ASEA

Agroecology in SouthEast Asia

1st ASEA PhD Days

Virtual meeting

1st - 2nd December, 2021 | 14:00-17:00 GMT+7

Agroecological performance and sustainability of crop-livestock systems in Northern Vietnam

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- **Contribution to the SC22:**

Methodological framework for assessing performances and impacts of innovations and transitions (SC2.2) of ASSET project “ Agroecology and Safe Food Systems Transitions in Southeast ASIA”.

Outline

1. **Introduction**

2.Objectives and research questions

3. Materials and methodologies

4. Expected outputs

5.Tentative schedule

Problem statement

- Monocropping of maize, rice, cassava is predominant on sloping lands
- Small-scale livestock production depends on crops products and natural grasslands
- Increased deforestation, intensive mono-maize production

=> increased synthetic fertilizer, soil erosion, degradation, loss of biodiversity=> soil fertility=> decreasing profit of monocrops

- Decreased natural grasslands and fodder, undeveloped policy for communal grassland => reduced cattle feed
- Livestock growth put burden on land use, environment footprint, pollution, food insecurity

➔ Unsustainable production systems

Research statement

- Agroecology is an alternative, using ecological services in design and management
- Mixed crop-livestock systems:

↑ Productivity of crop and livestock

↓ Diversity of feed resources, soil fertility

↓ Reliance on synthetic fertilizer

Design: Diversification and integration => agroecology

- Agroecological practices in crop production:

↑ Soil fertility, ↓ soil erosion

↓ Reliance on synthetic pesticides, fertilisers

Management practices

Literature reviews and knowledge gaps

- Interventions based on agroecology and CSA in Northwest

(e.g Mulching cover crops, intercropping, minimum tillage, agroforestry)

- Provided evidences on positive effects by adopting these practices on reduction of soil erosion and improvement of economic benefits
- Structure of cropping systems have changed due to some provincial policies

BUT

Understanding on the agroecological performance and sustainability of current crop-livestock-tree systems as an impact of interventions is unknown

- Previous studies on livestock systems:

Management practices, inputs and outputs of animal systems

Management, resource use, economic success of different pig farming systems; Sustainability of different pig farms

- Previous researches on cropping systems:

Dominant cropping systems and agroforestry at different elevations and evaluated the economic performance

BUT : Underevaluation of diversified farming systems

- ✓ Self-sufficiency of resources from complementary of sub-systems
- ✓ Potential of exchanging resources between different farming systems
- ✓ Few studies assessed influencing factors and constraints of adopting agroecological practices
- ✓ Understanding on agroecological practices in livestock production is missing

Objectives and research questions

Objectives

- Evaluate methodological framework (tools) for assessing performances and impacts of agroecological transitions;
- Characterize the current crop-livestock-tree systems regarding resource endowment and resource management
- Identify influencing factors and constraints of adopting agro-ecological practices;
- Evaluate the performance of agroecological practices and their impact on household livelihoods
- Assess the sustainability of different smallholder crop-livestock-tree systems

Objectives and research questions

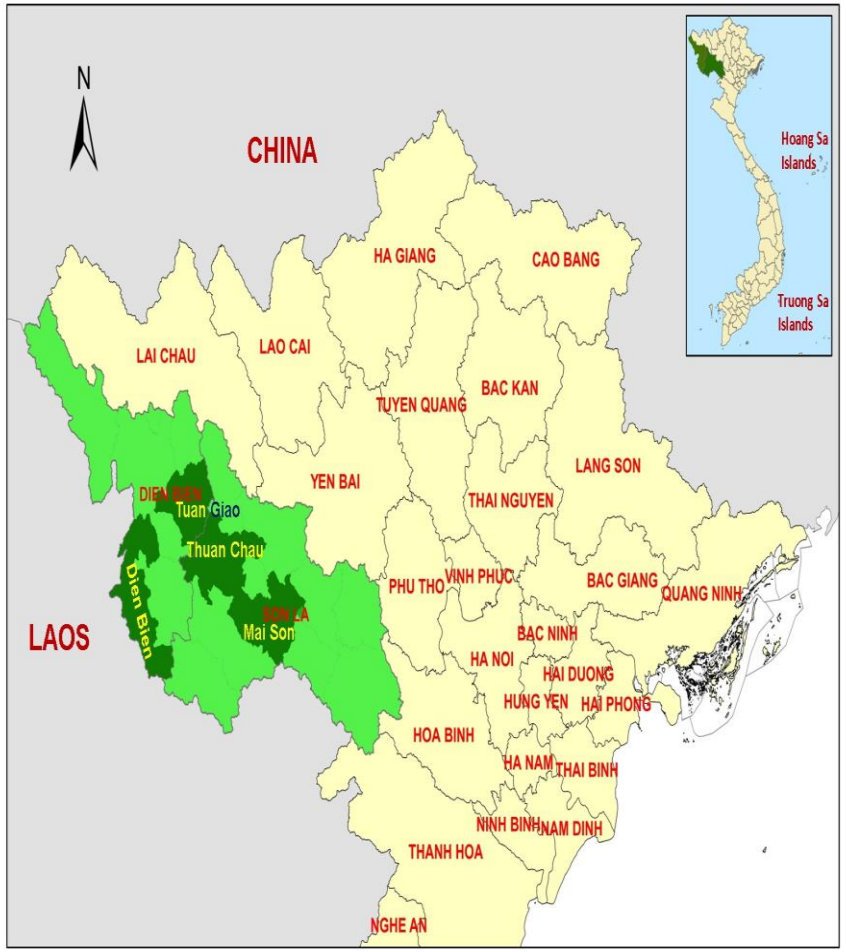
Research questions

- What is the suitability of existing methodologies in evaluating the performance and impacts of agroecological transitions?
- What are current agroecological crop-livestock-tree systems in the area?
- How internal and external resources are managed in these systems?
- What types of agroecological practices are adopted in crop and livestock production? What are influencing factors and constraints of farmers to adopt these practices?
- How are the current systems performing in terms of agroecological performance, and impact of crop-livestock diversification on sustainable livelihoods?
- What combinations of crop, livestock, tree systems improve biodiversity and economic benefits?

Materials and methodologies

Study sites

- Provinces: Son La and Dien Bien provinces
- Districts: one district/province (Tuan Giao and Mai Son districts)
- Communes: 4 communes/district (2 in highlands and 2 in lowlands), with innovations in agroecology
- Households: smallholder farmers keeping livestock (ruminants, pigs, poultry), crops, trees; less than 2 ha of land.



Materials and Methodologies

Objective 1: Evaluate methodological framework (tools) for assessing performances and impacts of agroecological transitions

Materials	Methodology		
	Information & methods	Source	Criteria Evaluation
Tool for Agroecology Performance Evaluation (TAPE) developed by FAO	Literature reviews on studies on sustainability assessment of innovative farming systems Reviews on methods, methodology comparison	Google scholar Science Hub Scopus Research gate	Strength in assessing the current performance of innovations and Progress towards sustainable agriculture Feasibility, utility, scientific soundness Reviews on methods, methodology comparison
Sustainabilitiy assessment of Food and Agricultural systems (SAFA) developed by FiBLE			
IDEA methodology (Farm Sustainability Indicators)			
Monitoring tool for integrated farm sustainability (MOTIFs)- developed by Marijke Meul et al. (2008)			

Materials and Methodologies

Objective 2: Characterize the current crop-livestock-tree systems regarding resource endowment and resource management

Data collection		Data analysis
Information/data	Methodology	
❑ **Dominant crop, livestock, tree systems, main land use**	Focus group discussion with farmers	Map of land uses, dominant systems will be generated
❑ **Resource endowment** Natural, physical, human, social, financial capital	In-depth interviews with farmers	✓ 2 steps of characterisation: • Categorisation: Farm typology via cluster analysis Criteria: diversity index of livestock, trees, crops (Magarlef index), indicators of resource availability above • Characterising systems: Characterizing farming systems: descriptive and comparative statistics analysis via mean and frequency ✓ NViVo and STATA software
❑ **Resource management**		
Internal resources: Land use, livestock feeding (feed types, seasonality), recyle of crops products, by-products of crops, trees on farm; Waste treatment: Recycle of crop residues; livestock manure; Labor and capital use: Time for caring livestock and cropping and tree growing; cash cycle within farm **External resource:** Feed purchase from market and from exchange; Purchase of agrichemicals (synthetic fertilisers, pesticides, herbicides); Capital loans, hired labor		

Materials and methodologies

Objective 3: Identify influencing factors and constraints of adopting agro-ecological practices

Data collection		**Data analysis**
Data	Methods	Qualitative data analysis, NViVo Quantitative data, STATA
Agroecological practices **In Crop production:** • Efficiency increase; Redesign practices • Weed, pest management practices • Management of hedges, vegetation strips **In Livestock production:** • Selection and combination of animals, breeds • Feeding strategies • Functional diversity (herd/farm level)	Key informant interviews with extensionists In-depth interviews with farmers	• Type of practices • Adoption frequency of practices
Influencing factors and constraints • Influencing factors: Significance of adopting practices and reasons • *Constraints:* managing and continuing practices	Indepth interviews with farmers	• Type of factors, constraints • Frequency of factors • Frequency of constraints

Materials and Methodologies

Objective 4: Evaluate the performance of agroecological practices and their impact on household livelihoods

Data collection		Data analysis
Data	Methods	
Performance of diversity and integration (synergy) Data obtained from Objective 2		Using methodology of objective 1
Impact of crop-livestock diversity on sustainable livelihoods Income: Outputs of crops, livestock, trees Production costs (livestock, crops, trees) Revenue of main crops, livestock, tree activities; Stability of income: Reduction of income during shocks. Vulnerability: cases of pests, disease; market price fluctuation	Indepth interviews with farmers	- Caculation of crop-livestock diversity index, crop/livestock diversity index: (Magarlef index) $Di = (Si - 1)/\ln(Ni)$, - Descriptive and comparative analysis: using Mean of income, frequency of income reduction, frequency of pests, diseases - Correlation between income and crop-livestock diversity, using Probit model to estimate the probability of diversity effect on income

Materials and Methodologies

Objective 5: Assess the sustainability of different smallholder crop-livestock-tree systems

- The most suitable methods in Objective 1 will be used for the sustainability/impact assessment
- Sustainable dimensions: economics, environment, social dimensions
- Delphi-technique will be used to adapt the methodology to local context, using a Likert-scale from 1 (the lowest) to 5 (the highest) to choose relevant sustainable indicators/themes
- Selection criteria:

+ Irrelevant themes/sub-themes with mean rank >= 3.5 and quartile deviation <= 0.5 will be accepted.

+ Themes/sub-themes with mean rank <= 3.5 and quartile >= 0.5 will be rejected

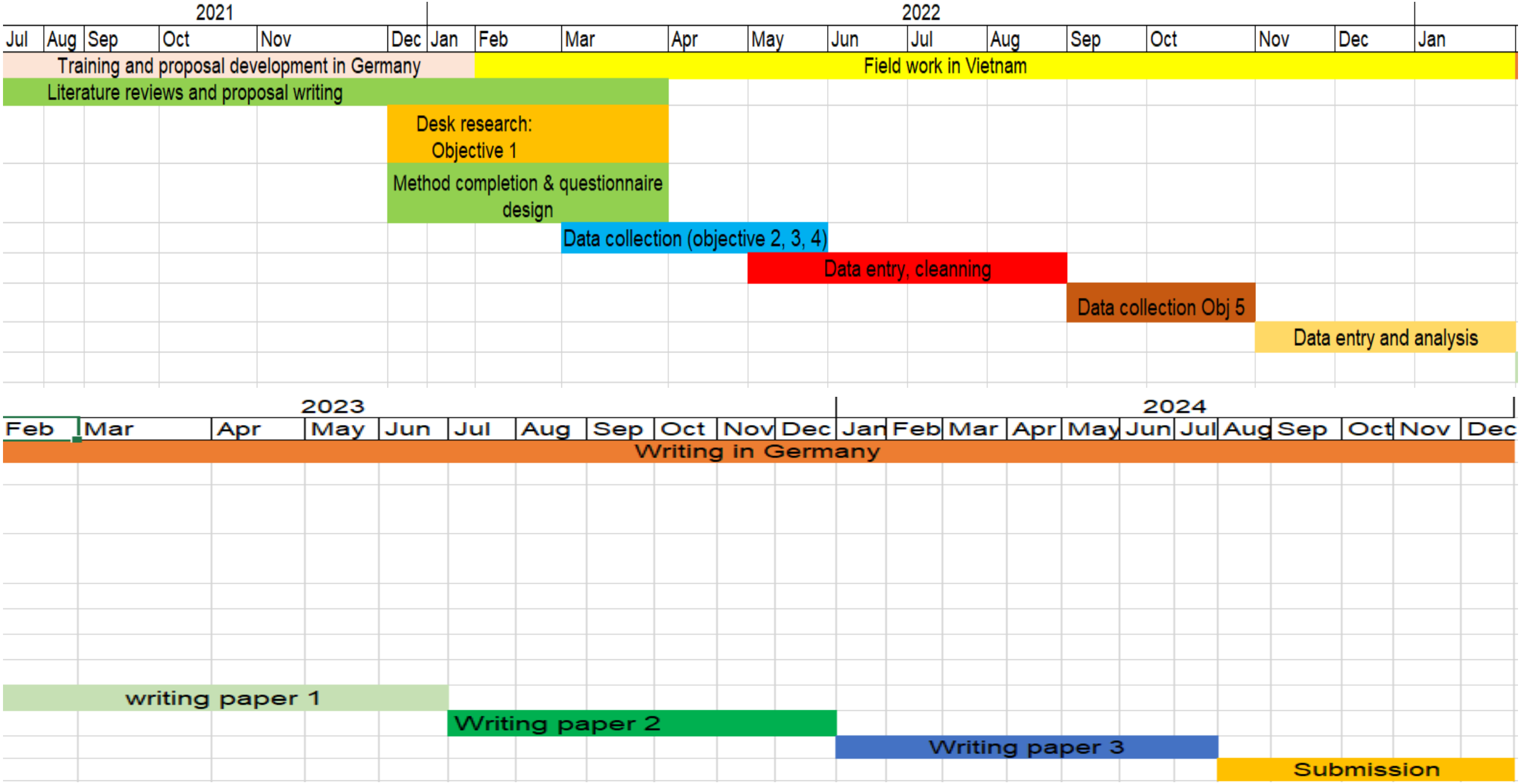
Expected outputs

- Categorized different crop-livestock-tree systems in the community according resource endowment, and understood management resources of these systems
- Types and frequency of adopted agroecological practices in crop and livestock production
- Influencing factors and constraints on adopting agroecological practices.
- Proposed a farming systems with better biodiversity and economic performance

Number of samples/interviews

Contents	No. samples	Location
(Individual) in-depth interviews	80	Field visit 4 communes each in Dien Bien and Son La provinces.
Group discussion	8	Field visit
Key informant interview	10	
Transect walk	8	
Total	106	2 rounds, approx. 160 interviews

Tentative Schedule



THANK YOU FOR YOUR ATTENTION!