

CROP AND PASTURE PRODUCTION AND SUSTAINABLE ENVIRONMENT

Preamble

Degrees offered to be awarded are M.AgSE and PhD AgSE in Crop and Pasture Production and Sustainable Environment. PhD have options in (Crop Production, Plant Breeding, Seed Technology, Crop Pathology, Crop Entomology, Pasture Agronomy and Pasture Production). PhD. AgSE shall be by a combination of taught courses, seminar courses, supervised teaching and research. Every PhD student is expected to take and obtain satisfactory performances in all the following compulsory courses in addition to Seminars and Internship. M. AgSE is designed to combine sound knowledge of the principles, theories, practicals and scientific methodologies with in depth understanding of sustainable crop and pasture production relating to livestock production and sustainable exploitation of natural resources.

Philosophy

To produce world class students with knowledge in Crop /pasture production with a well balanced education and industrial experience.

The graduates must be such that they can be self-reliant in all aspects of crop production, particularly; forage, crop improvement, crop protection, crop processing and agronomy, and the student is tailored to be a job creator and not job seeker with sufficient industrial background to fit to the current need of today's industry and practice.

Objectives

- To inculcate into our students that crop/pasture production should be viewed and practiced with agro –business inclination.
- To promote professional development of graduates in Agriculture, by providing students with understanding and hands-on experience of different discipline within the realms of crop/pasture production.
- To develop crop varieties that are adaptable to our various biotic and abiotic stresses of the environment.
- To train students who will focus on research and development in crop/pasture production.
- To train students to meet the industrial need and achieve enhanced entrepreneurial skills.

LIST AND SYNOPSES OF COURSES
CROP AND PASTURE PRODUCTION AND SUSTAINABLE ENVIRONMENT

M.AgSE

First Semester Courses

Course Code	Course Acronyms	Course Title	Credit Units
ACE 801	CEADESE1	Climate Change and Agriculture	3
GES 801	CEADESE5	Short English Language Course	1
GES 803	CEADESE3	Short French Language Course	1
CRP 801	CROPSYS.	Cropping Systems	2
CRP 803	PRINCDEV	Principles of Cultivar Development	3
CRP 805	CROPPROT	Crop Protection and Productivity	2
CRP 807	PHYSICRPD	Physiology of Crop Production	2
CRP 809	PASPREUZ	Pasture Production, Evaluation and Utilization	3
CRP 811	CROPPTEC	Crop/Pasture Processing Technology	3
CRP 813*	PCULDEVT	Principles of Cultivar Development	2
CRP 895	CEADESE3	Seminar I	1
		TOTAL	23

*Elective course

Second Semester Courses

Course Code	Course Acronyms	Course Title	Credit Units
ACE 802	CEADESE2	Information System and Agricultural Knowledge Management	3
ACE 804	CEADESE4	International Trade and Commercial Policy	3
CRP 802	SEEDPROD	Seed Production	2
CRP 804	FIELDEXP	Field Experimentation	2
CRP 806	SOILFMCN	Soil Fertility Management and Crop Nutrition	2
CRP 808	AGROECP	Agronomy, Ecology and Physiology of Pastures	3
CRP 810	ENGRACPP	Engineering Application in Crop/Pasture Production	3
CRP 812*	NEWFCRPR	New Frontiers in Crop Production	2
CRP 814*	BIOMGENS	Biometrical Genetics	2
CRP 894	CEADESE9	Internship Reports	2
CRP 896	CEADES10	Seminar II	1
CRP 899	CEADES11	Dissertation	6
		TOTAL	31

*Elective Courses

M.AgSE Students are to offer either GES 801 or GES 803.

Total Units for M.AgSE Crop and Pasture Production and Sustainable Environment: 53
Units minimum.

SYNOPSIS OF CROP/ PASTURE PRODUCTION AND SUSTAINABLE ENVIRONMENT (M.AgSE)

CRP 801 Cropping Systems (2 Units)

Land tenure systems in West Africa, Soil and water conservation, Mechanized farming for various cropping systems e.g Agroforestry, Alley farming, Mixed vs sole cropping systems, Mixed farming, Zero-tillage farming (Conservation agriculture), Plantation agriculture and Organic Agriculture. Greenhouse (controlled environment) crop production, Agronomy of specific crops of importance to African food security. Crop protection, Crop nutrition. Thematic term papers and seminars on regional cropping systems of West Africa, developing resilient farming systems in West Africa etc. Tractor operation and licensing practicals under AMS 700.

CRP 802 Seed Production (2 Units)

National and regional variety release systems in West African countries; ECOWAS Harmonized seed laws. Conditions for seed production, Controlled seed multiplication, Evaluating and maintaining genetic purity during seed production; Seed Certification; Principles of seed processing, outlay of seed processing plants, Seed Pre-cleaning, conditioning, grading and sizing equipment and operations. Commercial seed treatments. Seed store and gene bank operation: seed germination testing, viability and quality control. Viability modelling, seed drying, packaging and transportation. Hybrid seed production: Genetic basis of hybrids, Population genetic analysis in hybrid production, Hybrid purity and GMO testing. Thematic term papers and seminars on specialised seed industries like organic seed production, Seed cooperatives, Public-private partnerships (PPP), National and regional seed business incentives, Farm management/cost benefit analysis and other topical seed enterprise development issues etc.

CRP 803 Principles of Cultivar Development (3 Units)

Plant Genetic Resources, Line development and recurrent selection, Plant breeding methods-back crossing, cultivar developments for dicot and monocot crop plants, mutation breeding and hybridization, introduction to genetic engineering, exploiting cytological and genetic methods in crop improvement (induction and utilization of male sterility, polyploidy, double haploids breeding, apomixes), Variety release and variety integrity maintenance, Analysis of crosses, expectation for line cross means, heterosis, inbreeding

depression, Analysis of mating designs, North Carolina (NC) designs I, II and III, diallel mating designs; Hayman-Jinks analysis, Marker based analysis; molecular markers, Genetic maps, Marker-trait association; Recombinant inbred lines

CRP 804 Field Experimentation (2 units)

Hypothesis testing, Experimental designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design, Factorial experiments, Split plots designs, Analysis of Variance (ANOVA) and Mean comparisons. Regression and correlation. Mixed models, confounding variables, Use of statistical package programmes.

CRP 805 Crop Protection and Productivity (2 units)

Pests and pathogens in crop protection and productivity. Plant-nematode relations or interactions; population dynamics of nematodes; methods of nematode control in agricultural soils. Definition and categorization of insect pests; development of pest status. Economics of insect pest attack; forecasting Insect pest outbreak. Fungi diseases of national and international importance. Classification and nomenclature of plant parasitic fungi. Morphology, Biology and Ecology of fungi. Classification and properties of plant pathogenic bacteria. Growth, reproduction and genetics of plant pathogenic bacteria. Kinds of inoculum produced and dissemination. Bacteria diseases of national and international importance. The nature of viruses' growth and reproduction. The genetics of viruses. Kinds of inoculum produced. Dissemination, Virus diseases of national and international importance. Control measures, quarantine, cultural, chemical, host plant resistance, etc.in crop protection and productivity. Basic crop protection equipments, maintenance and repairs.

Practicals:- Sampling for nematodes and nematodes extraction from soil and plant. Isolation, purification and identification of major plant pathogens (bacteria and fungi). Creation of insect museum of agricultural importance. Identification of insect body parts. Virus isolation and transmission. Virus purification. Application of molecular and plant tissue culture techniques in plant disease diagnosis.

CRP 806 Soil Fertility Management and Crop Nutrition (2 Units)

Soil characterization, Soil mapping, Land use planning, Soil fertility management, Integrated soil fertility management, Organic fertilizer and compost production and use, Soil microbiology, Carbon sequestration, Plant nutrition, soil management and climate change, Soil chemistry, Soil Ecology and environment

CRP 807 Physiology of Crop Production (2 units)

Physiological mechanism underlying crop yield: growth, development, assimilate partitioning and carbon economy, Canopy carbon assimilatory process and effect of environmental factors; light (Photosynthetic photon flux density), water and nutrient availability, Irradiance response curve model and

analysis of canopy carbon assimilation, Canopy architecture and carbon assimilation, coefficient of extinction, LAI, Sunlighted leaf area, leaf orientation and canopy carbon assimilation, Leaf area duration, relative leaf growth rate, Canopy respiration and yield; growth and maintenance respiration, factors affecting them and implication towards yield, Carbon balance and yield, Stress physiology and ameliorative process, Water balance: water deficit and flooding. Physiology of crop response, adaptation and acclimation and its consequent on crop yield, water use efficiency and yield. Irrigation and yield, Energy balance: UV and other lethal electromagnetic radiation, shading. Physiology of crop response and effect on yield. Radiation use efficiency and yield. Nutrient response curve, indicating different zones of uptake; deficiency, poverty adjustment, luxury consumption and toxicity zone with emphasis on essential macro nutrients. Nutrient use efficiency; nutrient uptake and utilization, dimensions of nutrient use efficiency (Agronomic, Partial factor productivity, Physiological, internal, recovery and economic nutrient efficiency). Iron and aluminum toxicity specifically in rice production and its implication on crop yield. Fertilizer application (inorganic and organic agriculture) and crop yield, Effect of reactive oxygen species on crop yield, Crop Ecophysiology and Introductory crop modelling, Environmental factors and crop yield, System theory, system dynamics concepts and principles, Crop simulation models in Agricultural research and management, Fundamentals of DSSAT model, Yield analysis of some selected field crops; yield component of some selected arable crops and its implication towards yield formation, Physiological bases of agronomic management practises; spacing, fertiliser application, irrigation, variation in planting date etc.

CRP 808 Agronomy, Ecology and Physiology of Pastures (3 units)

Agronomy and adaptation of tropical pasture plants and their pattern of geographical distribution. Origin and domestication of forage plants. Genetic variation and mode of reproduction in pasture plants. Natural and sown pasture compared. Establishment and management of improved pastures - land requirement, land preparation, planting materials and planting, etc. Degradation and persistence of pastures. Role of legumes in tropical pasture production. Pasture condition, species inter- relations environmental influences. Pasture as an ecosystem, species interrelationships and succession. Animal-soil-plant interactions. Influence of edaphic, physiographic and biotic factors in pasture productivity

CRP 809 Pasture Production, Evaluation and Utilization (3 units)

Role of pastures in animal production, factors influencing choice of species for sown pastures. Steps in pasture establishment and management - weed management, fertilizer management and grazing management. Pasture research methodology and evaluation techniques. Pasture quality evaluation and factors affecting quality. Animals and pasture measurements under experimentation and

statistical analysis. Utilization techniques - *in situ* grazing and grazing systems, cut-and-carry system, conservation and utilization techniques

CRP 810 Engineering Application in Crop/Pasture Production (3 units)

Field mechanization: Land clearing operations; Tillage operations – ploughing, harrowing, planting, ; Equipment for mechanized agricultural production – The tractor and accessory implements, Conservation agriculture equipment; Intensive mechanization equipment for large scale farming

Irrigation: Classifications & types of irrigation system; Merits & demerits of irrigation system; Criteria for the selection of irrigation system; water use efficiency; Crop water requirements, crop coefficient, field water requirements, field irrigation methods; irrigation scheduling, conveyance structures, Soil, water and plant relationship

Drainage: Principles of soil and land drainage; Surface drainage, drainage methods, crop row drain system, Subsurface drainage criteria, Drainage and erosion control, Drainage types and classifications; selection of drainage systems

Soil and water conservation on cropland, Soil and water conservation on pasture and rangeland,

Flood control: Causes of flood; Flood and the associated disasters; Identification of flood prone areas; Climate change and flood; Flood control techniques and facilities

Farm structures for crop/ pasture production: Dams, canals and other hydraulic systems; Farm workshop for equipment servicing, repairs and maintenance; Storage structures for crops and hays, Selection criteria for location of farm structures and construction materials.

CRP 811 Crop/Pasture Processing Technology (3 units)

Crop/ Pasture Harvesting Equipment: Traditional harvesting equipment; tractor Mounted harvesters; combine harvester, Principles and techniques of handling crop/ pasture production equipment.

Primary processing equipment; Choppers, grain shellers and threshers, grain separators and sorters, dryers, pelletizers; Maintenance and servicing of the identified equipment; Secondary processing equipment: Types and principle of operation of expellers, extractors, extruders, hay balers; Maintenance and servicing of the identified equipment;

Storage Facilities: Classification of storage systems, Traditional storage system – Bags, guard traditional crib, rhombus, etc; Improved storage system – Improved crib, Evaporative Coolant system; Modern storage system – Refrigeration, cold storage system, silo, ware house; cooling vans; Storage facilities for root and tuber crops – barn, shelf, pit or underground storage system, etc.

CRP 812 New Frontiers in Crop Production (2 units)

Marker Assisted Selection (MAS), DNA technology on tissue culture in Crop and forage production, Genetic Engineering, Genotyping and phenotyping of crop and pasture of essential attributes.

CRP 813 Pasture in farming systems and environmental management (2 units)

Role of crop-livestock system in sustainable production, role of legumes, integration of pastures in plantation and animal crops. Intensive feed garden, fodder bank system. Sustainable use of crop residues in enhancing dry season feeding. Animal grazing and crop productivity. Managing animals in crop production environments. Animal grazing and ecosystem stability, traditional animal production system, environmental health, and rural livelihoods. Effect of fire in natural pasture management. Ruminant production and global warming, desertification

CRP 814 Biometrical Genetics (2 units)

Sources of variation, Additive Dominance Model, Epistasis, Interraction, G x E, Line x tester analysis, Experimental population-BIPS, NC I, NC II, Diallel

LIST AND SYNOPSES OF COURSES

CROP/ PASTURE PRODUCTION AND SUSTAINABLE ENVIRONMENT

PhD. AgSE

Courses at the PhD AgSE programme comprises Centre Courses taken at both Semesters, Programme Courses taken at First Semester and specialization based courses of a minimum of six (6) units each to be offered at the Second Semester.

CENTRE COURSES

First Semester

Course Code	Course Acronyms	Course Title	Credit Units
ACE 801	CEADESE1	Climate Change and Agriculture	3
GES 801	CEADESE5	Short English Language Course	1
GES 803	CEADESE3	Short French Language Course	1
		TOTAL	5

Second semester

Course Code	Course Acronyms	Course Title	Credit Units
ACE 802	CEADESE2	Information System and Agricultural Knowledge Management	3
ACE 804	CEADESE4	International Trade and Commercial Policy	3
		TOTAL	6

PROGRAMME COURSES

First Semester Courses

Course Code	Course Acronyms	Course Title	Credit Units
CRP 901	APPLSARH	Applied Statistics for Agricultural Research	3
CRP 903	ADVCRPRD	Advanced Crop Production	3
CRP 995	CEADES13	Seminar I	1
CRP 997	CEADES16	Seminar III (To be taken at second year)	2
		TOTAL	9

SPECIALIZATIONS BASED COURSES

Second Semester Courses

Course Code	Course Acronyms	Course Title	Credit Units
		PhD AgSE in Crop Production	
CRP 902	CROPSYST	Advanced Cropping Systems	3
CRP 904	ADVCPECO	Advanced Crop Ecology	3
CRP 906	CPGRDEVT	Crop Growth and Development	3
		PhDAgSE in Plant Breeding	
CRP 908	PLGBREED	Plant Genetics and Breeding	3
CRP 910	PHYSGECP	Physiological and Genetics of Crops	3
CRP 912	ADCROPTA	Advanced Crop Taxonomy	3
		PhDAgSE in Seed Technology	
CRP 914	ADVSEEDP	Advanced Seed Processing and Handling	3
CRP 916	APSEEDCE	Applied Seed Certification	3
CRP 918	ADVSSTOR	Advanced Seed Storage	3
		PhDAgSE in Pasture Agronomy and Production	
CRP 920	ADVPMAPR	Advanced Pasture Management and Animal Production	3
CRP 922	APRMUTIL	Applied Range Management and Utilization	3
CRP 924	PASTPRPD	Pasture Production and Productivity	3
		PhDAgSE in Crop Physiology	
CRP 926	ADVPGYAN	Advanced Plant Growth and Yield Analysis	3
CRP 928	ADVPHAPH	Advanced Post Harvest Physiology of Crops	3
		PhDAgSE in Crop Entomology	
CRP 930	IMSYTAXO	Advanced Insect Morphology, Systematics And Taxonomy	3
CRP 932	APENTOCP	Applied Entomology in Crop Production	3
		PhDAgSE in Crop Pathology	3
CRP 934	ADVDMYCO	Advanced Mycology	3
CRP 936	ADVBACTG	Advanced Bacteriology	3
CRP 938	ADVPMYCO	Advanced Plant Virology	3
Minimum of six (6) Units of specialization based courses			6
CRP 994	CEADES12	Internship Reports	4
CRP 996	CEADES14	Seminar II	1
CRP 999	CEADES18	Thesis	10
		TOTAL	21

For Non –FUNAAB Graduates: Courses to be audited will be determined by the Programme Leader based on transcript provided. Also, candidates from Anglophone Countries are to offer GES 801 (French Language) and those from Francophone Countries are to offer GES 803 (English Language).

Total Units for PhD. AgSE = 40 Units minimum in addition to the Centre's Courses

SYNOPSIS OF CROP/ PASTURE PRODUCTION AND SUSTAINABLE ENVIRONMENT (PhD.AgSE)

CRP 901: Applied Statistics for Agricultural Research (3 Units)

Experimental designs, Sampling techniques, factorial experiments, split plot design, multiple and partial regression and correlation, Analysis of Covariance

CRP 903: Advanced Crop Production (3 Units)

Environmental factors of crop production. Yield limiting Factors and concepts related to their influence on crop growth, Production Systems and diversity, plant distribution and crop yield.

CRP 902: Advanced Cropping Systems (3 Units)

Land tenure systems in West Africa, Soil and water conservation, Mechanized farming for various cropping systems e.g Agroforestry, Alley farming, Mixed vs sole cropping systems, Mixed farming, Zero-tillage farming (Conservation agriculture), Plantation agriculture and Organic Agriculture. Greenhouse (controlled environment) crop production, Agronomy of specific crops of importance to African food security. Crop protection, Crop nutrition. Thematic term papers and seminars on regional cropping systems of West Africa, developing resilient farming systems in West Africa etc.

CRP 904: Advanced Crop Ecology (3 Units)

Ecology and agronomy of different crops. Climatic, edaphic, biotic and geographical factors of the environment and ant their relationship to crop distribution and productivity.

CRP 906: Crop Growth and Development (3 Units)

Growth and crop phenology, hormonal control of growth and yield sustenance as influenced by mineral nutrition and water supply, yield improvement and rejuvenation of low producing crops.

CRP 908: Plant Genetics Breeding (3 Units)

Gene action, heritability, inbreeding and heterosis. Response to selection, selection method for self and cross pollinating crops, Genotype x environment interaction. Breeding techniques for self-cross pollinating crops, conservation of genetic resources.

CRP 910: Physiology and Genetics of Crops (3 Units)

Plant environment, relationship between genotype and the environment, methods of detecting varietal differences, photosynthetic efficiency, C3 and C4 plants. Physiological basis of heterosis in plants. Molecular genetics-DNA and RNA, Genetic code.

CRP 912: Advanced Crop Taxonomy (3 Units)

Angiosperm systematics, procedures for preparation of long term herbarium materials, use of keys in plant taxonomy. Relevance of plant anatomy, genetic, phytochemistry. Numerical taxonomy, Chemosystematics.

CRP 914: Advanced Seed Processing and Handling (3 Units)

Seed processing principles, pre cleaning, and conditioning, basic cleaning, dimensional sizing, specific gravity separation, surface texture separation, air separators, electronic separators, miscellaneous cleaning equipment. Commercial seed treatments. Seed handling, accessories design and layout of processing plant.

CRP 916: Applied Seed Certification (3 Units)

Brief history, objectives, Certification Authority, Manpower requirements, elements of sound seed certification programme, minimum certification standards, Field inspection, pre and post-harvest control (Varietal purity, seed borne disease). Seed quality tests in the laboratory.

CRP 918: Advanced Seed Storage (3 Units)

Types of seed, seed moisture relationships. Life span of seeds, seed deterioration, seed storage, purposes and precepts. Storage pests, storage fungi. Types of storage, conditional storage. Seed packaging.

CRP 920: Advanced Pasture Management and Animal Production (3 Units)

Pasture improvement techniques, proper uses of tropical pastures, method of enhancing quality and utilization, grazing management, its effect on pasture and animal productivity, stocking rate, carrying capacity, stocking density, grazing season etc. production of different classes of ruminants on pasture, pasture requirement for different classes of animals.

CRP 922: Applied Range Management and Utilization (3 Units)

Range ecology and conditions, range land productivity, range resources and their roles in domesticated animal production, influences of man on range land productivity.

CRP 924: Pasture Production and Productivity (3 Units)

Pasture productivity indices, herbage yield measurement, sampling techniques, relationship between herbage yield and animal productivity, quality indices and evaluation techniques, measuring dry matter yields of shrubs and trees used as forage.

CRP 926: Advanced Plant Growth and Yield Analysis (3 Units)

Kinetics of growth rate. Theories components of growth rate, determination of primary values, data analysis and transformation. Uses and abuses of growth analysis. Environmental regulation of the components of yield. Measurement of growth resources, dry matter production and its distribution into various sinks. Roles of plant characters in development of growth and yield. Regulations of growth and yield. Climatic factors affecting growth and yield field crops.

CRP 928: Advanced Post Harvest Physiology of Crops (3 Units)

Harvest indices, concepts of ripening changes during maturation, ripening and senescence, pre and post-harvest factors affecting crop quality. Regulation of ripening and senescence.

CRP 930: Advanced Insect Morphology, Systematics and Taxonomy (3 Units)

Insect systematics, purpose and methods of identification, classification, components of biological classification. Taxonomic categories, nomenclature, classification of the class Insects.

CRP 932: Applied Entomology in Crop Production (3 Units)

Principle of insect control-definition and categories of pest status. Insect pest damage, economics of insect pest attack, forecasting insect outbreak, methods of pest control –Biological, genetic, environmental, chemical, mechanical, physical, legislative, Cultural, Host Plant resistance, integrated pest management.

CRP 934: Advanced Mycology (3 Units)

Classification and nomenclature of Plant parasitic fungi, Morphology, biology and ecology of fungi. Methods of determining nutritional requirements of fungi. Effect on environmental factors on growth and sporulation.

CRP 936: Advanced Bacteriology (3 Units)

Classification and properties of Plant pathogenic bacteria. Growth and reproduction. The genetics of bacteria. Kinds of inoculum produced. Dissemination. Bacterial disease of National and International importance. Control measures, quarantine, cultural, chemical, host-plant resistance etc.

CRP 938: Advanced Plant Virology (3 Units)

The nature of virus growth and reproduction. The genetics of viruses. Kinds of inoculum produced. Dissemination, virus diseases of National and International importance. Control measures, quarantine, cultural. Borne infection. Vector-host relationship in arthropod-borne infection. Method in the study of plant viruses.