

Report

Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Sustainability – An Approved Curriculum for a Master- Level Subject

Cairo, Egypt and Bobo-Dioulasso, Burkina Faso

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Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Achieving Sustainability – Proposed Curriculum for a Master-Level Subject

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Table of Contents

Background and Rationale.....	4
Learning objectives.....	4
Subject title and academic context.....	5
Subject structure.....	6
Subject planning log-frame.....	7

Background and Rationale

Agricultural systems and rural livelihoods continuously evolve as a result of interactions between the local farming systems and global, regional and national driving forces. Agricultural technologies and agricultural, environmental and rural development policies are increasingly designed to contribute to the sustainability of agricultural systems and associated livelihoods. The effectiveness and efficiency of such policies and technological developments in realizing desired contributions could be greatly enhanced if the quality of their ex-post and ex-ante assessments is improved. In higher education on agriculture , environment and rural development there are grand needs for developing capacities for integrated system assessment for agricultural and livelihood systems.

This document presents the curriculum of a subject titled “Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Achieving Sustainability” in master education programs, or in the last year of undergraduate programs. The course is designed to improve both knowledge and practical skills for learners in sustainable intensification (SI) from the view of the socio-ecological system science, and relevant system-based quantitative methods for assessments of SI adoption and impacts (both ex-post and ex-ante) at household-farm and community-landscape scales.

The subject will bring state-of-the art knowledge/methods and outputs from research activities within the CGIAR Research Programs (CRP) on Dryland Systems (DS) and Grain Legumes and Dry Cereals (GLDC) conducted in Burkina Faso and other developing countries about learning. Research materials (data, operational methods/tools, research publications) and sites from CGIAR-DS and GLDC will be used as learning materials and practical fields, respectively.

The curriculum has successfully passed the evaluation during the workshop for revising training programs and curricula at the Institute for Rural Development (IDR) of the University of Bobo. This workshop was held from 1st to 4th June 2021 in the town of Banfora. The UNB Scientific Committee Meeting on the 30th July 2021 approved the proposed curriculum and decided that the new curriculum will be implemented starting from the new batch of MSc student to be recruited in the next academic year.

Learning objectives

At the end of the subject, learners should have attained sufficient knowledge and skills:

- (1) To understand the state-of-the art concepts and frameworks on farming system, livelihood systems and sustainable intensification (SI)
- (2) To understand the rationales of common methods in integrated analysis and ex-post and ex-ante assessments of agricultural livelihood systems (ALS) in response to different management/policy interventions, such as: sustainability criteria and indicators, farm-household analysis, innovation adoption analysis, eco-efficiency analysis and agent-based modelling.

- (3) To be able to operate the above-mentioned methods using related computer software and interpret the results,
- (4) To be aware of advantages, limitations of each methods, hence the complementariness of methods and relevant uses
- (5) To have a better self-learning capability in follow-up research (e.g. research thesis, dissertation, and other research projects)

Subject title and academic context

Subject title	Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Achieving Sustainability
Sub-units	Part I, Introduction to Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Part II Advanced Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems
Education level	Master program or End year of undergraduate program
Educational Program	Master of Science in Rural Economy and Agribusiness
Institute/University	Rural Development Institute (IDR), University Nazi BONI (UNB)
Subject length	Each sub-unit comprises 60 hours in total, including: Part I • lecturing: 14 hrs • computer lab: 6 hrs • field visit: 4 hrs • student's time for personal research: 36 hrs. Part II • lecturing: 12 hrs • computer lab: 10 hrs • field visit: 2 hrs • student time for personal research: 36 hrs.
Responsible teachers	Boundia Alexandre Thiombiano (corresponding lecturer) Invited external lecturers ¹ (invited lecturer for particular units in the first two years of subject implementation)
Preliminary knowledge and skills (pre-K&S)	Knowledge and skills (K&S) students learned before attending the subject: • Basic agricultural science: soil science, crop science, agronomy, rural sociology, agricultural economics. • Operational methodological subjects: statistics (intermediate level), GIS (basic level), computer programming (basic level).

¹ External lecturer in relevant to the units will be invited. A potential list of potential external lecturers, mainly from GLDC and ICARDA scientists (e.g. Dr. Quang Bao Le et al.) is being formulated.

	• Other K&S:
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Subject structure

Structure summary

The course includes three sessions. The lecturing session (24 hours) consists of 12 units that introduce basic concepts, contemporary frameworks, criteria and indicators of SI as well as quantitative system methods to assess SI adoption, performance and impacts. The computer lab session (10 hours) is student's practicing on computer for methods of SI adoption and impact assessments. There will be a rapid field excursion (2-3 hours) in the research sites of CRP GLDC and DS in which case studies will be demonstrated and explain on the field.

List of learning units:

There are two course parts/modules that are at introductory and advanced levels.

Part I: Introduction to Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems

Unit 1: Sustainable Intensification (SI): development issues and needs, concept

Unit 2: Sustainable Intensification (SI): framework, criteria and indicators

Unit 3: Systems approach to structure complexity of agricultural systems and related livelihoods

Unit 4: Protocol for the conceptualisation of a problem into an agricultural system

Unit 5: Typology-based approach to manage farm-household diversity for better targeting and out-scaling

Unit 6: Computer lab 1: Multi-variate statistics for household-farm typology analysis

Unit 7: Household's adoption of SI practices: analysis of socio-ecological determinants

Unit 8: Computer lab 2: Multi-variate statistics for adoption analysis

Unit 9: Eco-efficiency assessment of production systems: concept, application to crop component and whole smallholder system

Unit 10: Field practicum: practice to interview farmers

Part II: Advanced Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems

Unit 1: Overview of modelling methods in integrated assessment for livelihood and farming systems

Unit 2: Computer lab 3: Data Envelopment Analysis Programming (DEAP)

Unit 3: Multi-agent Systems (MAS) for SI scenarios evaluation – concept, methodological steps

Unit 4: Computer lap 4: MAS modelling in NetLogo

Unit 5: Nutrient balance assessment in smallholder systems and strategies for achieving SI

Unit 6: Computer lap 5: Engineering a simple relevant MAS model in NetLogo

Unit 7: Demonstrative case study of MAS for SI, usages of MAS for SI

Unit 8: Prospective research/development directions, course closing

Unit 9: Field practicum: practice to farming system design

Subject planning log-frame

Course Unit	Unit time length	Activity type	Learning materials	Evaluation type	Lecturers (Name underlined is the main lecturer)
<u>Part I: Introduction to Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Achieving Sustainability</u>					
Unit 1: Sustainable Intensification (SI): development issues and needs, concept	2 hr	Lecturing	Selected textbook chapters; key papers; GLDC research publications and data	Subject writing exam (end of the course)	<u>Boundia Thiombiano</u> External lecturer ¹
Unit 2: Sustainable Intensification (SI): framework, criteria and indicators	1 hr	Lecturing Group homework		Homework report evaluation; Subject writing exam (end of the course)	<u>External lecturer¹</u> Boundia Thiombiano
Unit 3: Systems approach to structure complexity of agricultural systems and related livelihoods	2 hr	Lecturing		Subject writing exam (end of the course)	<u>External lecturer¹</u> Boundia Thiombiano
Unit 4: Protocol for the conceptualisation of a problem into an agricultural system	2 hr	Lecturing Group homework		Homework report evaluation	<u>Boundia Thiombiano</u> External lecturer ¹
Unit 5: Typology-based approach to manage farm-household diversity for better targeting and out-scaling	3 hr	Lecturing		Homework report evaluation	<u>Boundia Thiombiano</u> Quang Bao Le
Unit 6: Computer lab 1: Multi-variate statistics for household-farm typology analysis	3 hrs	Computer lab Group homework		Homework report evaluation	<u>Boundia Thiombiano</u>
Unit 7: Household's adoption of SI practices: analysis of socio-ecological determinants	2 hr	Lecturing		Homework report evaluation	<u>Boundia Thiombiano</u> External lecturer ¹

Unit 8: Computer lab 2: Multi-variate statistics for adoption analysis	3 hrs	Computer lab Group homework		Homework report evaluation	<u>Boundia Thiombiano</u>
Unit 9: Eco-efficiency assessment of production systems: concept, application to crop component and whole smallholder system	2 hrs	Lecturing		Subject writing exam (end of the course)	<u>Boundia Thiombiano</u> External lecturer ¹
Unit 10: Field practicum: practice to interview farmers within 2 hours	4 hrs	Field visit		Filled 2-page questionnaire	<u>Boundia Thiombiano</u>
<u>Part II: Advanced Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems</u>					
Unit 1: Overview of modelling methods in integrated assessment for livelihood and farming systems	2 hrs	Lecturing	Selected textbook chapters; key papers; GLDC research publications and data	Subject writing exam (end of the course)	<u>External lecturer¹</u> Boundia Thiombiano
Unit 2: Computer lab 1: Data Envelopment Analysis Programming (DEAP)	4 hrs	Computer lab Group homework		Group homework report evaluation	<u>Boundia Thiombiano</u>
Unit 3: Nutrient balance assessment in smallholder systems and strategies for achieving SI	2 hrs	Lecturing		Subject writing exam (end of the course)	<u>Boundia Thiombiano</u> External lecturer ¹
Unit 4: Multi-agent Systems (MAS) for SI scenarios evaluation – concept, methodological steps	3 hrs	Lecturing		Subject writing exam (end of the course)	<u>External lecturer¹</u> Boundia Thiombiano
Unit 5: Computer lap 2: MAS modelling in NetLogo	4 hrs	Computer lab		Subject writing exam (end of the course)	<u>External lecturer¹</u> Boundia Thiombiano
Unit 6: Computer lap 3: Engineering a simple relevant MAS model in NetLogo	2 hrs	Computer lab		Subject writing exam (end of the course)	<u>External lecturer¹</u> Boundia Thiombiano

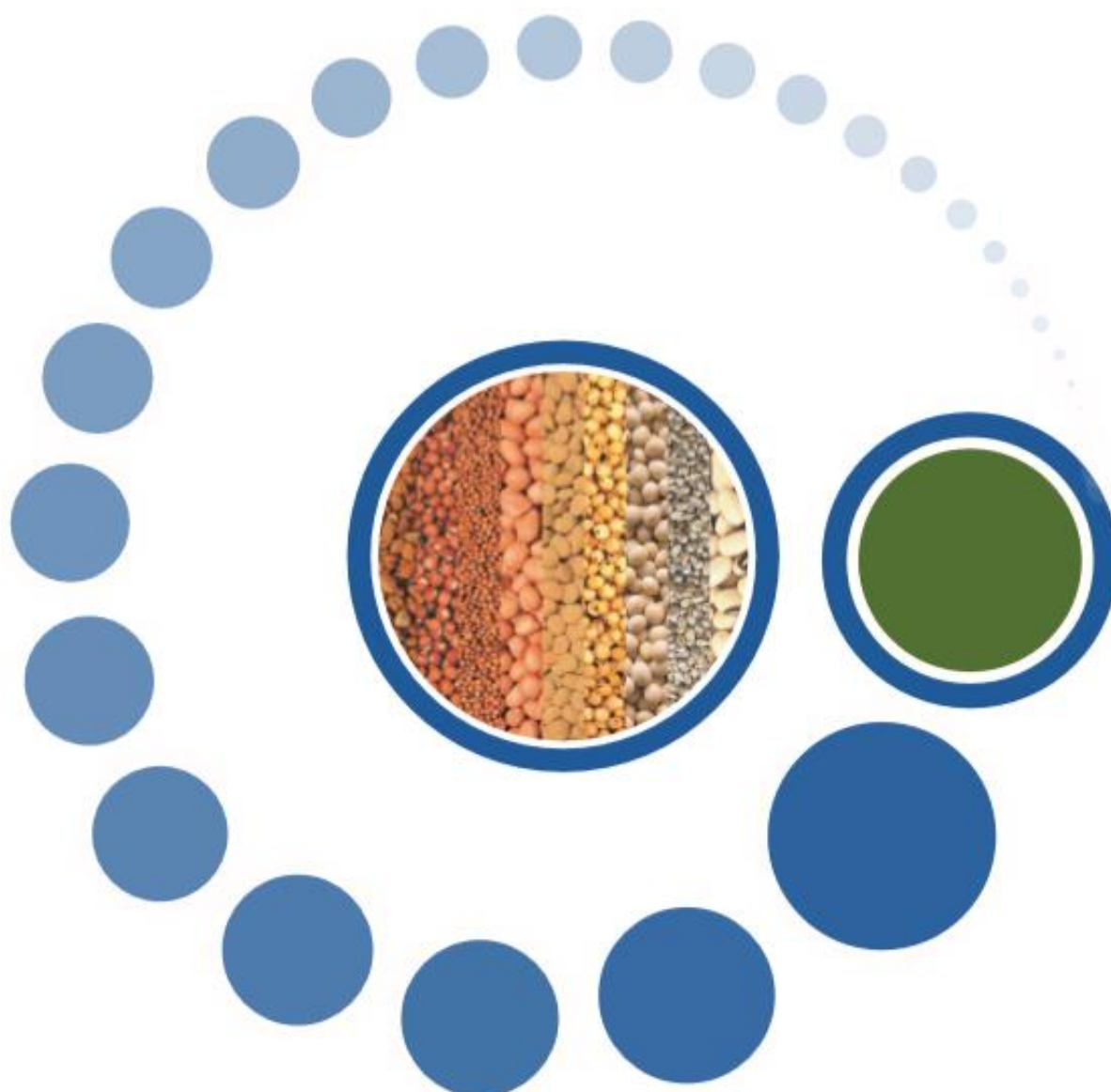
Unit 7: Demonstrative case study of MAS for SI, usages of MAS for SI	3 hr	Lecturing		Subject writing exam (end of the course)	<u>External lecturer¹</u> Boundia Thiombiano
Unit 8: Prospective research/development directions, course closing	2 hrs	Lecturing		Subject writing exam (end of the course)	<u>Boundia Thiombiano</u> External lecturer ¹
Unit 9: Field practicum: farming system design	2 hrs	Field visit		Research site of Dr Le and Dr Thiombiano in Satiri or Pontieba	<u>Boundia Thiombiano</u>

¹ External lecturer in relevant to the units will be invited. A potential list of potential external lecturers, mainly from GLDC and ICARDA scientists (e.g. Dr. Quang Bao Le et al.) is being formulated.

Subject assessment workshop, Management Board and Scientific Committee meetings

The workshop took place 1st - 4th June 2021 in the town of Banfora where is the second campus of the University of Bobo. Banfora is located South-West at 80 km from Bobo-Dioulasso. The workshop gathered stakeholders from universities, research institutions; the Ministry of Higher education and the Ministry of public service and Labour of Burkina Faso. The main objective of the workshop was to revise training programs and assess curricula at the Institute for Rural Development. The presented curriculum of the subject “Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Achieving Sustainability” was commented and approved by the participants.

In the university process, the presented curriculum then submitted to the Management Board of the Institute for Rural Development (IDR) beginning of July for final assessment and approval. The UNB Scientific Committee Meeting held on 30th June 2021 approved the curriculum and decided to launch the teaching of the subject during the next academic year as part of the new programs and curricula at the Institute for Rural Development, UNB. Within the participatory curriculum development process, the ICARDA/GLDC-UNB project team continues to develop teaching-learning materials. The team also planned to organize a multi-stakeholder workshop in the 4th quarter of 2021 to refine the detailed contents of the curriculum and teaching-learning materials to fit better training needs.



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