

COURSE MODULE DESCRIPTION FOR M. AgSE IN LIVESTOCK SCIENCE AND SUSTAINABLE ENVIRONMENT

Module Title: BIOSTATISTICS					
Module code APL 801	Student workload 3 hours	Credits 3 Units	Semester First Semester	Frequency First semester of every new academic session	Duration One semester (Minimum of 13 weeks)
1	Types of courses a) Lecture b) Seminar c) Assignments		Contact hours 3 hours/week	Independent study X hours	Class size 8 students
2	Prerequisites for participation Participants must have completed undergraduate degree in relevant field from recognised University with minimum of Second Class Honours Upper Division and register for Short English Language Course and be able to write and read mathematical notations with ease.				
3	Course description/Synopsis Planning of experiments, Ways of increasing accuracy of experiments. Regression and correlation. Mixed models, completely randomized designs, randomized complete block, Latin squares, factorial experiments, confounding variables, split plots designs. Lattice designs, lattice squares, missing data, analysis of results of series of experiments, analysis of data arising from animal production/breeding. Use of package programmes for analysis of data arising from animal experimentation.				
4	Learning outcomes Students to see statistics applied to life science (i.e. Biostatistics) as an interesting course. Be able to design with ease agricultural experiments and generate results that can be used for predictions or in making inferences/deductions. Be able to make raw field data more meaningful to researchers and assist researchers in knowing exact differences between species or strains, etc. Students/Researchers would have sound statistical background and be able to apply the common statistical techniques with ease. Help students to understanding statistical terms and being able to interact well with Statisticians.				
5	Objectives After taken this course, the student(s) will be able to: Design agricultural experiments, collect data, analyse data, interpret and present research results in a precise form. Be conversant with steps/approaches to follow to minimize experimental errors. Know the analysis of variance and students are expected to know the commonly used statistical techniques (e.g. correlation and regression, co-variance and chi square) for data analysis in agricultural research.				

	Know the common experimental designs and models as well as being able to solve some examples. Use some software packages
6	Teaching methods Lectures through PowerPoint presentation, discussions and at times allow students/participants to solve some problems in class after some examples have been provided. Students are also given 'take home' assignments.
7	Assessment methods Assessments for the course are in form of continuous assessment tests, take home assignments, class discussion and participation in the semester examination.
8	The course module contained herein is for students pursuing any of the following degree programmes: (i) M. AgSE. (ii) Ph.D. AgSE.
9	Responsibility for module Two Professors from the Department of Animal Breeding and Genetics, Federal University of Agriculture, Abeokuta, Nigeria will introduce the course synopsis and discuss every concepts of the course to ensure that all the objectives are achieved with ease.
10	Course lecturers and Department Prof. C.O.N. Ikeobi and Prof. O. Olowofeso, Department of Animal Breeding and Genetics, Federal University of Agriculture, Abeokuta, Nigeria.
11	Course outline
Week	Topic(s)
1 & 2	Students to get very good scientific calculator and Statistical Tables for the course. Planning of experiments and ways of increasing accuracy of experiments.
3 & 4	Correlation and regression, Misuse of correlation and regression in agricultural research. Multiple examples and summarisation of results in an ANOVA Table
5 & 6	Designs and Models (MODEL 1 AND II ANOVA), Analysis of variance
7 & 8	Missing data and <i>Kruskal Wallis test statistic</i> , analysis of results of series of experiments using one way or two-way approaches
9 & 10	Analysis of data arising from animal experimentation, some classical examples
11	Latin square, factorial experiments, confounding variables, split plots designs. Lattice designs
12	Use of some software packages/programmes for analyses of data arising from animal experimentation.
13	Review of semester work and Tests/Assignments before examination

Recommended texts for the course

- (i) Statistical Procedures for Agricultural Research by Gomez, K.K. and Gomez, A.A.
(Second Edition).
- (ii) Biostatistics by Glover, T. and Mitchell, K.

Module/Course Title: Tropical Livestock Feed Resource and Commercial Feed Milling					
module/ course code (APL 802)	Student work- Load 3 hours	Credits (ECTS) 3	Semester Second Sem.	Frequency Each session	Duration 1 semester
1	Types of Courses Lectures and group participation	Contact hours 30 hours	Independent study 6 hours	Class size	
2	Prerequisites for participation Knowledge of feed ingredients used in feed industry				
3	Learning outcomes After successful completion of this course students are expected to be able to: - recognise the principles of feed formulation and its preconditions; - to apply simple and sophisticated linear programming techniques in formulating animal feeds/foods; - interpret deviations (natural variation; analytical errors) in nutrient content and/or digestibility of feed ingredients with respect to its feeding value; - demonstrate knowledge on feed additives in feeds for pigs, poultry and ruminants. - demonstrate knowledge of (main) groups of ingredients, including nutrient contents, animal feeding values and safety aspects for animals.				
4	Subject aims/Content Conventional, alternative and new feed resources. Tropical feedstuffs type, availability and extent of utilization, feed microscopy, and feedstuff standardisation and quality assessment. Feed mill operation and design. General aspects of livestock feed formulation for various classes of livestock. Computer in feed formulation and least cost diets. Recycling of waste and their nutritional potentials.				
5	Teaching methods Lectures, seminar presentations, discussion, case study				
6	Assessment methods Continuous Assessment Tests, Practicals and Examination, study visits				
7	This module/course is used in the following degree programme/s as well				

	Master of Agriculture in Livestock Science and Sustainable Environment (M.AgSE)
8	Responsibility for module/course Course Coordinator
9	Other information <ul style="list-style-type: none"> • http://www.vivo.colostate.edu/hbooks/pathphys/digestion/index.html • http://www-biol.paisley.ac.uk/kinetics/contents.html • http://en.wikipedia.org/wiki/Enzyme_kinetics#column-one • http://mark.asci.ncsu.edu/SwineReports/2004-2005/Contents.htm • http://www.das.psu.edu/dairynutrition/ • http://www.vet.ed.ac.uk/clive/cal/RUMENCAL/Frames/frmMega.html • http://www.uky.edu/~dhild/biochem/supp.html • http://vanat.cvm.umn.edu/run/plate7.html • http://www.ales2.ualberta.ca/afns/drtc/ • http://www.clfmaofindia.org/ • http://www.nianp.res.in/ • http://www.nutrisocietyindia.com/ • http://www.fao.org • http://www.codexalimentarius.net/web/index_en.jsp • http://www.ars.usda.gov • http://www.fao.org/ag/AGA/AGAP/FRG/afris/default.htm • http://www.aphca.org/ • http://www.fao.org/ag/AGA/AGAP/FRG/frg1.htm

Module Title: Poultry Farming Systems and Sustainable Environment					
Module code	Student workload	Credits	Semester	frequency	Duration
APL803	3 hours	2 Units	First Semester	Every Academic Session	1 semester
1	Types of courses a) Lectures b) Class Discussions on Recent Topics/Seminars	contact hours 39 hours / Semester	independent study 13 hours	class size 10 students	
2	Prerequisites for participation The students must have successfully completed undergraduate degree in Animal Science and register for short course in English Language				
3.	Course Description: Poultry Farming Systems and Sustainable Environment: Past and Present Scenario of Poultry Industry, Poultry housing, Livestock Environment; Macro Environment and Micro Environment, Climate Change, Food Security and Safety: Seminar: One Topic per student Practical: Farm Visit				
4	Learning outcomes: <ul style="list-style-type: none"> • Students will be acquainted with the different environments of the poultry production systems and to engender a sustainable environment for a stable food production. • Students are expected to understand the problems of and opportunities available in systems of poultry production as well coordinate livestock issues with other agricultural disciplines. 				
5	Subject aims: This course aimed at: 1. Encouraging students to develop a well-rounded interest in poultry production and different systems of production. 2. Exploring the attendant effects of climate change on the efficiency of poultry production to engender sustainable production and environment.				
6	Teaching methods Lectures accompanied by class discussions/seminars supported by power point presentations as well as farm visit.				
7	Assessment methods: Continuous Assessment Test, Quiz, Term Paper and Examination				
8	This module is used in the following degree programme: Master of Agriculture in Livestock Science and Sustainable Environment (M.AgSE)				

Responsibility for module:**Module I****Past and Present Scenario of Poultry Industry**

- ✓ Domestication of Poultry
 - Genetic Classification of Chicken and other species of Poultry- Layers, Broiler, and other class of Poultry – Hybrids available
- ✓ American, English, Mediterranean, Asiatic, Indian breeds, dual purpose breeds and non-descript birds
- ✓ Terms used in Poultry farming
- ✓ Growth of Poultry industry in Nigeria
 - Poultry population and other Poultry related statistics, per capita meat and egg availability
- ✓ Poultry Systems: small and large scale
- ✓ Systems of rearing: free-range, free-to-range, semi intensive, intensive rearing (deep litter, cage and slat floors), etc.
- ✓ Nutrition and management of poultry species in the different rearing systems
- ✓ Introduction to rearing of Turkeys, Ducks, Japanese Quails, Guinea fowls and Geese for meat production
- ✓ Poultry integration, Contract farming and Linkages
- ✓ Scavengeable Feed Resource Base

Poultry housing

- ✓ Layout
- ✓ Orientation
- ✓ Water source
- ✓ Different house designs
- ✓ Roof and roofing material
 - Selection of poultry farm site and ideal location
- ✓ Future expansion facility – electricity – farm equipment – cleaning methods
- ✓ Housing and different growing programs; All in and All out systems, batch system, etc.

Module II**Livestock Environment:****Macro Environment**

- ✓ Poultry house temperature
- ✓ humidity, cross ventilation, radiation, ammonia concentration, air flow, environmentally controlled house

Micro Environment

- ✓ Heat and moisture production from Poultry house, cooling/ heating of Poultry houses – movement of air, system of ventilation, Lighting management, critical temperature
- ✓ Seasonal management.

Climate Change

- ✓ Observed climate change
- ✓ Complex interactions of temperature and precipitation
- ✓ Impact of climate change on poultry production and food safety
- ✓ Adaptation and best management practices

Food Security and Safety

10	<p>Other information</p> <p>Practical: Farm Visits</p> <p>Instructor: Dr. O. M. Sogunle</p> <p>Department of Animal Production and Health, Federal University of Agriculture, Abeokuta</p>
11	Course Outline
Week	Lecture Topics
1	<p>Introduction: Past and Present Scenario of Poultry Industry</p> <p style="text-align: center;">Growth of Poultry industry in Nigeria</p>
2, 3 & 4	<p>Poultry Farming Systems: small and large scale</p> <ul style="list-style-type: none"> ✓ Systems of rearing: free-range, free-to-range, semi intensive, intensive rearing (deep litter, cage and slat floors), etc.
5	Nutrition and management of poultry species in the different rearing systems
6 & 7	Introduction to rearing of Turkeys, Ducks, Japanese Quails, Guinea fowls and Geese for meat production
8 & 9	<p>Poultry integration, Contract farming and Linkages</p> <p>Scavengeable Feed Resource Base</p>
10 & 11	<p>Poultry housing</p> <ul style="list-style-type: none"> ✓ Layout ✓ Orientation ✓ Water source ✓ Different house designs ✓ Roof and roofing material <ul style="list-style-type: none"> ○ Selection of poultry farm site and ideal location ✓ Future expansion facility – electricity – farm equipment – cleaning methods ✓ Housing and different growing programs; All in and All out systems, batch system, etc.
12 & 13	<p>Livestock Environment:</p> <p>Macro Environment</p> <ul style="list-style-type: none"> ✓ Poultry house temperature ✓ humidity, cross ventilation, radiation, ammonia concentration, air flow, environmentally controlled house <p>Micro Environment</p> <ul style="list-style-type: none"> ✓ Heat and moisture production from Poultry house, cooling/ heating of Poultry houses – movement of air, system of ventilation, Lighting management, critical temperature ✓ Seasonal management. <p>Climate Change</p> <ul style="list-style-type: none"> ✓ Observed climate change

	<ul style="list-style-type: none"> ✓ Complex interactions of temperature and precipitation ✓ Impact of climate change on poultry production and food safety ✓ Adaptation and best management practices <p>Food Security and Safety</p>
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References:

1. The Role of Livestock in developing communities: Enhancing multi-functionality by Frans Swanepoel, Aldo Stroebel and Siboniso Moyo (2010)
2. Oluyemi, J. A. and Roberts, F.A. (2000). *Poultry Production in Warm Wet Climates*. London: Macmillan Publishers Ltd. Pp. 18 – 34.
3. Saxena, H.C. and Ketelaars, E. H. (1993). *Poultry Production in Hot Climate Zone*. New Delhi –Ludhiang: Kalyani Publisher.,
4. Rice, J. E. and H. E. Botsford (1959). *Practical Poultry Management* (6th ed) New York & London: John Wiley and Sons, Inc. Pp. 118 – 138.
5. Olomu, J.M. (1995). *Monogastric Animal Nutrition*. Principles and Practices. (1st ed). Jachem Publication. Pp 67-74.
6. Climate Change Mititigation and Agriculture by Wollenberg et al., 2012
7. Poultry Production and Hot Climate by Daghir (2008)

Module Title.Ruminant Livestock Production System and Environmental Sustainability					
module codeAPL 804	student workload 2 hours/week	credits ..3 units	semester 2 Semester	frequency One Semester	duration 13 weeks
1	Types of courses seminar	contact hours . 2hours	independent study 3 hours	class size 12 students	
5	Prerequisites for participation Ruminant Animal Production at the Undergraduate level.				
2	Learning outcomes - Understand the interface between animal production and climate change. - Theatre presentation on Ruminant and Environmental sustainability. - Practical skills in ruminant livestock				
3	Subject aims - Sustainable sheep and goat enterprise - Impact on climate change. ----- Gas emission and Livestock Production. - Organic ruminant production system				
4	Teaching method. <i>Case studies, group work, lectures, discussions, Project works.</i>				
6	Assessment methods - Continuous assessment test and Examinations. - Pre and Post data seminar presentation, Classroom interactions				
8	This module is used in the following degree programmes as well ... <i>M.AgSE</i> ... <i>PH.D AgSE</i>				
10	Responsibility for module - Professor B.O. Oluwatosin, Dr O.A. Fasae, ..Professor O.A. Akinsoyinu.				
11	Other information - The module was specially designed for M.AgSe program.				

Module Title: Animal Biotechnology					
Module code	Student workload	Credits	Semester	Frequency	Duration
APL 806	2 hours	2 Units	Second Semester	Each semester	1 semester
1	Types of courses a) Lecture b) Seminar		contact hours 2 hours/week	independent study X hours	class size 11 students
2	Prerequisites for participation Must have completed undergraduate degree in relevant field and register for Short English Language Course.				
3	Course Description Animal Biotechnology Animal cell and tissue culture, maturation of oocytes, <i>in vitro</i> oocytes fusion, cloning, species hybridization, inter-species embryo transfer and artificial insemination, DNA sequences, blood group analysis and genetic polymorphism, electrophoretic techniques, genes and genetic markers. Linkage mapping by recombination. Mapping and map distances, chi-square test, mitotic segregation and recombination, analysis of single meiosis, sex chromosomes and sex linkages. Extensive practical sessions on relevant sections to be carried out. Practicals: Basic biotechnology lab and equipment appraisal, DNA extraction, polymerase chain reaction, electrophoresis, restriction fragment length polymorphism and amplified fragment length polymorphism. Artificial Insemination: Semen collection using AV, analysis, dilution, and preservation procedures [cryopreservation]. Insemination techniques in farm animals and poultry. Seminar: Four topics per student.				
3	Learning outcomes Students will learn the principles and applications of biotechnology to livestock improvement.				
4	Subject aims <ol style="list-style-type: none"> To develop the ability to understand and differentiate types of cells and function of cell organelles. To understand structure and functions of deoxyribonucleic and ribonucleic acids. To acquire principles of cloning technology and other techniques used in recombinant DNA technology To develop a basic understanding of molecular markers and genetic mappings applied 				

	<p>to animal improvement.</p> <p>5. To develop understanding of ethics in biotechnology as applied to livestock improvement and effects on environment.</p>
5	<p>Teaching methods</p> <p>Lectures, discussions and seminars.</p>
6	<p>Assessment methods</p> <p>Assessment methods for course are in form of continuous assessment tests, term papers, class discussions, regular seminars and examination.</p>
7	<p>This module is used in the following degree programmes as well</p> <p>M.AgSE</p> <p>PhD.AgSE</p>
8	<p>Responsibility for module</p> <p>Instructor I:</p> <p>Animal cell and tissue culture, maturation of oocytes, <i>in vitro</i> oocytes fusion, cloning, species hybridization, inter-species embryo transfer, DNA sequences, blood group analysis and genetic polymorphism, electrophoretic techniques, genes and genetic markers. Linkage mapping by recombination. Mapping and map distances, chi-square test, mitotic segregation and recombination, analysis of single meiosis, sex chromosomes and sex linkages. Extensive practical sessions on relevant sections to be carried out.</p> <p>Instructor II:</p> <p>Artificial Insemination: Semen collection using AV, analysis, dilution, and preservation procedures [cryopreservation]. Insemination techniques in farm animals and poultry.</p>
9	<p>Other information</p> <p>Practicals:</p> <p>Basic biotechnology lab and equipment appraisal, DNA extraction, polymerase chain reaction, electrophoresis, restriction fragment length polymorphism and amplified fragment length polymorphism.</p> <p>Artificial Insemination: Semen collection using AV, analysis, dilution, and preservation procedures [cryopreservation]. Insemination techniques in farm animals and poultry.</p> <p>Instructors: Dr. J.O. Daramola, Department of Animal Physiology, Federal University of Agriculture, Abeokuta, Nigeria.</p> <p>Dr. A.O. Adebambo, Department of Animal Breeding and Genetics, Federal University of Agriculture, Abeokuta, Nigeria.</p>
10	<p>Course outline</p>
Week	Lecture Topics

1	<ul style="list-style-type: none"> • History of biotechnology • Types, use and importance of biotechnology
2 & 3	<ul style="list-style-type: none"> • DNA, RNA, types, structure and function • Replication, transcription and translation
4 & 5	<ul style="list-style-type: none"> • Gene expressions • Mutations and markers in livestock improvement. • Mapping, linkages and marker assisted selection
6 & 7	<ul style="list-style-type: none"> • Techniques in biotechnology <ul style="list-style-type: none"> - Cloning, - PCR - Electrophoresis and Blotting techniques - sequencing
8 & 9	<ul style="list-style-type: none"> • Artificial Insemination: <ul style="list-style-type: none"> - Semen extenders - Semen collection - Semen evaluation dilution,
10	<ul style="list-style-type: none"> • Semen preservation <ul style="list-style-type: none"> - Liquid storage - Cryopreservation [Rapid and slow freezing]
11 & 12	<ul style="list-style-type: none"> • Animal cell and tissue culture • Maturation of oocytes, <i>in vitro</i> oocytes fusion
13	<ul style="list-style-type: none"> • Insemination techniques and species embryo transfer in farm animals and poultry.

References:

1. Reading material consists of lecture notes/internet websites.
2. Animal Biotechnology [Eds. Ashish Verma & Anchal Singh], 2013
3. Animal Cell Culture: A Practical Approach [John Masters]
4. Artificial Insemination in Farm Animals [Ed. Milad Manafi], 2011

Module Title: QUANTITATIVE GENETICS					
Module code	Student workload	Credits	Semester	Frequency	Duration
APL 807	2 hours	2 Units	First Semester	First semester of new academic session	One semester
1	Types of courses a) Lecture b) Assignments		Contact hours 2 hours/week	Independent study X hours	Class size 4 students
2	Prerequisites for participation Participants must have completed undergraduate degree in relevant field from recognised University with minimum of Second Class Honours Upper Division and register for Short English Language Course. Basic background in Genetics will be an added advantage				
3	Course description/Synopsis Genetics and phenotype variations. Genetic basis of qualitative traits, Genetic parameters (heritability, repeatability, correlation among traits). Selection in short and long terms. Crossbreeding and selection for crossing ability. Inbreeding depression and heterosis, genetic conservation				
4	Learning outcomes <ul style="list-style-type: none"> • Students to be able to pinpoint the differences between measurable and non-measurable traits. • Be able to compute heritability, repeatability and genetic correlation among economically important traits with different methods. • Reasons for practising purebreeding and crossbreeding programmes as well as the problems associated with the programmes. • Know that conservation of the animal genetic resources will lead to increased productivity with minimal inputs. • Students to know the consequences of inbreeding particularly inbreeding depression, selection and selection methods, etc. 				
5	Objectives After taken this course, the student(s) will be able to: <ul style="list-style-type: none"> • Know causes of variations and major differences between qualitative and quantitative traits with some examples • Know heritability, repeatability and correlation as genetic parameters, the estimation methods of each parameter, importance of the parameters and their significance. • Be conversant with mathematics involved in the estimation of each parameter and correct classification of traits into highly, moderately and lowly heritable/repeatable traits. • Meaning and types of selection, reasons for selection within the herd/flock. • Gains of selection in short and long terms 				

	<ul style="list-style-type: none"> • Breeding systems with particular interest in various crossbreeding programmes, advantages and problems associated with each programme. Inbreeding and its consequence particularly inbreeding depression. • Heterosis and common types of heterosis as well as need to conserve animal genetic resources for increased productivity.
6	Teaching methods Lectures through PowerPoint presentation, discussions and at times allow students/participants to solve some problems in class after some examples have been provided. Students are also given take home assignments.
7	Assessment methods Assessments for the course are in form of continuous assessment tests, take home assignments, class discussion and participation in the semester examination.
8	The course module contained herein is for students pursuing any of the following degree programmes: (iii) M. AgSE. (iv) Ph.D. AgSE. APL807 is an elective and only students with strong flair for Genetics/Breeding are enjoined to register for the course.
9	Responsibility for module Two Professors from the Department of Animal Breeding and Genetics, Federal University of Agriculture, Abeokuta, Nigeria will introduce the course synopsis and teach the important topics in Quantitative Genetics.
10	Course lecturers and Department Prof. C.O.N. Ikeobi and Prof. O. Olowofeso, Department of Animal Breeding and Genetics, Federal University of Agriculture, Abeokuta, Nigeria.
11	Course outline
Week	Topics
1 & 2	Genetics and phenotype variations, variation in traits, components of variance, major differences between qualitative and quantitative traits. Multiple factor hypothesis, transgressive variation, modifying genes or modifiers
3 & 4	Genetic basis of qualitative traits, multifactorial traits and classification of multifactorial (polygenic) traits into quantitative, threshold and categorical or discrete traits.
5 & 6	Genetic parameters (heritability, repeatability, correlation among traits). Methods of estimation and some examples on how to estimate each of the genetic parameter.
7 & 8	Basic biometry and statistical measures with some examples
9 & 10	Selection in short and long terms. Types of selection and reasons for selection within a herd or flock of animal genetic resources
11	Crossbreeding and selection for crossing ability

12	Inbreeding depression and heterosis, genetic conservation
13	Review of semester work, tests and assignments before examination

References

1. Introduction to Quantitative Genetics by D.S. Falconer
2. Statistical Techniques in Quantitative Genetics by J.P. Jain
3. An introduction to Genetic Analysis by A.J.F. Griffiths, J.H. Miller, D.T. Suzuki, R.C. Lewontin and W.M. Gelbart (7th Edition)
4. Genetics from genes to genomes by L.H. Hartwell, L. Hood, M.L. Goldberg, A.E. Reynolds, L.M. Silver and R.C. Veres.

Module/Course Title: Poultry Nutrition and Organic Animal Agriculture					
module/ course code (APL 808)	Student work- load 2 hours	Credits (ECTS) 2	Semester Second Sem.	Frequency Each session	Durati on 1 semester
1	Types of courses Lectures and group participation	Contact Hours 20 hours	Independent study 4 hours	Class size	
2	Prerequisites for participation Basic knowledge of poultry feeding and basic health needs				
3	Learning outcomes The student should be able to identify the feed ingredients required by different classes of poultry and know standardized ways of carrying out metabolic studies. Students should know the classes of vitamins and know their importance				
4	Subject aims/Content Feed resources and nutrient quality of ingredients for poultry feeding standards/NRC requirement vs requirements in tropics for all classes of and/specie of poultry. Methods for metabolic studies and determination of protein utilization and quality of proteins utilized by poultry. Importance of vitamins and minerals for poultry and associated deficiency symptoms.				
5	Teaching methods Lectures, seminars and discussions				
6	Assessment methods Continuous Assessment Tests, seminar, field trips, Practicals and Examination				
7	This module/course is used in the following degree programme/s as well				

	Master of Agriculture in Animal production and health and Animal Nutrition.
8	<p>Responsibility for module/course</p> <p>Course Coordinator</p>
9	<p>Other information</p> <ul style="list-style-type: none"> • http://www.vivo.colostate.edu/hbooks/pathphys/digestion/index.html • http://www-biol.paisley.ac.uk/kinetics/contents.html • http://en.wikipedia.org/wiki/Enzyme_kinetics#column-one • http://mark.asci.ncsu.edu/SwineReports/2004-2005/Contents.htm • http://www.das.psu.edu/dairynutrition/ • http://www.vet.ed.ac.uk/clive/cal/RUMENCAL/Frames/frmMega.html • http://www.uky.edu/~dhild/biochem/supp.html • http://vanat.cvm.umn.edu/run/plate7.html • http://www.ales2.ualberta.ca/afns/drtc/ • http://www.clfmaofindia.org/ • http://www.nianp.res.in/ • http://www.nutrisocietyindia.com/ • http://www.fao.org • http://www.codexalimentarius.net/web/index_en.jsp • http://www.ars.usda.gov • http://www.fao.org/ag/AGA/AGAP/FRG/afris/default.htm • http://www.aphca.org/ • http://www.fao.org/ag/AGA/AGAP/FRG/frg1.htm

Module Title: Sustainable Integrated Livestock Farming Systems					
Module code APL 810	Student workload 4 hours	Credits 2 Units	Semester Second Semester	Frequency Each 2 nd semester	Duration 1 semester
1	Types of courses a) Lecture b) Seminar		contact hours 4 hours/week	independent study X hours	class size 12 students
2	Prerequisites for participation Must have completed undergraduate degree in relevant field and register for Short English Language Course.				
3	<p>Course Description Sustainable Integrated Livestock Farming Systems</p> <p>What is Sustainable Agriculture / Farming system?</p> <p>Concept and themes of sustainable Agriculture:</p> <p>Farming and Natural Resources; water, energy, air and soil</p> <p>Principles guiding plant production practices; selection of site, species and variety, diversity, soil management, Efficient use of inputs, concerns about practitioners' goals and choices.</p> <p>Principles guiding animal production practices; Management planning, animal selection, animal nutrition, reproduction livability of animals, pasture? Paddock, confinement of animals.</p> <p>Economic, social and political considerations; food and agricultural policy, land use, consumers and food value chain.</p> <p>Integrated farming/Integrated biosystems</p> <p>Perspectives</p> <p>Case studies of integrated farming systems</p> <p>Practicals:</p> <p>Students to be part of a model sustainable integrated livestock farming system for at least 2 weeks, then write a report of their observations criticisms and lessons learnt</p>				
3	Learning outcomes The students should understand the meaning of sustainability in agricultural farming systems; the natural resources and their efficient use in plant and animal production practices including economic, social and political considerations.				
4	<p>Subject aims</p> <p>To develop an ability in the students to understand the term “Sustainable Agriculture” and its necessity in our contemporary times.</p> <p>To teach the three goals of sustainable agriculture viz, Environmental health, Economic profitability and Social and economic equity and to develop ability in students to make distinctions between these goals.</p> <p>The students have to be clear on the interrelationships between farming and natural resources of Energy, Air and Soil and emphasis laid on efficient use of these and other inputs to ensure lasting sustainability</p> <p>To take the students through the principles guiding selection of various plant production practices as they relate to sustainability up to the level of clear understanding.</p> <p>To take the students through the principles guiding selection of various animal production practices as</p>				

	<p>they relate to sustainability up to the level of clear understanding.</p> <p>To develop in students ability to do a case study of integrated farming systems and to come up with their own observations, criticisms and probable ways of improving the system</p>								
5	<p>Teaching methods Lectures, discussions, case studies, and seminars.</p>								
6	<p>Assessment methods Assessment methods for course are in form of continuous assessment tests, term papers, class discussions, regular seminars and examination.</p>								
7	<p>This module is used in the following degree programmes as well M.AgSE PhD.AgSE</p>								
8	<p>Responsibility for module Instructor I: General introduction, Crop farming systems; Mono -cropping, mixed cropping, crop rotation, alley farming etc. Animal rearing; Pastoralism, nomadic rearing, transhumans etc Comparison, advantages and disadvantages of the crop farming and Animal rearing systems Instructor II: What is sustainable Agriculture, and why? System's perspective in understanding sustainability Farming and natural resources Principles to guide practitioners /growers in selecting appropriate plant management practices Principles to guide practitioners / producers in selecting appropriate Animal management practices Economic, social and political considerations; food and agricultural policy, land use, consumers and food value chain. Integrated farming/Integrated biosystems Case studies Seminars and Discussions</p>								
9	<p>Other information Practicals: Students to be part of a model sustainable integrated livestock farming system for at least 2 weeks, then write a report of their observations criticisms and lessons learnt Instructors: Prof. Oluwatosin, Oluseyi and Dr. Adeleye, Oluwagbemiga Livestock Science and Sustainable Environment Program CEADSE</p>								
10	<p>Course outline</p> <table border="1"> <thead> <tr> <th>Week</th> <th>Lecture Topics</th> </tr> </thead> <tbody> <tr> <td>1</td> <td> <ul style="list-style-type: none"> • General introduction, • Crop farming systems; Mono -cropping, mixed cropping, crop rotation, alley farming etc </td> </tr> <tr> <td>2 & 3</td> <td> <ul style="list-style-type: none"> • Animal rearing; Pastoralism, nomadic rearing, transhumans etc • Comparison, advantages and disadvantages of the crop farming and Animal rearing systems </td> </tr> <tr> <td>4 & 5</td> <td> <ul style="list-style-type: none"> • What is sustainable Agriculture and why? • Main goals of sustainable Agriculture <ol style="list-style-type: none"> i. Environmental health ii. Economic profitability iii. Social and economic equity • Considerations for human resources </td> </tr> </tbody> </table>	Week	Lecture Topics	1	<ul style="list-style-type: none"> • General introduction, • Crop farming systems; Mono -cropping, mixed cropping, crop rotation, alley farming etc 	2 & 3	<ul style="list-style-type: none"> • Animal rearing; Pastoralism, nomadic rearing, transhumans etc • Comparison, advantages and disadvantages of the crop farming and Animal rearing systems 	4 & 5	<ul style="list-style-type: none"> • What is sustainable Agriculture and why? • Main goals of sustainable Agriculture <ol style="list-style-type: none"> i. Environmental health ii. Economic profitability iii. Social and economic equity • Considerations for human resources
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	<p>Social responsibilities such as working and living conditions of labourers, needs of rural communities, consumer health and safety (present and future)</p> <ul style="list-style-type: none"> • Considerations for land and natural resources maintaining or enhancing this vital resources for a long time
6 &7	<ul style="list-style-type: none"> • System's approach to understanding sustainability • The systems envisaged in very broad terms include: <ul style="list-style-type: none"> (i) the individual farms, (ii) the local ecosystem, (iii) communities affected by this this farming system both locally and globally
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10	<ul style="list-style-type: none"> • Principles to guide practitioners / growers in choosing appropriate plant management practices • Principles to guide practitioners / producers in choosing appropriate Animal management practices
11 & 12	<ul style="list-style-type: none"> • Seminar presentations by groups of students followed by questions and discussions.
13	<ul style="list-style-type: none"> • Seminar presentations by groups of students followed by questions and discussions • Revision

References:

5. Reading material consists of lecture notes/internet websites.
6. Farming systems and sustainable Agriculture, Dept of Agronomy, Forages and Grassland management, College of Agriculture, CSK, Vishvavidyala, Palampur 176062. Uploaded to Researchgate by Surinder Singh Rona CSK, HPKV Plampur 2016
7. Balasubramaniyan, P and Palaniappan 2004. Principles and practice of Agronomy, 2nd Edition, Agrobios

Module Title: Animal Behaviour and Welfare dynamics and Livestock sustainability in a changing climate					
Module code APL 811	Student workload 2 hours	Credits 2 Units	Semester First Semester	Frequency Each session	Duration 1 semester
1	Types of courses a) Lecture b) Seminar		contact hours 2 hours/week	independent study 6 hours	class size 8 students
2	Prerequisites for participation Must be proficient in English language and also must have completed undergraduate degree in relevant field of Agriculture				
3	<p>Course Description</p> <p>Animal Behaviour and Welfare dynamics and Livestock sustainability in a changing climate</p> <p>Animal law, ethics, principles and theorems.</p> <p>Global warming</p> <ul style="list-style-type: none"> • Climate change • Sustainability and probable effect on production of animals <p>Seasonal changes and effect on the welfare of animals</p> <ul style="list-style-type: none"> • Physical response of different species of animals • Behavioural response of the animals • Physiological response of different species of animals • Nutritional adaptation of animals • Reproductive capacity of different species of animals • Hormonal balance <p>Freedom: Behaviour of Animals</p> <ul style="list-style-type: none"> • What is normal behaviour? • Do animals have behavioural needs? • How can behavioural needs be assessed? • What is environmental enrichment? • How can it be supplied? • Does it always improve an animal's welfare? <p>Controlling the environment, insulation and ventilation:</p>				

	<ul style="list-style-type: none"> • Energy exchange with the environment • Thermoneutral zone • Air flow • Air distribution • Diffused systems <p>Group Seminar presentations: A group of students reads and present topical issues on sustainability and how it affects the welfare of livestock animals</p>
3	<p>Learning outcomes</p> <p>The students will understanding the rules and laws guiding the handling and rearing of Livestock animals that exists in Europe and Nigeria. They will also have a knowledge of the evolvement of the principles and ideologies guiding the Animal welfare theorems and how to apply it in the practical rearing and production of livestock animals</p>
4	<p>Subject aims</p> <ol style="list-style-type: none"> 6. To understand the rules and laws guiding the handling and rearing of Livestock animals that exists in Europe and Nigeria 7. To understand the evolvement of the principles and ideologies guiding the Animal welfare theorems 8. To understand Global warming and how it imparts on both the animals and their environment 9. To understanding the 5 Freedoms in Animal Welfare context 10. To have a grasp of what the normal behaviour of different species of animals are (including different status) and use the knowledge to detect / diagnose disease infections 11. To learn how to mitigate and/or finding solutions to the problem of global warming in a livestock environment 12. To understand the concept of sustainability 13.
5	<p>Teaching methods</p> <p>Lectures and discussions.</p>
6	<p>Assessment methods</p> <p>Assessment methods for this course entails continuous assessment tests, , class discussions and examination.</p>
7	<p>This module is used in the following degree programmes;</p>

	M.AgSE PhD.AgSE
8	<p>Responsibility for module</p> <p>Instructor I:</p> <p>Animal law, ethics, principles and theorems.</p> <p>Global warming</p> <p>Seasonal changes and effect on the welfare of animals</p> <p>Freedom: Behaviour of Animals</p> <p>Instructor II:</p> <p>Controlling the environment, insulation and ventilation</p> <p>Concept of Sustainability</p>
9	<p>Other information</p> <p>The students are also referred to website links that will assist them understand Freedom of animals, Animal ethics and laws according to DEFRA and BBSRC United Kingdom</p>
10	Course outline
Week	Lecture Topics
1	<p>Animal law, ethics, principles and theorems.</p> <p>Evolution and definition of Animal welfare by different authorities</p>
2,3 & 4	<p>Freedom: Behaviour of Animals</p> <ul style="list-style-type: none"> • What is normal behaviour? • Explaining the five freedoms of animals • Do animals have behavioural needs? • How can behavioural needs be assessed? • What is environmental enrichment? • How can it be supplied? • Does it always improve an animal's welfare?
5,6 & 7	Seasonal changes and effect on the welfare of animals

	<ul style="list-style-type: none"> • Physical response of different species of animals • Behavioural response of the animals • Physiological response of different species of animals • Nutritional adaptation of animals • Reproductive capacity of different species of animals • Hormonal balance <p style="text-align: center;">-</p>
8 &9	<p>Global warming</p> <ul style="list-style-type: none"> • Climate change • Sustainability and probable effect on production of animals <p style="text-align: center;">-</p>
10,11 & 12	<p>Controlling the environment, insulation and ventilation:</p> <ul style="list-style-type: none"> • Energy exchange with the environment • Thermoneutral zone • Air flow • Air distribution • Diffused systems <p style="text-align: center;">-</p>

Module/Course Title: Internship Reports					
module/ course code (APL 898)	Student work- load 2 hours	Credits (ECTS) 2	Semester Second Sem.	Frequency Each session	Duration 1 semester
1	Types of courses Lectures and group participation	Contact Hours 20 hours	Independent study 4 hours	Class size ALL students	
2	Prerequisites for participation General Knowledge of Animal Science, field experimenter Research methods				
3	Learning outcomes Develop communication, interpersonal and other critical skills in the job interview process. Build a record of work experience. Identify, write down, and carry out performance objectives (mutually agreed upon by the employer, CEADSE, experiential learning supervisor, and the student) related to their job assignment.				
4	Subject aims/Content How to identify a problem, how to develop research proposal				
5	Teaching methods Report Writing, Post Internship seminar				
6	Assessment methods Oral interviews, work done and attitude to work				
7	This module/course is used in the following degree programme/s as well				

	Master of Agriculture in Animal production and health, Animal Nutrition, Animal Physiology, Animal Breeding and Genetics.
8	Responsibility for module/course Course Coordinator
9	Other information

Module/Course Title: Research project, Seminars and Dissertations					
module/ course code (APL 899)	Student work- load 4 hours	Credits (ECTS) 4	Semester First Sem.	Frequency Each session	Duration 1 semester
1	Types of courses Lectures and group participation	Contact Hours 20 hours	Independent study 4 hours	Class size ALL students	
2	Prerequisites for participation General Knowledge of Animal Science, field experiment Research methods				
3	Learning outcomes Build work experience, Enhance your resume, Develop work-ready skills (that employers demand), Strengthen your networking while Exploring, or reaffirming, your career choice				
4	Subject aims/Content Research and dissertation or Thesis				
5	Teaching methods No formal teaching. Interaction, observation and experiential activities				
6	Assessment methods Oral interview				
7	This module/course is used in the following degree programme/s as well Master of Agriculture in Animal production and health, Animal Nutrition, Animal Physiology,				

	Animal Breeding and Genetics and Pasture and Range Management
8	Responsibility for module/course Course Coordinator
9	Other information