

Research Application Summary

Development of a Regional Masters of Science Curriculum in Agro-ecology

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Abstract

Agro-ecology is a transdisciplinary, action oriented, participatory approach to moving food systems towards sustainability. It is grounded in the science of ecology (i.e. the science of how nature works) with its system focus. It is also grounded in the practical experience of farming that is place-based, steeped in local knowledge and experience, and builds on a farmer-to-farmer knowledge exchange process. And finally, it is part of a current and growing social movement for food system change that brings food security, food sovereignty, and food justice to all parts and people in the food system, from local to global. All three components are considered essential for doing agro-ecology. The proposed curriculum is designed for students who have an undergraduate degree in the natural sciences related to food systems (agronomy, ecology, agro-ecology, pest management, etc.) or in the social sciences related to food systems (agricultural economics, sociology of food, rural development, political economy, etc.). The course is designed for two years on a semester system, including a summer session in between the two years. It could be extended to three years by requiring fewer courses per semester, and offering more electives, especially field experiences. Students who complete this degree will be prepared to work on the complex problems facing food systems in today's world. The degree will prepare them to think and act way beyond the basic need for increasing production, and instead, be able to tackle the much larger issues of providing food security, food sovereignty, and food justice in a world facing political, economic, and ecological changes, including globalization, corporatization, and concentration in the food system, as well as climate change impacts. Graduates of this curriculum will be problem solvers, change agents, and innovators able to collaborate and participate with multiple stakeholders in the food system, and will do so with a sense of fairness, equity, and justice.

Key words: Agro-ecology, curriculum, farming, food production, MSc Agro-ecology, University of Nairobi

Résumé

L'agroécologie est une approche participative, transdisciplinaire et orientée, visant à faire évoluer les systèmes alimentaires vers une durabilité. Elle s'appuie sur la science de l'écologie (c'est-à-dire la science du fonctionnement de la nature). Elle s'appuie également sur l'expérience pratique de l'agriculture, ancrée dans les connaissances et expériences locales, et reposant sur un processus d'échange de connaissances entre agriculteurs. Enfin, elle s'inscrit dans un mouvement social en

pleine croissance pour un changement du système alimentaire assurant la sécurité, la souveraineté et l'équité alimentaire à tous les niveaux et à tous les acteurs du système alimentaire, du local au mondial. Les trois composants sont considérés comme essentiels pour faire de l'agroécologie. Le programme proposé est destiné aux étudiants titulaires d'un diplôme de premier cycle en sciences naturelles liées aux systèmes alimentaires (agronomie, écologie, agro-écologie, lutte antiparasitaire, etc.) ou en sciences sociales liées aux systèmes alimentaires (économie agricole, sociologie de l'environnement, alimentation, développement rural, économie politique, etc.). Le cours est conçu pour deux ans sur un système semestriel, y compris une session d'été entre les deux années. Il pourrait être prolongé à trois ans, avec moins de cours par semestre et davantage de cours au choix, notamment sur le terrain. Les étudiants ayant ce diplôme pourraient travailler sur les problèmes complexes des systèmes alimentaires dans le monde d'aujourd'hui. Ce diplôme les préparera à penser et à agir bien au-delà du besoin fondamental qui est d'augmenter la production. Ils seront en mesure de répondre aux problèmes beaucoup plus vastes de sécurité, souveraineté *et* alimentaire dans un monde confronté aux changements politiques, économiques et écologiques, y compris la mondialisation, la transformation sociétale et la concentration dans le système alimentaire, ainsi que les impacts du changement climatique. Les diplômés de ce programme seront des résolveurs de problèmes, des agents de changement et des innovateurs capables de collaborer avec plusieurs acteurs du système alimentaire, et le feront avec un sens d'équité et de justice.

Mots clés: agro-écologie, curriculum, agriculture, production alimentaire, MSc Agro-écologie, University of Nairobi

Introduction

The definition of Agro-ecology continues to draw lots of different opinions across the globe from various expertise. However, since the first international Symposium on Agro-ecology for Food Security and Nutrition. organized by FAO in 2014 (FAO, 2014), a wider view about agro-ecology is being recognized. There are common principles articulated for agro-ecology, that includes a combination of bio-physical and socio-economic elements that are grounded in the three pillars of sustainable development – the social, the economic and the environmental.

FAO (2018a) notes that if agro-ecology is seen as a scientific discipline, it is viewed as a set of practices and a social movement. As a science, it studies how different components of the agroecosystem interact. As a set of practices, it seeks sustainable farming systems that optimize and stabilize yields. As a social movement, it pursues multifunctional roles for agriculture, promotes social justice, nurtures identity and culture, and strengthens the economic viability of rural areas. It is pegged on family farming systems whereby family farmers are the people who hold the tools for practising agro-ecology. They are the real keepers of the knowledge and wisdom needed for this agenda. Therefore, family farmers around the world are the keys elements for producing food in an agroecological way.

FAO (2008b) further emphasizes agro-ecology as the science of applying ecological concepts and principles to manage interactions between plants, animals, humans and the environment for food security and nutrition. The agency has developed 10 guiding elements of agro-ecology as:

1. Diversity: diversification is key to agroecological transitions to ensure food security and nutrition while conserving, protecting and enhancing natural resource.

2. Co-creation and sharing of knowledge: agricultural innovations respond better to local challenges when they are co-created through participatory processes.
3. Synergies: building synergies enhances key functions across food systems, supporting production and multiple ecosystem services.
4. Efficiency: innovative agroecological practices produce more using less external resources
5. Recycling: more recycling means agricultural production with lower economic and environmental costs.
6. Resilience: enhanced resilience of people, communities and ecosystems is key to sustainable food and agricultural systems.
7. Human and social values: protecting and improving rural livelihoods, equity and social well-being is essential for sustainable food and agricultural systems.
8. Culture and food traditions: by supporting healthy, diversified and culturally appropriate diets, agro-ecology contributes to food security and nutrition while maintaining the health of ecosystems.
9. Responsible governance: sustainable food and agriculture requires responsible and effective governance mechanisms at different scales – from local to national to global.
10. Circular and solidarity economy: circular and solidarity economies that reconnect producers and consumers provide innovative solutions for living within our planetary boundaries while ensuring the social foundation for inclusive and sustainable development.

To conform to the new trend in agriculture, experts are required in Africa to guide the continent. Thus a regional course in agro-ecology is proposed to provide critical human resource that will implement agro-ecology in the region. This would ensure that the region is not left behind through modern agriculture revolution systems. The following are suggested content of the curricula (Table 1):

Conclusion

This suggested curriculum for agro-ecology provides a platform that the region can use to ensure agro-ecology is understood and implemented. The focus is food system and all aspects that include from farm to fork. Thus it integrates science, social and environmental aspects and provides opportunity to link farming communities with consuming communities.

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Table 1. Proposed curriculum for MSc. Agro-ecology at University of Nairobi

Core/ Elective	Year	Semester	Course title	Course Description
Core	1	1	An Introduction to Agro-ecology	The ecological foundations for sustainable agro-ecosystem design and management. Why we need agro-ecology. History of the development of agro-ecology.
Core	1	1	The Evolution of Agriculture and Food Systems	Centers of origin of agriculture, domestication, local vs. global food systems, modernization, and the need for agro-ecology.
Core	1	1	Sustainable Soil-Management	Understanding the components of a healthy soil ecosystem: physical, chemical, and biological.
Core	1	1	Ecological Sustainability of Food Systems	From limiting factors to systems approaches in ecology. Genetics and adaptations, population and community ecology. Disturbance, succession, and agro-ecosystem development. Interactions, interference, and mutualisms.
Elective	1	1	Ecology	A basic background course in the field of ecology, recommended for students with no or very limited background in the science of ecology.
Core	1	2	Economic Sustainability of Food Systems	The economic structures of the food system, from the farm to the market. Economic analysis, ecological economics, and true cost accounting.
Core	1	2	Social and Cultural Sustainability of Food Systems	The sociology of agriculture, social organizations and relationships, gender, race, and ethnicity, social change, and social movements.
Core	1	2	Participatory Action Research in Agro-ecology	Participatory Action Research (PAR) as the key methodology for applying agro-ecology for transforming agriculture and food systems. The course will cover methodology, history, case studies and experimental design.

Core/Elective	Year	Semester	Course title	Course Description
Core	1	1	The Diversification of Agro-ecosystems	Moving from industrial monocultures to diversified farming systems with agro-ecology. Multiple cropping, integrating animals, agroforestry, permaculture, etc.
Elective	1	2	Organic Agriculture	Principles and practices of organic agriculture, organic matter management, pest management, certification, opportunities and challenges. A field component with hands-on experience will be included. A course designed for students with limited farming experience.

Inter-year Summer session:

Students must choose either research experience 1 or 2, depending on their interests and orientation in food system study.

Elective 1	Summer session	Research Experience 1 Focused on Ecological and Agronomic Factors		A field-based experiential learning course where students are placed with an on-going, onfarm agro-ecological study, and given the opportunity to design a possible thesis project.
Elective 2	Summer session	Research Experience 2 Focused on Economic and Social Factors		A field-based experiential learning course where students are placed with an organization or institution focused on economic and social issues in food system sustainability, and are given the opportunity to design a possible thesis project.
Core	2	3		Ecological Pest Management (EPM): weeds, arthropods, and diseases Ecological principles and practical applications of effective EPM are integrated through case studies. Examples of biological control, habitat management, beneficial organisms, and other approaches are used throughout.
Core/Elective	Year	Semester	Course title	Course Description
Core	2	3	Alternative Energy in Agro-ecosystem	The laws of thermodynamics and energetics are used as a theoretical foundation for designing alternative energy for food systems. Includes energy accounting, life cycle analysis, renewable energy, solar and wind, and social metabolism.
Core	2	3	Local and Traditional Knowledge in Sustainable Food Systems	A course focused on the transdisciplinary process of knowledge sharing, the cocreation of knowledge, valuing local and practical sharing, the cocreation of knowledge, valuing local and practical sharing, the cocreation of knowledge, valuing local and practical
Core	2	3	Food Security, Food Sovereignty, and Food Justice	With a focus on bringing culture back into agriculture, and making our food systems “people centered” once again, the course will use a case study approach for how to provide access, sustainable livelihoods, equity, and justice in food systems.
Core	2	3	Multifunctionality in Agro-ecosystem	Identifying, valuing, and promoting the environmental services of food systems, including climate change mitigation, carbon sequestration, biodiversity conservation, soil protection, producing water and clean air, etc.
Core	2	4	The Transition to Sustainable Food Systems	Building upon the theory of food system transformation presented in Gliessman’s “Five Levels of Transition to Agro-ecology,” the principles, processes, and practices of food system change to sustainability will be explored.
Core	2	4	Indicators and Monitoring of Sustainability	An introduction to sustainability science as applied to food systems. A focus on developing and monitoring interdisciplinary indicators. Case studies will be featured throughout the course.

Core/Elective	Year	Semester	Course title	Course Description
Core	2	4	Alternative Markets and Food Networks	The course focuses on the need to directly connect the people who grow the food with those who eat it. Concepts include short food chains, direct marketing, food hubs, food networks, fair trade, certification schemes, procurement schemes, etc.
Core	2	4	The Policy Environment for Sustainable Food Systems	Using a political economy and political ecology focus, the course explores how to confront the current power in food systems. A rights-based approach is used to understand how policies that promote agro-ecology and food systems sustainability can be developed and integrated into a policy change environment.

Thesis or Internship in Agro-ecology: The thesis or final internship report will be project based. It will attempt to integrate the three parts of agro-ecology: 1) science; 2) practice; and 3) social change. The advisory committee will be made up of two academics (one from an ecological focus in agro-ecology and the other from a social focus), and a third nonacademic with direct food or farming experience.

References

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