Report on

Workshop for Consolidating Curriculum of the New Master-level Subject Titled

"Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Sustainability"

Cairo, Egypt and Bobo-Dioulasso, Burkina Faso

December 2021

ICARDA

Université Nazi Boni UNB

CGIAR RESEARCH PROGRAM ON Grain Legumes and Dryland Cereals

Report of the workshop for consolidating curriculum of the new master-level subject titled

"Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Sustainability"

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Table of content

1. Introduction

With the assistance of the International Center for Agricultural Research in the Dry Areas (ICARDA) through CGIAR Research Program on Grain Legumes and Dry Cereals (CRP GLDC), the Institute for Rural Development at the University Nazi BONI has organized a workshop for consolidating curriculum of the new master-level subject titled "Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Sustainability" from the 14 to the 15 December 2021 in Bobo-Dioulasso, Burkina Faso. This proposed subject aims at improving the training on system approach in agricultural research and development at IDR-UNB in the context of increasing challenges facing the rural development sector in Burkina Faso. The developped currilum of the subject therefore targets building academic capacities of graduate students and young academia in integrated system assessment for agricultural and livelihood systems which is key for ensuring a sustainable agricultural and rural development. The workshop followed the first one held 1st - 4th June 2021 in Banfora, in the South west of Bobo-Dioulasso that introduced the initial curriculum, got feedbacks from agricultural academia and employers and the approval of the subject

Main objective

The main objective of the multi-stakehoders workshop was to develop a new subject: ***"Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Sustainability"*** for the Master of Science Program in Agricultural Economics at the Institute for Rural Development (IDR).

Specific objectives

The specific objective of the workshop was:

- write a document of the subject curriculum;
- compile relevant learning materials

2. Organizers

The workshop is organized by:

- Institut du Développement Rural (IDR), Université Nazi BONI (UNB), Burkina Faso
- International Center for Agricultural Research in Dry Areas (ICARDA)

3. Participants

A total number of thirty (30) participants attened the workshop. It gathered:

- thirteen (13) senior lectures from IDR-UNB;
- two (02) senior lecturers from the faculty of Economics of the University Norbert ZONGO;
- three (03) researchers from National Research Institute (INERA);
- two (02) participants from the Ministry of agriculture;
- three (03) participants from vocational agricultural training schools;
- two (02) participants from NGOs and;
- five (05) former students of IDR.

The workshop took place in Bobo. Some participants attended the workshop online.

4. Facilitator and speaker

The worked was facilitate by Dr. Boundia Alexandre Thiombiano, Assistant Professor, Sustainable Agro-ecological and Resilient livelihood Systems, Institute for Rural Development (IDR), Université Nazi BONI (UNB) (boundia@gmail.com). He also presented the subject to the participants

5. Workshop content

- Presentation of the developed curriculum;

- Plenary discussion on the presentation

6. Worksop agenda

14 December, 2021		
Time	**Title**	**Facilitator/Presenter**
09.00–09.30 09.15-09.30 09.30-09-45	**Opening session** Presentation of participants Opening word by the Director of IDR/UNB	Dr. Boundia Alexandre Thiombiano (facilitator) Dr. Salifou Ouedraogo
09.15-14.00 09.30-09.45 09.45–10.00 10.00 – 10.30	**Plenary session** • Workshop agenda • Presentation of the collaboration IDR-UNB with ICARDA • Presentation of the Msc. Program in Agricultural Economics • Presentation of the official guideline for curriculum structure in Burkina Faso	 Dr. Boundia Alexandre Thiombiano Dr. Relwendé Patrice Zidouemba, Head of Department Rural Sociology and Economics Dr. Lardia Marcel Thiombiano
10.30 - 11.00	**Coffee break**	
11.00 – 12.00 11.00 – 11:30 11.30 – 12.0	**SESSION 1: Presentation and Q&A on the new subject** • Presentation of the proposed new subject • Q &A	 Dr. Boundia Alexandre Thiombiano (facilitator)
12.00-14.00	**Session 2: Group work** One group work on each sub-subject	Dr. Boundia Alexandre Thiombiano (facilitator)
14.00	**Lunch and closing of day 1**	
15 December, 2021		
Time	**Title**	**Facilitator/Presenter**
9.00 - 10.30	**Session 2: Group work (continued)**	Dr. Boundia Alexandre Thiombiano (facilitator)
10.30 - 11.00	**Coffee break**	
11.00 - 12.00	**Session 2: Group work (continued)**	Dr. Boundia Alexandre Thiombiano (facilitator)
12.00–14.30 12.00 – 14.00 14.00-14.30	**Plenary session** • Group work reporting and discussion *(1 hour for each group)* • Recommendation	Dr. Boundia Alexandre Thiombiano (Facilitator)
14.30	**WS Closing - Lunch**	

7. Outputs of the workshop

7.1. Presentation of the proposed new subject

7.1.1. Proposed description of the subject

7.1.1.1. Proposed learning objectives

The proposed new subject aims to:

- understand the state of art and existing frameworks on farming systems;
- understand the interrelation between farming system and livelihood sustainability and the importance on integrated analysis; and
- enable learners to address the challenge facing farming systems in developing countries.

7.1.1.2. Proposed overview of the subject

Subject title	Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Achieving Sustainability
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	36 hours in total, including: • lecturing: 24 hrs • computer lab: 10 hrs • field visit: 2 hrs
Responsible teachers	Boundia Alexandre Thiombiano (Principal lecturer) Quang Bao Le (invited lecturer for particular units)
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). • Other K&S:

7.1.2. Proposed 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 hours) in the research sites of CRP GLDC and DS in which case studies will be demonstrated and explain on the field.

The subject comprises the following units:

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: Overview of modelling methods in integrated assessment for livelihood and farming systems
Unit 6: Typology-based approach to manage farm-household diversity for better targeting and out-scaling
Unit 7: Computer lab 1: Multi-variate statistics for household-farm typology analysis
Unit 8: Household's adoption of SI practices: analysis of socio-ecological determinants
Unit 9: Computer lab 2: Multi-variate statistics for adoption analysis
Unit 10: Eco-efficiency assessment of production systems: concept, application to crop component and whole smallholder system
Unit 11: Computer lab 3: Data Envelopment Analysis Programming (DEAP)
Unit 12: Nutrient balance assessment in smallholder systems and strategies for achieving SI
Unit 13: Multi-agent Systems (MAS) for SI scenarios evaluation – concept, methodological steps
Unit 14: Computer lap 4: MAS modelling in NetLogo
Unit 15: Computer lap 5: Engineering a simple relevant MAS model in NetLogo
Unit 16: Demonstrative case study of MAS for SI, usages of MAS for SI
Unit 17: Prospective research/development directions, course closing
Unit 18: Field practicum: practice to interview farmers within 2 hours

7.1.3. Proposed subject planning log-frame

Course Unit	*Unit time length*	*Activity type*	*Learning materials*	*Evaluation type*	*Lecturer*
Unit 1: Sustainable Intensification (SI): development issues and needs, concept	2 hr	Lecturing	Selected textbook chapters; key	Subject writing exam (end of the course)	Boundia Thiombiano Quang Bao Le

Unit 2: Sustainable Intensification (SI): framework, criteria and indicators	1 hr	Lecturing Group homework	papers; GLDC research publications and data	Homework report evaluation; Subject writing exam (end of the course)	Quang Bao Le Boundia Thiombiano
Unit 3: Systems approach to structure complexity of agricultural systems and related livelihoods	1 hr	Lecturing		Subject writing exam (end of the course)	Quang Bao Le Boundia Thiombiano
Unit 4: Protocol for the conceptualisation of a problem into an agricultural system	2 hr	Lecturing Group homework		Homework report evaluation	Boundia Thiombiano Quang Bao Le
Unit 5: Overview of modelling methods in integrated assessment for livelihood and farming systems	2 hr	Lecturing		Subject writing exam (end of the course)	Quang Bao Le Boundia Thiombiano
Unit 6: Typology-based approach to manage farm-household diversity for better targeting and out-scaling	3 hr	Lecturing			Boundia Thiombiano External lecturer[1]
Unit 7: Computer lab 1: Multi-variate statistics for household-farm typology analysis	3 hrs	Computer lab Group homework		Homework report evaluation	Boundia Thiombiano
Unit 8: Household's adoption of SI practices: analysis of socio-ecological determinants	2 hr	Lecturing			Boundia Thiombiano External lecturer[1]
Unit 9: Computer lab 2: Multi-variate statistics for adoption analysis	2 hrs	Computer lab Group homework		Homework report evaluation	Boundia Thiombiano
Unit 10: Eco-efficiency assessment of production systems: concept, application to crop component and	2 hr	Lecturing		Subject writing exam (end of the course)	External lecturer[1] Boundia Thiombiano

whole smallholder system					
Unit 11: Computer lab 3: Data Envelopment Analysis Programming (DEAP)	2 hrs	Computer lab Group homework		Group homework report evaluation	Boundia Thiombiano
Unit 12: Nutrient balance assessment in smallholder systems and strategies for achieving SI	2 hrs	Lecturing		Subject writing exam (end of the course)	Boundia Thiombiano External lecturer[1]
Unit 13: Multi-agent Systems (MAS) for SI scenarios evaluation – concept, methodological steps	2 hrs	Lecturing		Subject writing exam (end of the course)	External lecturer[1] Boundia Thiombiano
Unit 14: Computer lap 4: MAS modelling in NetLogo	2 hrs	Computer lab		Subject writing exam (end of the course)	External lecturer[1] Boundia Thiombiano
Unit 15: Computer lap 5: Engineering a simple relevant MAS model in NetLogo	2 hrs	Computer lab		Subject writing exam (end of the course)	External lecturer[1] Boundia Thiombiano
Unit 16: Demonstrative case study of MAS for SI, usages of MAS for SI	1 hr	Lecturing		Subject writing exam (end of the course)	External lecturer[1] Boundia Thiombiano
Unit 17: Prospective research/development directions, course closing	2 hrs	Lecturing		Subject writing exam (end of the course)	Boundia Thiombiano External lecturer[1]
Unit 18: Field practicum: practice to interview farmers within 2 hours	2 hrs	Field visit		Filled 2-page questionnaire	Boundia Thiombiano

[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.

7.2. Summary of the discussion points

7.2.1. Subject description

The workshop participants found the description of the learning objective not precise enough. They made comments in order to improve the description of the learning objective.

Concerning the subject overview two main comments were made:

i) It was suggested to split the learning subject in two sub-subjects. This gives opportunity to allocate more time, given that a teaching subject cannot take more than 24 hours of lecturing and practicum.

ii) Participant proposed to remove Dr Quang Bao Le from the list of Responsible lectures as he is an invited lecture and given that the University cannot anticipate on his availability. It was suggested to keep him as invited lecture who can support the implementation of the subject based on his availability;

7.2.2. Subject structure summary

Based on the suggestion for splitting the new subject, two sub-subjects were formulated:

- **Part I: Introduction to Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems:** it comprises 10 learning units covering concepts definition, multicriteria analysis methods and field practicum;
- **Part II: Advanced Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems:** this second part has 9 units. It focuses on modelling methods, computer labs and field practicum.

7.2.3. Subject planning log-frame

The discussion on the point led to the redistribution of learning between the two sub-subjects. Each sub-subject has to be kept in the maximum duration of 24h of lecturing, lab session and filed visit as instructed by the guide for curriculum structure in Burkina.

Four lecturers agreed to join the lecturing team in addition to Dr Thiombiano. The course units were redistributed among them based on the field of expertise of every volunteer.

7.3. Presentation of the Agreed new subject

7.3.1. Agreed description of the new subject

7.3.1.1. Agreed 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).

7.3.1.2. Overview of the subject

The new subject is divided into two sub-subjets. Each has a length of 60 hours. It combines student personnal research time (60% of the sub-subject length: 36 hours) and in presence lecture and praticum (40% of the sub-subject length: 24 hours). The frirst sub-subject comprises 14 hours lecture time, 6 hours for compute lab and 4 hours of field visit. The second sub-subject comprises 12 hours lecture time, 10 hours for compute lab and 2 hours of field visit.

The summary of the subject is presented in the Table 1

Table 1. summary of the new subject

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
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 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 teacher	Boundia Alexandre Thiombiano
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). • Other K&S:

7.3.2. Agreed structure summary

The course includes three sessions for each sub-subject. 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 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:

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

7.3.3. Agreed subject planning log-frame

The subject planning log-frame is presented in table 2.

Table 2. Planning log-frame

Course Unit	*Unit time length*	*Activity type*	*Learning materials*	*Evaluation type*	*Lecturer (name underlined is the main responsible lecturer)*
Part I: Introduction to Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Achieving Sustainability					
Unit 1: Sustainable Intensification (SI): development issues and needs, concept	2 hrs	Lecturing	Selected textbook chapters; key papers; GLDC research publications and data	Subject writing exam (end of the course)	Boundia Thiombiano Aristide Semporé
Unit 2: Sustainable Intensification (SI):	1 hr	Lecturing Group homework		Homework report evaluation;	Boundia Thiombiano

framework, criteria and indicators				Subject writing exam (end of the course)	Aristide Semporé
Unit 3: Systems approach to structure complexity of agricultural systems and related livelihoods	2 hrs	Lecturing		Subject writing exam (end of the course)	Boundia Thiombiano
Unit 4: Protocol for the conceptualisation of a problem into an agricultural system	2 hrs	Lecturing Group homework		Homework report evaluation	Boundia Thiombiano
Unit 5: Typology-based approach to manage farm-household diversity for better targeting and out-scaling	3 hrs	Lecturing		Homework report evaluation	Boundia Thiombiano
Unit 6: Computer lab 1: Multi-variate statistics for household-farm typology analysis	3 hrs	Computer lab Group homework		Homework report evaluation	Boundia Thiombiano Bienvenu Somda
Unit 7: Household's adoption of SI practices: analysis of socio-ecological determinants	2 hrs	Lecturing		Homework report evaluation	Boundia Thiombiano
Unit 8: Computer lab 2: Multi-variate statistics for adoption analysis	3 hrs	Computer lab Group homework		Homework report evaluation	Boundia Thiombiano Bienvenu Somda
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)	Boundia Thiombiano
Unit 10: Field practicum: practice to interview farmers within 2 hours	4 hrs	Field visit		Filled 2-page questionnaire	Boundia Thiombiano
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	2 hrs	Lecturing	Selected textbook chapters; key papers; GLDC research publications and data	Subject writing exam (end of the course)	Boundia Thiombiano
Unit 2: Computer lab 1: Data Envelopment Analysis Programming (DEAP)	4 hrs	Computer lab Group homework		Group homework report evaluation	Boundia Thiombiano Patrice Zidouemba
Unit 3: Nutrient balance assessment in smallholder systems and strategies for achieving SI	2 hrs	Lecturing		Subject writing exam (end of the course)	Boundia Thiombiano
Unit 4: Multi-agent Systems (MAS) for SI scenarios evaluation – concept, methodological steps	3 hrs	Lecturing		Subject writing exam (end of the course)	Boundia Thiombiano
Unit 5: Computer lap 2: MAS modelling in NetLogo	4 hrs	Computer lab		Subject writing exam (end of the course)	Boundia Thiombiano Mamadou Belem
Unit 6: Computer lap 3: Engineering a simple relevant MAS model in NetLogo	2 hrs	Computer lab		Subject writing exam (end of the course)	Boundia Thiombiano Mamadou Belem
Unit 7: Demonstrative case study of MAS for SI, usages of MAS for SI	3 hrs	Lecturing		Subject writing exam (end of the course)	Boundia Thiombiano
Unit 8: Prospective research/development directions, course closing	2 hrs	Lecturing		Subject writing exam (end of the course)	Boundia Thiombiano
Unit 9: Field practicum: farming system design	2 hrs	Field visit		Research site of of the ICARDA/GLDC project in Satiri or Pontieba	Boundia Thiombiano

7.4. Workshop recommendations

The participant unanuously welcomed the developpement of the subjet which they found is much needed in the current context of livelihoods challenge in the rural ares of Burkina. The participants from the Ministry, NGOs and vocational training school in agriculture found the

training in the subject should not be limited to the Msc program. The workshop particiapant therefore recommand:

- the creation of specific short-term course with delivery of certificate in ''***Integrated Methods for Analysis and Assessment of Agricultural Livelihood Systems Toward Sustainability''*** for professionnals from NGOs and public workers who have not the opportunity to understake master studies. Such specific training should be hosted by IDR-UNB or a private center in collaboration with IDR-UNB;
- the IDR-UNB administration to discuss with the vocational training schools in Bobo-Dioulasso the possibility of collaborating to deliver the subject these schools: Vocationnal training school in agriculture (ENAFA) and vocational training school in Environment (ENEF);
- Inviting external lecturers (NARI, ICARDA, ressources persons).

8. SUPPORTING RESSOURCES

Learning materials (lecture notes, journal and conference papers, working papers and technical reports) are stored in the following folder link:

https://drive.google.com/drive/folders/14Zy1mA0ydO2uXzlV54RyZQNS0AYKryOH

The materials are being continued to be added and edited.

9. ANNEXES

ANNEXE 1: LIST OF WORSHOP PARTICIPANTS

No.	Tittle and full name
Participants from UNB/IDR	
1	Dr Salifou OUEDRAOGO
2	Dr Denis OUEDRAOGO
3	Dr Saïdou SANTI
4	Dr Kalifa COULIBALY
5	Dr Vinsoun MILLOGO
6	Dr Patrice R. ZIDOUEMBA
7	Dr Souleymane SANOGO
8	Dr Schémaéza BONZI
9	Dr Florent LANKOUANDE
10	Dr Bienvenu M. SOMDA
11	Dr Michel KERE
12	Dr Boundia Alexandre THIOMBIANO

13	Pr Patrice TOE
Participants from Université Nobert ZONGO (UNZ)	
14	Dr Abel TRAORE
15	Dr Inoussa TRAORE
Participants from National Institute for Environment and Agricultural Research (INERA)	
16	Dr Eveline COMPAORE
17	Dr Isabelle DABIRE
18	Dr Halimatou SERME/TOURE
Participants from the Ministry of Agriculture	
19	Mr. David TIEMTORE
20	Mr. Hypollite TIENDREBEOGO
Participants from vocational agricultural training schools	
21	Mr. Mamadou Lamine OUATTARA
22	Mr. Salifou SANOGO
23	Mr. Jean Paul ZOUNDI
Participants from NGOs	
24	Mr. Abel BEDA
25	Mr. Ardzouma SANOU
Former students	
26	Mr. Ambroise SAVADOGO
27	Mr. Saidou DIANDA
28	Ms. Zeinabou SOURABIE
29	Mr. Modibo OUEDRAOGO
30	Ms. Amina OUEDRAOGO