Cropping System and Sustainable Agriculture	AGRN -311	3(2+1)

THEORY

UNIT I: Cropping systems: definition, indices and its importance; physical resources, soil and water management in cropping systems; assessment of land use.

UNIT II: Concept of sustainability in cropping systems and farming systems, scope and objectives;production potential under monoculture cropping, multiple cropping, alley cropping, sequential cropping and intercropping, mechanism of yield advantage in intercropping systems.

UNIT III: Above and below ground interactions and allopathic effects; competition relations; multi-storeyed cropping and yield stability in intercropping, role of non-monetary inputs and low cost technologies; research need on sustainable agriculture.

UNIT IV: Crop diversification for sustainability; role of organic matter in maintenance of soil fertility; crop residue management; fertilizer use efficiency and concept of fertilizer use in intensive cropping system.

UNIT V: Plant ideo-types for dry lands; plant growth regulators and their role in sustainability.

PRACTICAL

- Sowing and agronomic management of crops under mixed, intercropping and relay systems
- Assessment of yield advantages under different cropping systems
- Calculation on sustainability/ stability index (relative production efficiency, system water use efficiency, land use efficiency, man-days generation, energy use efficiency, etc.)
- Evaluation on crop sequences under both irrigated and rainfed conditions
- Relay crop production under various cropping systems
- Study on scope of multiple cropping under monocropped rainfed situation
- Preparation of suitable crop sequences for different agro-climatic zones of West Bengal; Visit of field experiments on mixed, inter, relay and multi-tier cropping in farm/ research station
- Visit to nearby village to study on different cropping systems and making a report.

Dryland Farming and Watershed Management	AGRN -312	2 (1+1)

THEORY

UNIT – I: Definition, concept and characteristics of dry land farming; dry land versus rainfed farming;significance and dimensions of dry land farming in Indian agriculture.

UNIT – II: Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions.

UNIT – III: Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather conditions.

UNIT – IV: Tillage, tilth, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds,effectiveness and economics); anti-transpirants; soil and crop management techniques, seeding and efficient fertilizer use.

UNIT – V: Concept of watershed resource management, problems, appraoch and components.

PRACTICAL

- Seed treatment, seed germination and crop establishment in relation to soil moisture contents.
- Moisture stress effects and recovery behaviour of important crops
- Estimation of moisture index and aridity index
- Spray of anti-transpirants and their effect on crops
- Collection and interpretation of data for water balance equations
- Water use efficiency
- Preparation of crop plans for different drought conditions
- Study of field experiments relevant to dryland farming
- Visit to dryland research stations and watershed projects
- Tour and visits

Agronomy of Fodder and Forage Crops	AGRN -313	3(2+1)

THEORY

UNIT I: Adaptation, distribution, varietals improvement, agro-techniques and quality aspects including anti-quality factors of important fodder crops like maize, bajra, guar, cowpea, oats, barley, berseem, senji, lucerne etc.

UNIT II: Adaptation, distribution, varietals improvement, agro-techniques and quality aspects including anti-quality factors of important forage crops/grasses- lime, napier grass, Panicum, Lasiuras, Cenchrus etc.

UNIT III: Year-round fodder production and management, preservation and utilization of forage and pasture crops.

UNIT IV: Principles and methods of hay and silage making; chemical and biochemical changes,nutrient losses and factors affecting quality of hay and silage; use of physical and chemical enrichments and biological methods for improving nutrition; value addition of poor quality fodder.

UNIT V: Economics of forage cultivation uses and seed production techniques.

PRACTICAL

- Practical raining of farm operations in raising fodder crops;
- Canopy measurement, yield and quality estimation, viz. crude protein, NDF, ADF, lignin, silica, cellulose etc. of various fodder and forage crops
- Anti-quality components like HCN in sorghum and such factors in other crops
- Hay and silage making and economics of their preparation.

Seed Production Technology of Major Field Crops	AGRN - 314	3(2+1)

THEORY

UNIT I: Role in increasing agriculture production seeds its importance, in green revolution difference between grain and seed. Concept of seed quality, steps involve in seed production. Principles of seed production, concept and factors that affect the seed quality in the growing; processing and distribution of seed, seed replacement rate, multiplication rate, seed industry in India and role of various agencies, important terminology used in seed industry, breeders, foundation, and certified seed, maintenance of genetic purity.

UNIT II: Seed certification: Its concept, role & goal, necessity of seed certification, minimum seed certification standard for self and cross pollinated crops, Field and seed inspections, objectives, general principles and methods. Preparation of field reports, seed certification terms; seed certification agencies, certified and truthfully labeled seeds

UNIT III: Classes of seed; Seed Act regulations; Seed certification and testing.

UNIT IV: Seed production and processing of principal crops: Cereals (Rice, Hybrid rice, Wheat, Maize, Hybrid maize), Pulses (Chickpea, Lentil, Greengram, Blackgram, Lathyrus), Oilseeds (Mustard and Rapeseed, Groundnut, Sunflower, Sesame), Tuber crops (Potato), Fibre crops (Jute), Fodder crops (Ricebean, Cowpea).

PRACTICAL

- Selection of land and study on specific cultivation practices (isolation distance, seed treatment, sowing / planting pattern, rouging, harvesting, etc.) in seed production plots
- Varietal identification at different growth stages in seed production fields
- Study on parental lines in hybrid seed production
- Methodology of seed testing for physical purity, moisture content, viability, germination, vigour index, etc.
- Calculation on seed production methods, economics and testing procedures
- Visit to seed production plots of hybrid rice, greengram, rapeseed-mustard groundnut, sesame, jute, etc.
- Visit to Seed Processing Plant for post-harvest processing and storage.

Agrostology and Agro-forestry	**AGRN - 315**	**2(1+1)**

THEORY

UNIT I: Agrostology: definition and importance; principles of grassland ecology: grassland ecology – community, climax, dominant species, succession, biotype, ecological status of grasslands in India, grass cover of India; problems and management of grasslands.

UNIT II: Importance, classification (various criteria), scope, status and research needs of pastures; pasture establishment, their improvement and renovation-natural pastures, cultivated pastures; common pasture grasses.

UNIT III: Agroforestry: definition and importance; agroforestory systems, agri

silviculture,silvipasture, agri silvipasture, agri horticulture, aqua silviculture, alley cropping and energy plantation.

UNIT IV: Crop production technology in agro-forestry and agrostology system; silvipastoral system:meaning and importance for wasteland development; selection of species, planting methods and problems of seed germination in agro-forestry systems; irrigation and manuring in agro-forestry systems, associative influence in relation to above ground and underground interferences; lopping and coppicing in agro-forestry systems; social acceptability and economic viability, nutritive value of trees; tender operation; desirable tree characteristics.

PRACTICAL

- Preparation of charts and maps of India showing different types of pastures and agro-forestry systems
- Identification of seeds and plants of common grasses, legumes and trees of economic importance with reference to agro-forestry
- Seed treatment for better germination of farm vegetation
- Methods of propagation/planting of grasses and trees in silvipastoral system
- Fertilizer application in strip and silvipastroal systems
- After-care of plantation
- Estimation of protein content in loppings of important fodder trees
- Estimation of calorie value of wood of important fuel trees
- Estimation of total biomass and fuel wood
- Crop production technology in agro-forestry and agrostology system
- Visit to important agro-forestry research stations
- Tour & Visits