the next generation of agricultural scientists. His research publications are extensive, with over 80 journal articles and refereed conference proceedings, and he has presented at more than 30 local and international conferences.

Leadership and Administrative Experience

In addition to his academic achievements, Prof. Ansah has demonstrated strong leadership and administrative capabilities at UDS. He currently serves as the Dean of the Faculty of Agriculture, Food, and Consumer Sciences, a role he has held since 2021. Prior to this, he was the Vice Dean of the Faculty and has also held several other leadership positions, including Examination Officer, Faculty Third Trimester Field Practical Program (TTFPP) Cordinator, Chairman of various committees, and a member of the University Governing Council.

His leadership extends beyond academia into various administrative and governance roles, where he has contributed to strategic planning, accreditation processes, and quality assurance in academic programs. He has been instrumental in shaping the direction of the Faculty and the University, and his efforts have had a lasting impact on the academic community at UDS.

Community Service and Professional Engagement

Prof. Ansah is deeply committed to community service, both within his academic institution and in the wider society. He has played an active role in professional organizations, having served as President of the Ghana Animal Science Association (GASA) from 2021 to 2023. He is also a member of several other professional groups, including the Ghana Society of Animal Production (GSAP) and the Indian Society for Sheep and Goat Production and Utilization (ISSGPU). His involvement with these organizations has significantly advanced the field of animal science in Ghana and internationally.

In addition to his professional contributions, Prof. Ansah is a dedicated leader in various social and community initiatives. He serves as the National President of the UDS Alumni Association and is actively engaged with the Ghana Baptist Convention. As a licensed minister with the Ghana Baptist Convention, he oversees the Student Ministry at the Dungu Campus of the University for Development Studies. He also serves as the patron of the Student Christian Council at the Nyankpala Campus of UDS. Furthermore, Prof. Ansah chairs the Scripture Union Regional Committee for the Northern, Savanna, and Upper East Regions, representing the region on the national Council of Scripture Union.

Prof. Ansah has also contributed to national and international projects, such as monitoring the implementation of the new Senior High School curriculum in Ghana, overseeing internal assessments and transcripts for SHS, and serving as an external assessor and examiner for various tertiary institutions. Additionally, he served as an independent consultant for the development of a climate-smart agriculture investment plan, which was funded by the World Bank.

Awards and Recognition

Prof. Ansah's contributions to the field of animal science have been widely recognized. He was awarded the prestigious Commonwealth Scholarship for his PhD and the DANIDA Grant for his MPhil studies. He also received the CV Raman Fellowship Award for International Scientists. These honors reflect his excellence in research and his commitment to advancing agricultural science in Ghana.

Conclusion

Prof. Terry Ansah's career exemplifies his unwavering commitment to advancing animal science, enhancing livestock production, and promoting sustainable agricultural practices. His vast contributions in research, leadership, and community service have had a profound impact on both academic and agricultural sectors. By focusing on the challenges faced by both smallholder and commercial farmers in Ghana and West Africa, Prof. Ansah remains a prominent figure in the field, continually shaping the future of livestock production and sustainable agricultural development.

Programme

Topic	:	**Feeding the Future: Transforming Sheep and Goat Farming in the Arid and Semi-arid Zones through Innovative Feed Solutions**
Venue	:	Dr. Andani Andan Academic Chamber, Central Administration Block, Tamale Campus, Dungu GPS: NT-0272-1946
Chairman	:	Vice-Chancellor, **Professor Seidu Al-hassan**
2:00 pm	:	Guests Seated
2:15 pm	:	Vice-Chancellor Procession (Audience stand) - Prayers (Christian and Moslem) - Introduction of Chairman by the Registrar, **Mr. Nurudeen Issah Abubakari** - Welcome Address/Introduction of Speaker by the Vice-Chancellor, **Professor Seidu Al-hassan** - Lecture on "Feeding the Future: Transforming Sheep and Goat Farming in the Arid and Semi-arid Zones through Innovative Feed Solutions" by **Prof. Terry Ansah** - Chairman's Closing Remarks - Vote of Thanks by **Dr. Mary Salifu Danse** - Announcements - Recession (Audience stand)

Dedication

First and foremost, I dedicate this lecture to my parents, Rev. Francis Yaw Ansah and Madam Judith Sappor Ansah. Their steadfast support throughout my education, coupled with the strong moral values and deep-rooted Christian faith they instilled in me, have been pivotal in both my academic and personal development. Their unwavering love and guidance have provided a solid foundation upon which I continue to build.

Additionally, I want to acknowledge the importance of peaceful co-existence and mutual respect among individuals of different religions, races, and tribes. My parents have exemplified these principles, teaching me the value of embracing diversity and fostering harmonious relationships with others.

Secondly, I dedicate this lecture to the late Rev. Thomas Sayibu Imoro (may his soul rest in peace) and his family. Rev. Imoro opened his doors to mentor me, offering leadership opportunities that allowed me to learn and grow in ways I will forever cherish. This is but a small token of my gratitude for the profound sacrifices you have made for me.

Extended Abstract

Sheep and goats play a pivotal role in the agricultural landscape of many developing countries, especially in rural areas where they contribute to food security, economic stability, and employment opportunities. These animals are particularly valuable in arid and semi-arid regions, where they efficiently utilize marginal lands that are unsuitable for crop production. Globally, sheep and goat meat production has been steadily increasing, with mutton production rising by 16% and chevon by 15.5% between 2012 and 2022. In Ghana, sheep and goat farming is largely carried out under smallholder systems, with the Djallonké and Sahelian breeds being the primary livestock raised. In recent times, Boer goats have garnered significant attention from commercial goat producers in Ghana. Known for their rapid growth, high meat yield, and adaptability to diverse environments, Boer goats have become increasingly popular among farmers aiming to improve productivity and meet rising local and export demands for high-quality goat meat.

Despite the significant production of small ruminants, Ghana's sheep population of 8.6 million and goat population of 5.8 million currently meet only about 30% of the national demand for small ruminant meat, creating a considerable gap. Northern Ghana is the main production hub, contributing approximately 70% of the country's sheep and goat output. However, Ghana is still facing a trade imbalance, importing more sheep and goat meat than it exports. This underscores the need to enhance productivity within the sector.

The small ruminant industry in Ghana is hindered by several challenges, including theft, disease outbreaks, high mortality rates, and the absence of a structured and reliable livestock feed system. Among these, the lack of adequate and quality feed resources is one of the primary constraints, leading to suboptimal animal performance, malnutrition, and reduced productivity. Proper nutrition is vital for the growth, reproduction, and milk production of small ruminants. Unfortunately, many smallholder farmers struggle to provide balanced diets for their animals, especially during the dry season, undermining the genetic potential of even the best breeds and preventing the sector from meeting local demand and generating exportable surpluses.

The importance of a well-structured feed system cannot be overstated. Small ruminants require a substantial amount of dry matter for maintenance and growth. While pasture and browse plants form the foundation of their diet, supplemental feed is often necessary to meet their nutritional needs, particularly

in the dry season. The agricultural systems in Ghana's Savanna Agro-Ecological Zone depend on four primary livestock management systems—extensive, semi-intensive, tether-extensive, and intensive—which each have distinct feed requirements and face unique sustainability challenges.

This lecture emphasizes the importance of addressing the "Nutritional Feed Gap," which is worsened by seasonal fluctuations in feed availability and quality. During the dry season, biomass yields from pastures decrease sharply, reducing the nutrients available to livestock. This feed scarcity negatively affects the growth and productivity of sheep and goats, threatening the sector's contribution to food security. The widespread reliance on natural pasture, combined with competing land-use demands, further exacerbates the situation, especially as grazing lands are often shared with crop farmers, leading to conflicts over land use.

To address these challenges, this lecture underscores the significance of integrating indigenous forage varieties and browse plants into small ruminant feeding systems. Research has shown that species like *C. purpureus* (Pennisetum purpureum), *P. glaucum* (Pearl millet), and *B. GP0423* (Brachiaria) offer substantial benefits, including high biomass yield, crude protein content, and total digestible nutrients (TDN). B. GP0423 yields 3-3.7 tons per hectare, with a crude protein content of 12.5-12.8% and a TDN range of 45.8-50.5%, while P. Massai stands out with a yield of 5-5.5 tons per hectare, crude protein content of 11.9-12.1%, and TDN values between 48.5-49.3%. These varieties offer higher nutritional values, particularly in terms of crude protein, which is essential for maintaining livestock health and productivity. They are excellent candidates for supporting livestock growth, especially in areas where feed availability and quality are key constraints. This diverse range of forage varieties provides multiple options for farmers seeking to optimize livestock nutrition. However, factors such as yield consistency, seasonal availability, and cost-effectiveness should be considered when selecting the best forage for a given environment. For regions with fluctuating feed availability, these forages can significantly enhance livestock productivity and contribute to sustainable animal husbandry practices.

In addition to the above forage species, other crops like groundnut, cowpea, and pigeon pea residues offer supplementary feed options for livestock. The data shows different varieties of groundnut (peanut) and their associated annual biomass yield and crude protein content. The highest yielding variety is Mani Pinta (Late), with an impressive 5.4 t/ha biomass yield, although it has a

moderate crude protein content of 10.3%. Other varieties such as Azivivi (Late) and Samnut 23 produced 6.6 t/ha and 3.0 t/ha, respectively, with crude protein contents around 11-13%. Samnut 22 had the highest crude protein content at 13.4%, but with a lower yield of 3.5 t/ha, suggesting it could be a more protein-dense option compared to higher-yielding varieties like Yenyawoso (Early) (3.7 t/ha with 11.4% crude protein).

The cowpea varieties exhibit significant variation in both biomass yield and crude protein content. Zaayura-SARC 4-75 yielded the highest biomass at 11.7 t/ha, with a relatively high crude protein content of 15.3%, making it a highly efficient forage crop. Other varieties like Songotra-IT97K-499-35 (3.5 t/ha, 13.8% protein) and Asomdwe-IT94K-410-2 (15% protein) also provide good yields and high protein, offering versatile options for supplementation in animal diets. Padituya, with a biomass yield of 2.5 t/ha, likely has a lower total nutritional contribution, though its protein content was not provided. Pigeon pea, with a variety of biomass yields ranging from 1-4 t/ha, presents a flexible legume for livestock feed. The crude protein content of pigeon pea varies significantly, with some local varieties offering 13-23.5% crude protein. This variation suggests that pigeon pea could be a valuable crop, depending on the specific variety selected for cultivation, especially in areas requiring a high-protein supplement for livestock.

Rice varieties were also tested for biomass yield and crude protein content. The highest yielding varieties were Exbaika and Long grain ordinary 2, with yields of 4.1 t/ha. The protein content for these varieties, however, is relatively low, around 4.5-6.0%. Although rice straw is often used for animal feed, it does not provide as much nutritional value as the legume crops mentioned previously. This suggests that rice, while useful for biomass, may need to be supplemented with other higher-protein feeds for effective livestock nutrition.

Additionally, the proximate compositions of processed rumen digesta were influenced by both the season of collection and the method of processing. During the early wet season (EWS), sun-dried rumen digesta had a dry matter (DM) content of 95.5% and a crude protein (CP) content of 13.3%. Oven-dried samples from the same season showed slightly higher DM (96.0%) and a higher CP content of 19.2%. Fermented samples had a CP content of 18.4%, while urea-fermented digesta had the highest CP value at 19.4%. The neutral detergent fiber (NDF) content varied, with sun-dried samples showing 76.8%, oven-dried samples at 73.6%, and fermented samples at 69.9%. The acid detergent fiber (ADF) values were also affected by processing, with sun-dried samples having

47.5%, oven-dried samples 51.8%, and fermented samples 47.6%. Similarly, during the main wet season (MWS), oven-dried samples had a higher CP content (20.0%) compared to other treatments, with sun-dried and fermented samples having 18.9% and 20.9%, respectively. Urea-fermented samples had the highest CP content at 29.3%. NDF values ranged from 62.9% for urea-fermented to 64.3% for oven-dried, and ADF values were lowest in urea-fermented samples (35.9%). This lecture also explores the potential for mitigating the environmental impact of livestock production, particularly in reducing methane emissions, which are a major concern in ruminant farming. The incorporation of browse plants like *C. pentandra* into livestock diets has shown promise in reducing methane emissions, offering a pathway to more sustainable livestock production while improving productivity. Methane gas production, was higher in the cowpea varieties than in the groundnut varieties. The lowest methane gas production was recorded in the groundnut varieties Samnut 23 and Samnut 22.

In conclusion, by addressing feed scarcity, improving livestock nutrition, and integrating indigenous forage varieties and browse plants into small ruminant feeding systems, Ghana can unlock the full potential of its small ruminant farming systems. Strategic investments in feed production, research, and youth entrepreneurship will not only improve livestock productivity but also contribute to broader goals of food security, poverty reduction, and sustainable agricultural development. The future of small ruminant farming in Ghana depends on the successful integration of improved feeding systems, enhanced livestock management practices, and policy-driven interventions that foster a thriving and sustainable sector.

Acknowledgement

Bless the LORD, O my soul: and all that is within me, bless His holy name. – *Psalm 103:1*

All glory to God for His grace and mercies upon my life. He has enabled me to achieve this remarkable milestone.

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May the Lord bless you all.

UDS ANTHEM

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UDS - A PRIDE AND A HOPE
UDS - IS AN ICON OF A NATION
WE'RE A LIGHT, AND A PRIDE, AND A BEACON OF DEVELOPMENT
OUR KNOWLEDGE IS FOR SERVICE
HEREIN LAY THE CRADLE OF ACADEMIC EXCELLENCE
PRACTICALIZING EDUCATION FOR LIFE
UNITING THE PEOPLE IN DEVELOPMENT
INSPIRING EVERY MIND, EVERY HEART AND EVERY HAND
PROVIDING THE BEST OF OUR HIGHER EDUCATION
PRAISE BE TO GOD FOR THE BLESSINGS OVER ALL
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