

# **RURAL OR URBAN POVERTY: INTEGRATED RUMINANT ANIMAL AGRICULTURE AS PANACEA**

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# **Courtesies**

***The Ag. Vice-chancellor,  
University Registrar,  
Other Principal Officers of the University,  
Provost of the College of Health Sciences,  
Dean of the Faculty of Agricultural Sciences,  
Dean of Postgraduate School,  
Deans of other Faculties and of Students,  
My Head of Department and other Heads of Department,  
Director of Programmes and Units,  
Highly esteemed Academic and non-teaching colleagues in the  
University,  
My students, past and present  
Family members here present,  
My Lord Temporal and Spiritual,  
Eminent invited guests and friends.  
Reputable and ever reasonable LADOKITES,  
Gentlemen of the press,  
Distinguished Ladies and Gentlemen***

## **PREAMBLE**

**I feel not only honored but privileged to present to this audience, the maiden inaugural lecture in the new Department of Animal Production and Health.**

**My endless appreciation goes to Almighty Allah for creating me. I thank Almighty Allah who has journeyed with me thus far in the field of academics.**

**My inaugural lecture of today is the 43<sup>rd</sup> in the University, 8<sup>th</sup> in the Faculty of Agricultural Sciences and first in the new department of Animal Production and Health.**

**The first in the Faculty was delivered by Late Prof J. I. Olaifa, followed by Late Profs M. A. Akanbi. Profs A. B. Ogunwale, G. O. Farinu, G. O. Ojediran, J. G. Adewale and Prof. (Mrs) E. V. Okunade.**

**Mr. Ag. Vice Chancellor Sir, I consider it an esteemed privilege to present to you my findings as a researcher that has spanned well over twenty years.**

**My research interest has been tailored towards making ruminant animal production more attractive and profitable.**

**Even before I was born, my mother spent good eight years after marriage before my arrival. Glory be to God for his mercy endures forever.**

**This God has been so kind to me, he has seen me through the thick and thin of life.**

**May His name be glorified forever. ‘Subuananlilahi’ walahamudulilahi, walailailanlahu, Allahu Akbar, walaolah, walakuahata ilabilahi aliyulahasim.**

**My mind flashes back to thirty-five years ago, when I first gained admission into that Great University, the University of Maiduguri, to pursue a B.Sc. degree programme in Animal Science.**

**There was no mentor and no adviser although I have an uncle who was fairly educated.**

**However, I am very grateful to my parents who though did not receive western education, lived in an environment, where education was highly cherished.**

**All these encouraged them to support my educational pursuits. After the NYSC service year, my honest intention was to further my education. But there was no financial assistance.**

**My dad however prayed for me and said “God be with you and that all shall be well”.**

**I turned entirely to God and He has been sufficient and kind to me ever since.**

**"Behold God is mine helper: the Lord is with them that up-hold my soul" (Psalm 54:4).**

**I got a referee report from Dr. Asamoah Larbi recommending me for employment into LAUTECH.**

**He did so through the Office of the then Head of Department, Prof. J.O. Akinola on 29<sup>th</sup> April, 1999.**

**He said ‘Akinlade will deliver where others have failed’.**

**It is by this immeasurable grace of God upon my life that ‘Omo Baba tailor and omo Iya eleja’ is today professing Animal Science to this august audience.**

**We have all assembled here this after-noon to listen to the summary of the past twenty-one years of my life as an active scholar, and researcher.**

**Mr. Ag. Vice Chancellor Sir, distinguished audience, this lecture is dedicated to God, the Almighty, all my academic mentors, and my paternal grandmother, Madam Suwebat Abeni Akinlade who took care of me from the age of less than one up till puberty.**

**May God, the Almighty forgive her of her sins and count her as candidate of Aljanah fridaous.**

# **INTRODUCTION**

**Mr. Ag. Vice Chancellor Sir, with your permission, I wish to start this lecture by quoting my former secondary school Principal, Late Mr. J.O. Ogunniran who always said**

**‘If you are failing daily to prepare, you are preparing daily to fail’ and ‘Heaven helps those who help themselves’.**

**These sayings still ring fresh and deep in my memory up till this moment.**

**My own inspiration in life is to make my life different from the life of others.**

**Thus, divine inspiration was and is still the strongest single force in my journey through life and it has never failed.**



**Poverty is the state of not having enough material possessions or income for a person's basic needs which includes: social, economic, and political elements.**

**Sheep, llamas and alpacas are small ruminant animals while Cattle, buffalo and hippos on the other hand are referred to as large ruminants.**

**Of all these in Nigeria today, cattle, sheep and goats are the well-known and recognized ruminant animal species, probably because of their large population and broad geographical spread.**

**In Nigeria, sheep, goats and cattle production forms part of nearly all known farming systems.**

**They have a long association with nomadic pastoralism, mixed farming, shifting cultivation and fallow, small holder farms.**

**They are also common among non-farming communities where they are tethered and fed in backyards.**

**Even when they are kept under the same management or by the same person the two are rarely allowed to integrate, interact and even when they do, such integration or interaction are not quantified or qualified and might even go unnoticed or unaccounted for in terms of figurative values.**

**Mr. Ag. Vice Chancellor Sir, in my academic sojourn since 1999 to date, my research interest focus have been on cattle, sheep and goats, including crop/livestock integration.**

**My research has been fixated mainly on the following:**

- **The development of year-round feed and feeding strategies for sheep, goat and cattle.**
- **The use of non-conventional feed resources in the management of sheep, goats or cattle for meat, milk and for maintenance or a combination of both.**
- **Integrations of ruminant into other farming systems**
- **Backyard small ruminant production**

## **What are ruminant animals?**

**Ruminants are animals that are able to acquire nutrients from plant-based forages by fermenting it in a specialized stomach prior to digestion, principally through microbial actions.**

### **Ruminants and their importance**

**Sheep is kept for the supply of wool while goats and cattle are kept for their meat, milk and skin. All are however kept as a reliable source of income.**

**In Nigeria, sheep, goats and cattle rearing is a lucrative business and it cuts across all the strata of the country, young and old, educated and uneducated, livestock specialist and even those that do not know anything about agriculture.**

**The special attributes of integrated cattle, sheep and goat agriculture that make them particularly suitable for rural and urban dwellers include the following:**

- ✓ **Ability to graze and utilize a wide range of poor quality forage and browse plants.**
- ✓ **They are well adapted to virtually all ecological zones.**
- ✓ **Ability to trek long distances.**
- ✓ **The cheapest in term of feed requirement, as could be fed on feed items not suitable for human consumption.**

- ✓ **Attract least risk in terms of diseases but the current risk particularly to cattle is rustling.**
- ✓ **They are easier to manage, no religion or cultural taboo against any of the species either their keeping or against the consumption of their products.**
- ✓ **Sheep and goats have short generation interval, about 1.5 years in sheep and goat (3-4 years in cattle).**
- ✓ **High reproductive rate in sheep and goats.**
- ✓ **They have high turnover rates on investment and hence low risk on investment among others.**

## **Ruminant animal products for human use**

**Goats produce 17% of tropical Africa's meat and 12% of its milk (Lebbie, 1986).**

**In sub Saharan Africa, goats account for about 11% of the total meat output (Reg and Lebbie, 2000).**

**It has been established that goat meat is lower in fat and cholesterol than mutton and beef and comparable to chicken.**

**They also have more minerals than chicken and lower in total and saturated fat than many other meats.**

**One reason for the leanness of goat meat is that goats do not accumulate fat deposit or marbling in their muscle. Goat meat is often cooked slowly and at low temperature.**

**Table1: Nigerian Livestock Population Estimate**

<b>SPECIES</b>	<b>NUMBER (MILLION)</b>
<b>Goats</b>	<b>34.5</b>
<b>Sheep</b>	<b>22.1</b>
<b>Cattle</b>	<b>13.9</b>

**Source: Bourn *et al.*, 2007.**



## **Milk and meat from goats, cattle and sheep**

**Virtually all of breeds of goats' sheep and cattle are bred for milk, meat or a combination of these products.**

**Milk produced can be consumed fresh or processed into other products like cheese or butter.**

**Such milk could be drunk fresh as well, pasteurization is however recommended for the safety of the milk that are consumed fresh.**

**The idea is to control the proliferation of *Staphylococcus aureus* and *Escherichia coli* (Ekici, 2008).**

**The strong smell of bucks due to the heavy presence of hormones will have impacts on the milk if not properly handled.**

**Milk from cattle is well known and is accepted by all, milk from sheep is available but not common while goat milk is the best in terms of nutritive contents.**

## **Contributions to human welfare, employment generation, poverty eradication and economic stability**

- **The average share of livestock in agricultural gross domestic product (GDP) in sub-Saharan Africa is estimated to be 25%, but this has increased to 35% if and when traction and manure are attached with monetary values (Winrock, 1992).**
- **As of now, these three ruminant animal species contribute significantly to cash at hand, as keepers can decide to sell in the event of an immediate or urgent financial need.**
- **All of the three serves as immediate sources of income or as savings for future conversion to cash. Rearing these animals provides employment for keepers whether in the rural or urban areas.**

## **Cattle, sheep and goats as assets, banking system and security**

- **Despite the facts that owners of cattle, sheep and goats either in the rural or urban centers did not have access to banking facility in the past, the situations have since changed.**
- **High livestock population could serve as collaterals for securing loans in the bank.**

- **A livestock keeper of these animal species who also engages in crop production uses these animals as security against crop failure that may come as a result of any unforeseen circumstances.**
- **For any crop-livestock farmer, the inclusion or concentration of keeping cattle, sheep and goats as components of an integrated crop/livestock farming system acts as sources of diversification,**
- ✓ **helping to cushion the effects of changing pattern of agriculture or vagaries of weather that sometimes determine the scope and pattern of agriculture.**

## **HEALTH BENEFITS OF CONSUMPTION OF BEEF, MUTTON AND CHEVON**

- **Goat and sheep meats, scientifically referred to as chevon and mutton respectively have distinctive tastes and contain different chemical compositions.**

**Chevon is rich in protein, vitamins and minerals, but contains very little fat, especially cholesterol.**

- **Goat meat for instance contains about 75.42% water, 3.55% fat, 19.95 % protein and 1.06% mineral matter. The energy value is about 580 kJ per 100 g.**

**Chevon has about the same nutritional value as mutton.**

- **In addition, in goat meat, the essential amino acids such as lysine, histidine and tryptophan are all present.**
- **Regardless of its nutritional value, goat meat is still less appreciated due to their specific smell and taste, the more if the animal is older.**

## **GOAT, SHEEP AND CATTLE AS GUARANTORS OF FOOD SECURITY AND GENERAL WELL-BEING**

**Mr. Ag. Vice Chancellor Sir, cattle, sheep and goats are very valuable, especially to everyone including the poor in the rural area and the rich or educated in the urban centers.**

**While people in developed countries continued to obtain an average of 27% of their calories and 56% of their protein requirement from animal food products, the respective averages in developing countries were 11% and 26% (FAO 2011).**

**The total meat production in developing countries grew by 5.4% per year between the early 1980s and mid-1990s (FAO, 2011).**



**This is more than five times the rate seen in the developed world and, with-out any doubt; we are heading for a Livestock Revolution as reported by FAO (2011).**

**This in turn increases the threat of trans boundary animal disease spreading or being in-troduced (FAO, 2011).**

**The versatility of the ruminant animal species with the basic facts that they can survive in harsh environment and on poor quality feed makes them unique as reliable sources of animal proteins and vitamins for the populace.**

## **CONTRIBUTION OF RECIPROCAL INTEGRATED LIVESTOCK SYSTEM TO EMPLOYMENT, ECONOMIC AND POLITICAL STABILITY OF NIGERIA AND THE WORLD OVER.**

**The average share of livestock in agricultural Gross Domestic Product (GDP) in sub-Saharan Africa has been estimated at 25%, but this increases to 35% when traction and manure are considered (Winrock, 1992).**

**Keeping any of the ruminant or any combination of them (especially cattle) portrays you as a rich farmer.**

**Countries like Nigeria, Kenya, and Rwanda are witnessing increasing demand for these animals and their products.**

**In Ghana for instance, there is reported increase in the consumption of goat meat, especially in growing urban areas.**

## **Acceptability of ruminant animals in religion**

**From time in memorial, there has not been any known religion taboo either against the keeping, consumption or the use of money generated from keeping ruminant animals.**

## **Livestock and the environment**

**Livestock-environment interactions are expected to be beneficial in a reciprocal manner, but this depends on the expertise of the farmers.**

**Such interaction should be well managed without or with limited damage to the environment.**

**Once the stocking rate is managed, then the interaction between these animals and their immediate environment remained friendly.**

**The misperception of livestock as degraders of the environment originates largely in the developed world, where intensive specialized livestock production is the norm.**

**Livestock-related environmental problems differ markedly between the developed and developing worlds.**

**In developing countries, most environmental problems are related to poverty, bad policies as a result of non-inclusion of livestock experts in policy formulation on livestock.**

**Any attempt to minimize the impact of livestock on the environment is bound to fail if farmers do not have better understanding of recent techniques of livestock production and is absolutely left in the hands of people who will tell that livestock rearing is an ancient business which does not require any new knowledge from experts.**

**Solutions must try not only to protect the environment but also to encourage and promote crop/livestock synergies that will enhance and promote crop/livestock as a single indivisible business enterprise in agriculture.**

**If and when this is done, the issue of environmental degradation would be of no concern again and it becomes a more sustainable and productive system with lucrative techniques of managing livestock.**

**In contrast, livestock related environmental problems in developed countries can be solved by enforceable legislation that makes livestock producers pay for any harm their activities inflict on the environment.**

**There is need for holistic research to better quantify and qualify the bio-physical and socio-economic interactions of sheep, goats and cattle rearing, the environment and human needs.**

**Moreover, there are several constraints to addressing issues of livestock, the environment and human needs, these include:**

- 1. Poor, scanty or a total lack of any useful information on farmers, livestock agriculture and the environment sustainability**
- 2. Lack of holistic approach in most of the research dealing with farmers, livestock-agriculture and their interactions with environment and the lack of identifiable or quantifiable indicators of these interactions or is it the integration;**
- 3. Lack of involvement of relevant scientists in the development of policies relating to herders/livestock- agriculture and the environment;**
- 4. Inconsistent goals and vision of farmers, scientists and policy-makers and,**
- 5. Lack of use of quantitative data for policy formulation (ILRI, 1997)**

## Cattle, sheep and goats-environment interaction or integration



**Recently, between 2012 to 2018, the population of cattle in the west of Nigeria increased to well over 10 million where they serve as good sources of meat, milk and income in the lives of rural and urban dwellers.**

**They are usually reared in relatively large herds in Northern Nigeria, whereas in the South large goat herds are not common.**

**Now, there are over 20million herds of cattle that have migrated to the south because of cattle rustling and Boko Haram crises in the northern part of the country.**

**This huge population now encourages skirmishes even in the southern part of the country most especially in the western Nigeria between the crop farmers and the herders.**

**Thus, adequate stocking rate manipulation and an encouragement of integrated/livestock-crop of farming is advocated.**



**Goats, sheep and cattle provide realistic options to manage plant communities.**

**Ruminants can be utilized to control undesirable plant species which are either consumed and provide biological weed control in pasture and range land.**

**When properly managed, ruminants can have a beneficial effect on the environment.**

**Goats, sheep and cattle are able to cope with degraded environments and are frequently and ignorantly blamed for causing it when, in fact, they are the only species that can continue to survive.**

**Following grazing/browsing by day, ruminants are often kept in paddocks and corrals at night, and their dungs are carefully gathered and sold in bags to local crop farmers.**

**In this way, ruminants have been responsible for promoting the agricultural development of sub-marginal areas; particularly since the use of artificial fertilizer was limited and is losing popularity, most especially among the organic agriculturists.**

**When land which had been over-grazed by cattle, sheep and goats shows signs of soil ex-posure, it should not be grazed again by ruminants, or serious ero-sion will occur.**

**Specialists in the economic development of land resources are often far too prone to exaggerate the de-structive habits of ruminants, even though other contributing causes, such as overpopulation, forest fires and insect damage, are recognized.**

**Sheep, goats and cattle will accept wide varieties of feeds that are unfit for human consumption.**

**While feeding is generally almost the same for ruminants, their feeding habits and pattern are however not the same.**

**They relish variety in their feed and do not thrive well when kept on a single type of feed for any length of time.**

**They prefer to select from many varieties of feeds, such as a combination of grasses and shrubs plants or tree leaves.**

**Seasonal variations and intensity of stocking influence the nature and magnitude of the intake.**

**The actual choice of forage for goats, sheep and cattle in a particular environment will be determined by soil type and rainfall.**

**In general, goats, sheep and cattle tend to prefer the less coarse grass like Guinea grass or Pangola grass than the coarser types such as Elephant grass.**

**Legumes whether fresh or conserved should also be included in the diets of ruminant animals to increase the nutritive value of the forage, thus supporting improved productivity.**

## **THE PANACEA TO RURAL AND URBAN POVERTY**

**Mr. Ag. Vice-Chancellor sir, you will recall earlier in this lecture, I stated four areas of my research focus on ruminants' animal Agriculture in a broader sense, these are:**

- 1. Development of year-round feed and feeding strategies for sheep, goat and cattle.**
- 2. The use of none conventional feed resources that included browse and crop residues in the keeping of sheep, goats and cattle.**
- 3. Systematic but reciprocal integration/interaction of animal-animal, ruminants with cropping.**
- 4. Backyard production of Maradi bucks with West African Dwarf does, with the aim of producing offspring that were better than the dwarf breed.**

# **1. Development of year-round feed and feeding strategies for sheep, goat and cattle.**

## ***Use of multipurpose trees***

**The multipurpose trees are trees whose parts serve as animal feed supplements, especially in the dry season. Such trees include, among others *Gliricidia sepium*, ‘Igi agunmaniye’ *Leucaena leucocephala*, ‘igi asofeyeje’, *spodia mombin*, ‘igi iyeye’, *Nebodia Levis* ‘igi akoko’ and *Ficus* species, ‘igi odan’.**

**While I absolutely agree that few of these trees have traditionally been used as animal feeds, their usage is not regular, the quantity to feed, in what form and for how long were never known traditionally.**

**Thus, the need for my effort on the propagation, the yields, the forms, the quantities, among others, on the uses of these trees in ruminant animal production.**

**For instance, in one of my studies, it was discovered that *G. sepium* was not readily relished by cattle, but that it can be consumed if it was fed to the animal in the dry form.**

**In a study that investigated voluntary feed intake by sheep and goats of *Gliricidia sepium* fed in three states of dry, wilted and fresh forms and at three levels of supplementation of 0, 10 and 30% to a basal diet of *Panicum maximum*.**

**The crude protein content was higher by more than 10% unit in fresh and wilted forms 27% in fresh, 26% in wilted and 16% in the dry form.**

**DM (Dry Matter) losses from the fresh and wilted leaves were 10 and 3 percentage units, higher respectively, than the dried leaves.**

**Corresponding value in goats were about 4 and 3 percentage units higher respectively. DM losses were 75.8% for fresh, 69% for wilted and 65.4% for dried in sheep while it was 74.9% for fresh, 73.6% for wilted and 70.6% for the dried.**

**Voluntary dry matter intakes of fresh and wilted *G. sepium* increased significantly as the level of supplementation increased.**

**In contrast however, voluntary DM intake of dried leaves increased up to 20% and dry matter losses from dry leaves were relatively lower than fresh and wilted leaves.**

**At all levels of supplementation, the voluntary DM intakes of fresh and wilted leaves by WAD sheep and goats were relatively higher than dried leaves.**

**The results from this study suggested that *G. sepium* leaves should be fed either in the fresh or wilted states at between 20 and 30% of the total dry matter allowance.**



**In another study, the usefulness of forage legume hays derived from intercrop as dry season feed supplements for lactating Bunaji and N'dama beef cattle were assessed in two feeding experiments conducted concurrently to study the influence of three forage legume hays {*Stylosanthes guianensis*, *Centrosema pubescens* and *Cajanus Cajan*} obtained from maize-based intercropping systems as supplements to matured guinea grass (*Panicum maximum*).**

**The legume hays were fed to lactating Bunaji cows (experiment 1) and Ndama calves (experiment 2) for a period of 30 and 60 days respectively.**

**Dry matter degradation characteristics of the forage legumes were also assessed in three rumen-fistulated Bunaji castrates.**

**Cows supplemented with *C. pubescence* and *C. cajan* produced highest milk (2.4vs2.1liters/day). Calves supplemented with *C. pubescence* and *S. guienensis* gained more weight (201vs233g/day).**

**Degradable fraction was lowest for *C. cajan*. The study concluded that additional benefits in terms of higher milk yield and body weight gain could be derived from the use of cereal based intercropped forage legumes as supplements especially by poor resource African small holder mixed farmers in the dry season.**

**In a complementary study, the feeding potentials of *Stylosanthes guianensis* and *S. hamata* for forage production in Trial 1 and in the second experiment the forage was fed to West African dwarf goats with the conclusion that *S. guianensis* produced a herbage yield of 17.2 t/ha but the two had a comparable crude protein contents. The total dry matter intake was higher (141.3g/day) in *S. guianensis* (vs72.7g/d), thus making *S. guianensis* more acceptable to goats than *S. hamata*.**

**In a further effort to encourage animal products and by products of higher nutritive value, *Panicum maximum* grass, which is perhaps the most popularly available grass species for ruminants, was further investigated through interplanting with various legumes.**

**The dry matter yield and rumen degradation characteristics of the forage at six weeks of harvest suggested that *Panicum maximum* that were either N-fertilized, intercropped with stylo had better nutrient contents than the ones from the control group.**

**This study concluded that total biomass from grass/legume or grass/fertilizer applied plots could be used to produce herbage of relatively good quality that would enhance productivity from ruminant animals.**

## **2. The use of non-conventional feed resources that included browse and crop residues in the keeping of sheep, goats and cattle.**

**My research efforts in this direction suggest that the use of non-conventional feed resources such as grasses, browse, shrubs, stubbles are very beneficial to profitable keeping of goats, sheep and cattle: Akinlade *et al.*, 2004; Akingbade *et al.*, 2005.**

***In sacco, Invitro and In vivo* digestibilities in the assessment of these feed resources were also employed and investigated. Other feed resources included the use of farm waste products, i.e. those that are not in use by human beings and the other by-products.**

**Mr. Ag. Vice Chancellor Sir,**

**In another study on the utilization of MPTS trees and shrubs, an experiment that investigated the live weight gain and efficiency of feed utilization by Bunaji cows during early lactation was carried out.**



**The feeding value of three supplements to a basal grass (*Pennisetum purpureum*) was investigated using sixteen primiparous Bunaji cows. The supplements used were: *Pueraria phaseoloides*, *Leucaena leucocephala* and dried brewers grain.**

**It was carried out in conjunction with my final year project students of 2005.**

**Milk yields were similar among treatments ranging from 1.1 to 2.6kg 4% fat corrected milk/day. *Pennisetum purpureum* with *Leucaena leucocephala*, promoted daily milk production of up to 2.8litres/day while for cows that were fed on BDG, average daily milk production was 1.8litres/day for non corrected fat**

**In another study that assessed four accessions of *Stylosanthes scabra* for dry matter yield and nutritive value, it showed that all the cultivars had high concentration of nutrients at 10wks of age.**



**This experiment showed that cultivar Fitzroy produced highest dry matter yield of 1973kg/ha and was recommended for use in this zone as it had highest herbage dry matter yield, a comparable crude protein content of 15.1%, with a low degradable fraction, highest dry matter intake of 133g/h/d.**

**This study, though a preliminary, suggested that all the accessions were suitable for supplementary feeding of goats in the dry season.**

**However, in a separate study that assessed the nutritive value of *Stylosanthes guianensis* and hamata in the derived savanna zone of Nigeria, the results revealed that *S. guianensis* had a higher herbage yield of 17.2t/ha and higher dry matter intake of 124.6g/h/d.**

**This study recommended that both cultivars could be cultivated for livestock use in the dry season.**



**In an experiment designed to raise cheap, affordable and sustainable beef from cattle, the influence of crop residues generated from legume/cereal crop production was investigated in N'dama calves.**

**The crop residue that consisted of maize stubbles and legume vines and leaves that were leftovers after the cropping season were gathered and fed to growing N'Dama calves. N'dama calves gained reasonable weight at the end of the experiment with an average daily weight gain of (430g/day).**

**A study conducted by Akinlade *et al.* (2004) investigated the agronomic and nutritive attributes of jack beans *Canavalia ensiformis*, two experiments were conducted.**

**In experiment 1, the forage production potential and quality were examined.**

**Results showed that plant components of leaves, stem and whole plants decreased with increased spacing.**

**Leaves yields were 0.223, 0.209 and 0.109t/ha for the spacing 50x50cm, 75x75cm and 100cmx 100cm respectively.**

**In the second trial, total dry matter intake increased with increased levels of supplementation while the least average daily weight gain of 0.18g/day was recorded for the controlled group.**

**The study concluded that based on the herbage dry matter yield, nutrient composition and the animal performance in terms of weight gain, *Cannaivalia ensifrmis* can be usefully incorporated into dry season feed strategy of WAD goats.**

**Table 2: Effect of spacing on forage yield of *Canavalia ensiformis* (kg ha<sup>-1</sup>)-----**

<b>Part parts/spacing</b>	<b>50x50cm</b>	<b>75x75cm</b>	<b>1mx1m</b>	<b>sem</b>
<b>Leaf</b>	<b>0.226<sup>a</sup></b>	<b>0.208</b>	<b>0.1093</b>	<b>0.3337</b>
<b>Stem</b>	<b>0.516<sup>a</sup></b>	<b>0.134</b>	<b>0.226</b>	<b>0.2866</b>
<b>Whole</b>	<b>1.816</b>	<b>0.783</b>	<b>0.6633</b>	<b>0.4139</b>

**Table 3: Forage intake, invivo digestibility and weight gain of goats supplemented with fresh *Canavaliaensiformis* leaf at three levels of supplementation**

Parameters	levels of supplementations			SEM
	0	10	20	
<b>Intake (g day<sup>-1</sup>)</b>				
<b>P. maximum</b>	<b>214<sup>a</sup></b>	<b>205.90<sup>a</sup></b>	<b>189.10<sup>b</sup></b>	<b>13.9</b>
<b>C. ensiformis</b>	<b>-</b>	<b>20.50<sup>b</sup></b>	<b>42.00<sup>a</sup></b>	<b>2.7</b>
<b>Total</b>	<b>214.4</b>	<b>226.40</b>	<b>231. 10</b>	<b>16.7</b>
<b>Crude protein g day<sup>-1</sup></b>				
<b>P. maximum</b>	<b>17.3</b>	<b>16.80</b>	<b>14.70</b>	<b>1.3</b>
<b>C. ensiformis</b>	<b>00</b>	<b>2.22</b>	<b>5.31</b>	<b>0.8</b>
<b>Total</b>	<b>17.3</b>	<b>19.00</b>	<b>19.98</b>	<b>1.6</b>



**Information on the use of residues from cropping systems as dry season feed supplements for sheep was similarly assessed with the use of legume hays of *Stylosanthes guianensis*, *Lablab purpureus* and *Aeschynomene histrix* harvested from cereal/legume plots were compared by feeding them as supplements for yearling's West African dwarf ram fed guinea grass as a basal diet.**

**Rams supplemented with Stylo and *A.histrix* gained more weight than those on lablab. (33vs13g/d) Organic matter digestibility followed similar trend. The trial recommended that feeding forage legume hays from cereal- based cropping systems as supplements can maintain live weight in sheep and even promote modest weight gain during the critical dry season when the available few feed resources are poor in quality.**

**In a study that was carried out by Akinlade *et al.* (2006), which investigated the effect of feeding three forms (fresh, wilted and dry) of wild sunflower on dry matter intake and nutrients digestibility by West African dwarf goats.**

**From the results, the crude protein contents of fresh form were 29.8%, 25.1% for the wilted and 20.0% for the dry form, but dry matter intake was highest for the dry form and was 125g/h/day.**

**The study concluded that WAD goats will consume more of dry wild sunflower and have it significantly digested.**

**Thus farmers can make judicious effort during the main wet season by conserving it in large quantity for later use in the dry season for sustainability and moderate weight gains in goats.**

### **3. Systematic but reciprocal integration/interaction of animal-animal, ruminants with cropping.**

**In crop/livestock research, an attempt should be made to investigate how the two enterprises can co-exist with tremendous benefits in a reciprocal manner.**

**In this regards, an experiment that assessed the biological contribution of ruminants to a modified land use system, was conducted over a period of three years with the objective of analyzing and quantifying the reciprocal benefits of integrated crop and livestock under intensive land use system.**

**Effect of cattle and sheep maintained at the same stocking rate, on continuously grazed established plots of land that consisted of maize plantation alone, maize plantation relayed crop with *Pueraria phaseloides* legumes in three replications with those plots grazed by cattle and another plot grazed by sheep while the last three were the control.**



**Results showed that the plots that were relayed cropped with legumes and grazed with livestock had total higher economic returns in terms of animal weight gain, {230g/h/d} and maize grain yield {1.75t/ha}.**

**Subplots grazed by cattle had the highest weight gain and this was followed by sheep grazed plots, however variation in herbage yield in the natural fallow grazed by cattle or sheep and none grazed were not significant.**

**However, the nutrients compositions of N, P and K of the herbage were better for those harvested on the improved plot by 4% than those harvested on the natural fallow by 2.1%.**

**It was concluded in this study that an improved crop yield and nutritive enhancement of forage could be achieved by the modified land use system designed in this study.**

**The nutrient cycling balance sheet each year, was efficient in plots that were grazed by animals although there was a small soil compaction in the grazed plots; this posed no problem when the stocking rate is well calculated, modified or adjusted.**

**Similarly in a grazing trial of an alley plot where *G. sepium* and Guinea grass were sown together, and three stocking rates imposed, it was discovered that at high stocking rates in the dry season cattle consume fresh *G. sepium* willingly.**

**In this study, the effect of three stocking rates on the performance of N'dama cattle in an alley grazing system using Ndama weaned cattle was investigated.**

**The stocking rates used were 1.0, 1.5 and 2.0Au/ha. Feed intake and weight gain in an alley farming system that comprised hedge rows of *Gliricidia sepium* interplanted with, *P. maximum*. The study was carried out in both wet and dry seasons.**

**Results showed that cattle consumed more grass than *G. sepium* in both seasons; intake of grass was higher in the wet season 3.87 and 1.56kg/animal/day respectively.**

**The relationship between weight gain and stocking rates was linear and most pronounced in the wet season, suggesting that the animal carrying capacity of the land at the season was not met.**

**Planting of *G. sepium* in an alley farming system could be used as a technique of conserving protein supplement to cattle in the dry season when grass forage was a limiting factor in quantity and quality.**

**In a complementary or a follow up study, the effect of levels of nitrogen fertilization application and maturity of wild sunflower on its chemical composition and rumen degradation characteristics in sheep was investigated.**

**Sunflower fertilized with 250kg N produced forage that had 35vs 57% NDF but the content increased with advance maturity.**

**Dry matter was 71.5%, nitrogen, 53.4% and NDF6.9% values at 7 weeks of growth were considered optimum for use in livestock feed. Nitrogen content of 1.79% for the foliage harvested from 125kgN application was the highest value.**

**Based on chemical composition values and the effect of maturity, Evidence from *in sacco* degradation characteristics of wild sunflower, showed that forage harvested from plots fertilized with 125kgN was adequate in all degradation parameters, most especially the degradable fraction, and thus forage should be harvested at age of 7-8weeks.**

**This plant species is almost a nuisance in the wet season and it equally survives into the early dry season.**

**It is rarely consumed by any of the ruminant species, however my research efforts have made it known that if dried either in the shade or in the sun it was consumed voluntarily by sheep, goat and cattle.**

**In another complementary study, three forms of wild sunflower were evaluated. It was fed as either fresh, wilted or in dry forms.**

**And the results obtained revealed that dry matter ranged from 61.7g in the fresh, 60.5 in the wilted to 95.5 in the dry form while dry matter digestibility ranged from 68.1% in the control, 78.1% in the dry matter form in WAD goats.**

**This was a significant result that could assist farmers to prepare for the dry season when feed resources are limited in availability and quality. Such feed resources could be conserved as hay or silage.**

**In a study that evaluated the use of crop residues either for mulch or as feed in crop-livestock systems:**

**Impact on maize grain yield and soil properties in West African humid forest and savanna zones was conducted across three main vegetation zones namely:**

- ✓ **The humid forest, forest savanna and Guinea savanna zones of West Africa. The study examined the effect of managing crop residues from cereal-legume cropping systems for mulch and fodder for sheep.**
- ✓ **Results from this study showed that by increasing the proportion of total crop residues produced from a unit area of land and used as mulch, increases maize grain yield, soil organic carbon, nitrogen and available phosphorus.**

**Maize grain yield increased from 1.35t/ha to 2.5t/ha for zero to 100% used as mulch.**

**The extra increases obtained when manure rather than the crop residues were supplied as mulch were relatively small, however suggesting that 25-50% of the crop residues could be removed as feed without any detrimental effect.**

**When any crop residues rejected by sheep and any other ruminant animals for that matter, were mixed with livestock urine and faeces and returned to the respective fields from where the crop residues had been removed, subsequent grain yield and soil organic carbon, nitrogen and available phosphorus increased.**

**This study demonstrated the possibility of managing crop residues for increased productivity in smallholder mixed crop- livestock systems.**

**When calves managed in the traditional Fulani agro- pastoral systems of Oyo State were assessed for performance using forty-five settlements in three local governments.**

**Results of the study showed that majority of the people involved in cattle rearing in the areas were Fulani from Kwara State, managing predominantly, Bunaji and Keteku breeds of cattle.**

**Calves constituted about 20% of the herd, worm infestation accounted for about 76% of health challenges, diarrhea (89%) and sand eating constituted 62% and were common in the dry season.**

**Improved feeding coupled with good health management was recommended.**



**Another study which evaluated the effect of feeding increasing levels of tropical kudzu, *Pueraria phaseoloides* on feed intake, weight change and manure production of weaned N'dama cattle showed that degradation characteristics improved with increasing inclusion levels of kudzu;**

**The soluble fraction increased from 53.3% to 78%, the rate of degradation improved from 0.02%/h to 0.05%/h. Nitrogen content also increased from 0.8 to 1.6% and manure production of up to 25g/kgDM<sup>0.75</sup>. The study concluded that highest daily weight gain of 118.9g/day was recorded at the highest level of supplementation.**

**As part of further efforts towards identification and evaluation of fodders, the production responses to pruning height and fodder quality of some trees and shrubs in a forest-savanna transition zone, southwestern Nigeria was carried out.**

**Seasonal fodder production responses of five shrubs (*Centrosema arenorum*, *Desmodum strigulosum*, *Desmodum velutnum*, *Phyllodium pulybellum* and *Tadchag trgetrum*) and five trees; *A. gunmfera*, *B. grandflora*, *A. npodes*, *B. monondora*,**

**✓ and *Nga eduls* to pruning heights ranging from 15 to 75cm were evaluated during the main wet, minor wet and dry seasons; and concluded that *C. arenorum* was the most promising specie for the development of animal agro forestry technologies in the west African forest-savanna transition zone and similar environment in the tropics.**

**In a study that investigated and compared physiological indicators of adaptation in the White Borno breed of goat and West African Dwarf goats in the humid zone of Nigeria, which was to ascertain how well a desert breed of goat, the white breed can adapt to a humid environment, the white Borno goats were procured during the first week of their arrival in Ibadan.**

**No significant differences were observed between the two breeds in pulse rate, respiratory rate, rectal temperature, packed cell volume, white blood cell and red blood cell counts, there was no significant difference in dry matter intake.**

**However the White Borno breed drank more water on daily basis than WAD goats. Daily water intake of white borno goats was 4.73litres/kg<sup>0.75</sup>/day as against 1.59l/kg<sup>0.75</sup> for WAD goats. The study concluded that White Borno goats should be as comfortable as WAD goats in the humid zone of Nigeria.**

**The study supported my backyard keeping of WAD does with Maradi bucks which up till now are doing fine. It is a non-sweat method of raising income even in the urban areas.**

## **Backyard System of Keeping goats**

**The West African dwarf goats are well-adapted to the western part of the country. However, they are known for dwarf size, small weight and poor growth rate.**

**One Maradi buck was purchased and allowed to roam freely with four WAD does under intensive system or what I called the backyard system.**

**By allowing the WAD females to mate with the Maradi bucks a better offspring was produced, the offspring grew better, had better weight gain and survived well, the average birth weight was 1.93kg for male and 1.80kg for the female offspring.**

**The survival rate was 99%. And the phenotypical attributes were better for the offspring. The population was more than double within a year.**



**Fig. 4: At the backyard of Prof. J.A. Akinlade's house**



**Fig 5:**

I was astounded when I heard about the 30-years-old lady, quitted her office Job for Goat farming. I'm astounded because not everybody wanted to become a farmer, as far as concerned she is educated and a dedicated banker.

**Goat farming involves in raising and breeding of domestic goats.**



**Fig 6:**

**A member of the House of Representatives from Ibadan Northwest/Southwest Federal Constituency, Stanley Olajide empowered 300 women in his constituency comprising widows and aged and vulnerable women.**

## **CONCLUDING REMARKS**

**Mr. Ag. Vice Chancellor sir, ladies and gentlemen, this inaugural lecture has overwhelmingly revealed that a crop farmer, who does not keep either cattle, sheep and goats or all in addition to his crop farming business, will not attain sustainable financial breakthrough.**

**In the same vein, any keeper of goats, sheep, cattle or all three at the same time as a single enterprise, will not be able to enjoy sustainable financial rewards.**

**Reciprocal Integrated ruminant agriculture can serve as a panacea to rural, urban poverty and crop farmers/ herder crises in Nigeria.**

**The stocking rate must however be strictly and judiciously respected.**

**The positive contributions of this class of animals are in areas such as; economic development, promotion of social values (village cohesiveness and recreation), food security, human health, and sustainability. Whether these occur in rural or urban communities, the benefits must not be neglected.**



**Ruminants are tolerant to many of the diseases affecting other livestock; they can tolerate varied diets, can utilize alternative feedstuff excellently and they have less stringent nutrient requirements.**

**I have identified various multipurpose trees, legumes, shrubs and herbs that can be fed to these animals. Other important parameters such as the forms they have to be fed i.e as a complete diet or as supplements and the right levels have also been demonstrated.**

**The importance of sheep, goats and cattle as animals of wealth creation and promoters of good health, when consumed responsibly has also been well preached throughout this lecture.**

**God, the Almighty also testified to this assertion in Leviticus Chapter One vs. Two. It reads: *Speak onto the children of Israel, and say unto them, if any man of you brings an offering unto the Lord, ye shall bring your offering of the cattle, even of the herd (goats) and of the flock (sheep). Psalm 104 vs. 14 also reads: He causeth the grass to grow for the cattle and herb for the service of man that he may bring forth food out of the earth.***

**I have made immense contributions at developing cheap and affordable year-round feed packages for WAD goats, sheep and cattle.**

**Various paper publications and efforts remain on-going even as I speak. (Akinlade *et al.* 2004<sup>a</sup>; Akinlade *et al.*, 2004<sup>b</sup>; Akinlade *et al.*, 2003).**

**Evidences are also documented in my research studies on crop residue/browse utilization in ruminant feeding (Akinlade *et al.*, 2006, 2003; Smith *et al.*, 1996; Smith *et al.* 1996).**

## MY CONTRIBUTIONS TO KNOWLEDGE

**The benefits to farm lands are enormous and these include the following:**

- ✓ **If and when ruminants graze *insitu*, both faeces and urine are deposited on the soil which can be used immediately to enhance crop production, its activities last longer in the soil.**
- ✓ **Ruminants can serve as a reservoir or processing unit for feed items that are not useful for humans. They can be processed into manure or even products that are consumable by humans.**
- ✓ **On the other hand, forage or herbage from crop plantation can be fed directly to the animal, and in ruminants, these plant parts serve as sources of complete diet or supplements to the animal.**
- ✓ **By-products from farm activities that can serve no useful purpose, can be incorporated to the diet of ruminant animals.**



# RECOMMENDATIONS

**Mr. Ag. Vice Chancellor Sir, as a result of the aforementioned findings and observations, the following recommendations are made:**

- **There is the need for an all year-round feed supply to cattle, sheep and goats, through the establishment of livestock feed banks. This can equally be commercialized.**
- **The animal rearing business should be integrated with cropping in a manner that will guarantee the envisaged biological benefits through integration in a reciprocal manner.**
- **Adequate data should be generated from the keeping of sheep, goats and cattle. This is to further explore the potential benefits of integrated crop farming and livestock keeping most especially rearing of cattle, sheep and goats as a single business on dwindling agricultural arable lands.**
- **Integrated livestock/ crop farming should be embraced as part of the national livestock road map; this will likely solve the current crop farmer-herder crises, thus making food availability easy and sustainable.**

- ✓ **Government to ensure that experts in the field of animal production are employed if and when there are issues that concern livestock in Nigeria.**
- ✓ **Efforts to alleviate the inadequacy in feed should be directed towards the utilization of readily available and inexpensive agro-industrial and industrial by-products as well as wastes. An adjustment of various production systems with an integrated approach should be encouraged.**
- ✓ **During the dry season, some livestock owners sell some of their herds at give-away prices. The dry season usually witness attendant cattle rustling which integrated livestock/crop farming can solve. Even the trans-human nomads cannot solve the problems of dry season feeding as the nomads often record losses of their animals. This is as a result of the non-abated incidences of trypanosomiasis in the Southern part of Nigeria and the all year round lack of feed.**

- ✓ **There is an old communal ownership of livestock, where an owner lends another neighbour either female weaners animals to rear.**
- ✓ **An agreement is initially reached as to the sharing formula. For instance, it could be that the first fruit/offspring is owned by the present keeper and the subsequent ones is given to the original owner.**
- ✓ **Another sharing perspective is giving the first offspring to the original owner and the subsequent own by the present keeper.**
- ✓ **However, if the first offspring's are twins, it is shared equally between the keeper and the owner.**
- ✓ **This long time traditional or communal mode of keeping ruminants, most especially the small ruminant should be resuscitated.**
- ✓ **It can be used as a means of alleviating poverty either in the rural or among urban inhabitants.**

**Mr. Ag. Vice Chancellor Sir, more than enough research studies have gone into dry season feed exploitations for ruminant livestock in various institutions in the country and LAUTECH is not an exception.**

**What is required now is the commercialization of the research results.**

**Besides, judging from the research results I have reported in this lecture, it is absolutely imperative that LAUTECH sets up a committee that will be saddled with the production of various kinds of ruminant animal feed all year round and the popularization of integrated crop/livestock as a unique production system.**

**It will be a glorious thing for our esteemed University to be the pioneer institution in the business of commercial production of ruminant feeds and a reinvigoration of livestock/crop as a unique farming system.**

**LAUTECH is endowed with the abundant human resources needed to handle the venture.**



**Sir, I am almost certain that the business will grow very fast, if not faster than, the business of internet and internet related business in Nigeria, because it is likely to be a new area of business in the country.**

**I therefore, strongly, recommend that LAUTECH as a matter of urgency, sets up a committee that will cut across various relevant disciplines as may be identified and get them engaged in the commercial production of year-round feed for ruminant livestock.**

**In the same vein many people see goats as been stubborn, the answer is no. They are goal getters, the animal doggedly perseveres, bearing pains in order to get at what they want.**

**Goat skin for GANGAN. “A ti ranmu gangan, kii se eyin eekanna boya ki ba dun bia ba so pe ati waye gangan ki se eyin awo ewure, agutan tabi awo maalu”.**

**An industry along this line is going to be equally viable.**

# ACKNOWLEDGEMENTS

**Mr. Ag. Vice-Chancellor Sir, somebody says "To be thankful for the benefit received is the nature of all well-groomed people, but the most detestable crime is ingratitude".**

- ☐ I want to sincerely express my deepest appreciation to Almighty ALLAH, my creator. Alhamdulillah Robil Alamin. And to those who have contributed to what this honourable audience is witnessing today. They have, at one stage of my life or the other, made a lasting positive impact on my life.**
- ☐ All my teachers from primary school through tertiary institution: the likes of Mr Akano, Mr. Emiola Adedapo, Mr. Otegbade- my Agriculture teacher, Prof M. O. Ologunde; Chemistry teacher at OSCAS; Late Prof. Abu-bakr Kibon at UNIMAID.**
- ☐ Colleagues at International Livestock Centre for Africa, now (International Livestock Research Institute), Chief I. O. Adekile and Dr A. A. Busari.**

- ❑ **All my academic siblings bound together by a mother called "APH". I am very grateful to the Dean, Prof. A. A. Akingbade as well as my past Deans, Profs. O.A. Ajao, A.A. Odunsi and G.O. Oyediran, Prof A.B. Ogunwale, Prof I.O. Adetunji and Late Prof Olaifa J. I. who led Panel that interviewed me for the position of Lecturer II.**

**I would be worse than an ingrate, if I forget to appreciate Prof. G.O. Farinu and my first contact to LAUTECH, Prof. J. O Akinola. A letter written to Prof J.O. Akinola who was then the Head of Department, was given to me by Dr. Asamoah Larbi of ILRI, Ibadan. However, on getting to LAUTECH, Prof Akinola, just left as HOD then Dr. Farinu just took over.**

**I have to say a very big thank you to Prof G.O. Farinu, for accepting me. In fact, he encouraged me to assume duty officially that day, which I obliged.**

**I am greatly indebted to Prof. O. A. Akinsoyinu, my academic mentor, my teacher, an erudite scholar for all the good works he did over my academic pursuit especially at PhD level. By the time Prof A. O. Akinsoyinu was presenting his Inaugural Lecture in 1998, I was his 12<sup>th</sup> PhD supervisee as of then, and then five of supervisees were Professors.**

**My humble H.O.D. Prof T. A. Adedeji and all ex Heads of Department, Prof O. A. Aderinola, Prof A.A. Akingbade, Prof. I.O. Oladunjoye.**

**I owe a lot of gratitude to my colleagues in the Department of Animal Production and Health; you have all been my partners in progress.**

**They include Drs. C. O. Olaniyi, T. A. Rafiu, Binuomote, Grace Tona, Olayeni and Mr. Daniel. And to our special Assistant lecturers, Dr. (Mrs.) Ojoawo, Mr. Tope Oyewole and Mr. Hammed.**

**My wonderful parents: Papa Safiyu Oladejo Akinlade and Madam R. O. Akinlade they are here today, to the glory of GOD.**

**Oriki aláwó**

**Omo aláwó Moore**

**Omo bààmú apá òtun,**

**Omo bààmú apá òsì**

**Omo bààmú ojú re ló wùmí**

**Aláwó Moore Ni mo se wá bá e ní tan**

**Omo arúgbó dúdú awó**

**Omo arà òkè èbìtì**

**Oriki iresa**

**Ilé òdi ará ìrèsà Omo epo**

**Paríolá o omo obaju elekoro Omo moboreje ti mo baloro**

**oko bi kùsàkùsà**

**Omo sééni, e mi o sééni**

**hin nín bí ará ìrèsà ninu oo**

**Paríolá fóle ko foniya oní mode**

**Iná yín sùn a ò maako, Iná yín sùn a ò maa bo.**

**Mr. Ag. Vice-Chancellor Sir, I thank Almighty God for giving me a virtuous woman as a wife, my soul mate, my friend, confidant and divine helper. Ladies and gentlemen, I am happy to introduce to you my wife, **Deaconess Adeyemi Adenike Akinlade**. The merciful God has blessed us with five children. They are indeed God's heritage and are wonderful children. They have been additional sources of joy to us and are of good behavior in all ramifications.**

### **Oriki ayede ekiti**

**Omo adè maaró jó, ò ró jó gbè bú**

**Omo ògunni geshin, ògunni yó kó o lú**

**Omo ògunni gògòrògò ti wò rò gò na gò**

**Omo à mómo lómo rúbo, kéèyii iyè wá dúpé à na**

**Finally, Mr. Ag. Vice Chancellor Sir, I am short of words in expressing my deep gratitude to God Almighty, who has brought me to this stage of my life. I will continually be grateful to Him all the days of my life. Alhamdulillah Robil alamin.**

**Thank you all for listening and God bless.**

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