ANNUAL AND PERENNIAL CROPS AGRONOMY

Course Code: BSAL 1207
Credit Units: 4 CU
Contact Hours: 60 Hours

Course Instructor

Dr. Elias Oyesigye

(Ph.D., Cranfield University, UK; PGrad.Dip Biostatistics, Open University, UK; MSc, Eduardo Mondlane University, Maputo; BSc, Makerere University, Uganda)
Email: eliasoyesigye@must.ac.ug

Course Description

Annual and Perennial Crops Agronomy provides a comprehensive, systems-based understanding of the principles and practices governing the production and management of major annual and perennial crops in Sub-Saharan Africa. Agriculture remains central to livelihoods, food security, and economic transformation in the region, yet productivity is constrained by soil degradation, climate variability, pests, diseases, and suboptimal agronomic practices.

This course integrates scientific principles, practical field skills, and economic analysis to equip learners with competence in establishing, managing, and evaluating annual and perennial crop enterprises. Emphasis is placed on variety selection, land preparation, plant population management, soil fertility, integrated pest and disease management, climate-smart agronomy, and value chain considerations.

The course combines lectures, field practicals, enterprise analysis, and case-based learning to prepare students for professional roles in crop production, agribusiness, extension, and sustainable agricultural development aligned with Uganda's national agricultural transformation agenda.

Course Objectives
1. Develop integrated competence in the principles and practices of annual and perennial crop production.
2. Build practical skills in crop establishment, management, and harvesting under diverse agroecological conditions.
3. Strengthen analytical capacity to evaluate crop productivity, sustainability, and profitability.
4. Promote climate-smart and environmentally responsible agronomic practices.

5. Foster entrepreneurial competence in managing crop enterprises for improved household income and commercialization.

Learning Outcomes

By the end of the course, students should be able to:

1. Apply agronomic principles to establish and manage major annual and perennial crops under varying production systems.
2. Design crop management plans incorporating appropriate variety selection, spacing, nutrient management, and integrated pest and disease management strategies.
3. Analyze crop growth stages, yield components, and productivity determinants in relation to agronomic interventions.
4. Evaluate economic feasibility and profitability of selected crop enterprises.
5. Integrate climate-smart, sustainable, and environmentally sound agronomic practices into crop production systems.

Rationale

Agricultural transformation in Sub-Saharan Africa requires graduates who possess both theoretical understanding and practical competence in crop production systems. Many farming systems suffer from low productivity due to poor agronomic practices, climate stress, declining soil fertility, and weak integration of economic considerations. This competency-based course bridges foundational agronomic science with real-world crop management and enterprise development. It equips learners with the knowledge, skills, and professional attitudes necessary to contribute effectively to food security, sustainable intensification, and income generation within annual and perennial cropping systems.

Competences / Skills
General Competence

Learners will apply scientific, technical, and entrepreneurial principles to design, manage, and evaluate sustainable annual and perennial crop production systems that enhance productivity, resilience, and profitability.

Specific Competences
i. Knowledge & Understanding

Learners will be able to:

*   Explain agronomic principles governing annual and perennial crops.
*   Distinguish growth habits, development stages, and yield formation processes.
*   Describe crop-specific production requirements across major crop categories.
*   Explain integrated soil fertility, water, pest, and disease management strategies.
*   Understand the economic and policy context influencing crop production in Uganda.

ii. Practical / Technical Skills

Learners will be able to:

- Conduct land preparation and crop establishment procedures.
- Determine appropriate spacing and plant population density.
- Develop nutrient management plans using organic and inorganic inputs.
- Implement integrated pest and disease management strategies.
- Perform pruning, staking, desuckering, training, and crop husbandry operations.
- Assess harvesting indices and post-harvest handling techniques.
- Prepare a basic enterprise budget and profitability analysis.

iii. Problem-Solving & Analytical Skills

Learners will be able to:

- Diagnose causes of low productivity in crop systems.
- Recommend suitable varieties and management practices for specific agroecologies.
- Evaluate trade-offs between productivity, sustainability, and profitability.
- Compare annual versus perennial systems in terms of resilience and economic returns.

iv. Attitudes & Values

Learners will demonstrate:

- Professional responsibility in crop management decision-making.
- Environmental stewardship and climate-smart thinking.
- Entrepreneurial mindset in crop enterprise development.
- Respect for farmer knowledge and inclusive agricultural transformation.

Pre-requisite Course(s)

- Principles of Crop Production Systems
- Introduction to Soil Science
- Plant botany and Physiology

Mode of Delivery

Blended learning approach with strong emphasis on field-based practical training, complemented by interactive lectures and ODEL support.

Teaching Approaches

- Interactive lectures
- Field practical sessions
- Farm visits and demonstrations
- Case studies

- Group presentations
- Enterprise budgeting exercises
- Problem-based learning

Instructional Materials

Field tools, crop production manuals, soil testing kits, planting materials, field demonstration plots, irrigation tools, digital projection equipment, statistical abstracts, enterprise budgeting templates.

Course Outline

Learning Outcome	Content	Learning Activities	Values & Attitudes	CH
Apply agronomic principles	Introduction to agronomy; role of an agronomist; classification of crops (annual vs perennial); crop growth and development; yield components; Good Agronomic Practices (GAPs); climate-smart agronomy principles	Interactive lectures	Critical thinking; professional accuracy	3 LH
Analyze growth and yield formation in annual crops	Crop growth stages; phenology; spacing & plant density; nutrient management; water management; weed control; integrated pest & disease management; harvesting; post-harvest handling; enterprise budgeting	Practical exercises; enterprise analysis	Precision; environmental responsibility	6 LH
Design crop establishment systems	Site selection; land preparation; variety selection; spacing & plant density; planting methods; climate-smart practices	Lectures; field demonstrations	Precision; environmental responsibility	4 LH, 2 PH
Manage soil fertility & water	Organic vs inorganic fertilizers; nutrient management; irrigation methods; soil health management	Lectures; practical demonstrations	Sustainability; stewardship	4 LH, 2 PH
Implement IPDM	Integrated pest, disease, and weed management; crop monitoring; digital innovations	Case studies; field visits	Ethical chemical use; safety	4 LH, 2 PH
Apply specialized perennial crop management practices	Orchard establishment; propagation (grafting, budding, macro/micro propagation); pruning & training; shading & windbreaks; ratooning; rejuvenation; nutrient management; perennial IPDM; harvesting indices; post-harvest handling; profitability analysis	Field practicals; case studies	Professional responsibility; long-term planning	6 LH
Manage annual crop systems	Growth stages; yield components; cereal, legume, oil crop, root & tuber agronomy	Lectures; group analysis	Analytical reasoning	6 LH
Design and manage annual crop systems	Cereals: Maize, Sorghum, Rice, Wheat, Barley Legumes & Pulses: Common beans, Cowpeas, Peanuts (Groundnuts),	Lectures; field demonstrations; case discussions	Analytical thinking; productivity focus	10 LH, 6 PH

	Chickpeas, Peas, Soybean, Green gram Oil crops: Sunflower, Sesame Root & Tuber Crops (Annual cycle): Irish potatoes, Sweet potatoes, Yams Industrial Annuals: Cotton Vegetables: Tomatoes, Onions, Carrots, Cabbage, Spinach, Nakati Other Annuals: Ginger			
Design and manage perennial crop systems	Fruit Crops: Bananas & Plantain, Mangoes, Citrus, Pineapples, Hass Avocado, Passion fruit, Papaya Beverage & Industrial Crops: Coffee (Arabica & Robusta), Tea, Cocoa, Sugarcane Nut & Oil Crops: Oil palm, Cashew nut, Macadamia Perennial Root & Tuber Crops: Cassava, Yams Other Perennials: Vanilla	Lectures; orchard demonstrations; field visits	Systems thinking; stewardship	12 LH, 10 PH
Conduct enterprise analysis	Enterprise budgeting; cost-benefit analysis; profit margins; value chains	Group work; presentations	Entrepreneurial mindset	4 LH
Evaluate sustainability & resilience	Climate-smart agriculture; conservation agriculture; agroforestry integration; risk management	Discussions; case-based learning	Resilience; innovation	5 LH
Student crop enterprise presentations	Selected crop production plans and enterprise analysis	Presentations	Communication; teamwork	8 PH

Mode of Assessment

Assessment Component	Competence Assessed	Assessment Mode	Weight (%)
Coursework (40%)	Practical & analytical competence	Field reports, quizzes, enterprise budgets	20%
	Communication & teamwork	Presentations	10%
	Professional conduct	Participation & practical evaluation	10%
Final Examination (60%)	Conceptual understanding	Short-answer questions	20%
	Systems analysis	Long-answer questions	20%
	Application & synthesis	Case-based questions	20%
Total			**100%**

Reading materials

1. Kuyah, S., Sileshi, G. W., Nkurunziza, L., Chirinda, N., Ndayisaba, P. C., Dimobe, K., & Öborn, I. (2021). Innovative agronomic practices for sustainable intensification in sub-Saharan Africa. A review. *Agronomy for Sustainable Development*, *41*, 1-21.
2. Karavidas, I., Ntatsi, G., Vougeleka, V., Karkanis, A., Ntanasi, T., Saitanis, C., ... & Savvas, D. (2022). Agronomic practices to increase the yield and quality of common bean (Phaseolus vulgaris L.): a systematic review. *Agronomy*, *12*(2), 271.
3. Shimeles, A., Verdier-Chouchane, A., & Boly, A. (2018). *Building a resilient and sustainable agriculture in sub-Saharan Africa*. Springer Nature.
4. Villalobos, F. J., & Fereres, E. (Eds.). (2016). *Principles of agronomy for sustainable agriculture* (p. 543). New York, NY, USA: Springer.
5. Wortmann, C., Amede, T., Bekunda, M., Ndung'u-Magiroi, K., Masikati, P., Snapp, S., ... & Kome, C. E. (2020). Improvement of smallholder farming systems in Africa. *Agronomy Journal*, *112*(6), 5325-5333.
6. Kagorora, J. P. K., Kansiime, M. K., Owuor, C., & Tumwine, J. (2021). A review of some aspects of Uganda's crop agriculture.
7. Ministry of Agriculture, Nature and Food Quality. (2024, April 29). *Uganda Agri-Economic Outlook*. Agroberichten Buitenland. Retrieved from https://www.agroberichtenbuitenland.nl/actueel/nieuws/2024/04/29/uganda-agri-economic-outlook
8. An Introduction to Agriculture and Agronomy. (October 2015). Retrieved from http://www.newagepublishers.com/samplechapter/001757.pdf
9. Brady, N. C., & Weil, R. R. (2017). *The Nature and Properties of Soils* (15th ed.). Pearson Education.
10. Gopalakrishnan, S., Wani, S. P., & Whitbread, A. M. (2019). *Agronomy for Sustainable*