Research Seminars

System Analyses for Sustainable Agricultural Production and Livelihoods of Smallholders: Complementary Approaches and Case studies in Southwestern Burkina Faso

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Eco-efficiency Analysis of Typical Smallholder Systems: Case Study in South-western Burkina Faso

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CGIAR RESEARCH PROGRAM ON Dryland Systems

ICARDA Science for Better Livelihoods in Dry Areas

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UPB

Introduction

- Low productivity of smallholder farms in Sub-Saharan Africa (SSA)
- Farm profitability is essentially based on technical efficiencies
- Integrated crop-livestock is a potential strategy to improve efficiency of the whole farm system, also meet food quality preferred by people
- "Uniform blanket" thinking vs. inherent diversity of livelihood context affecting farming outcomes

→ Still need for more research evidence in different contexts and further more need to informing on the role of agricultural livelihood heterogeneity

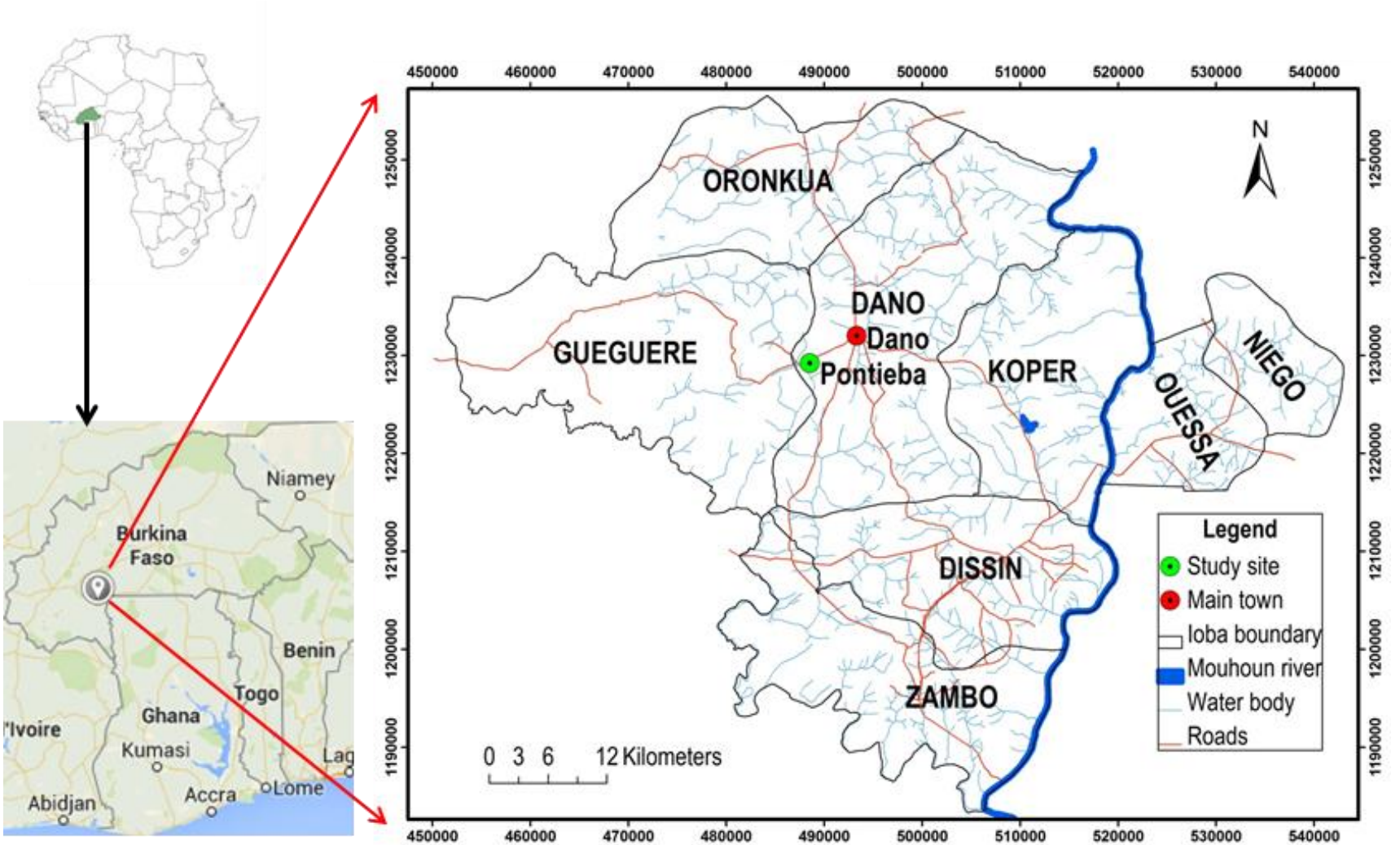
Source: Le et al. (in prep.)

Objectives

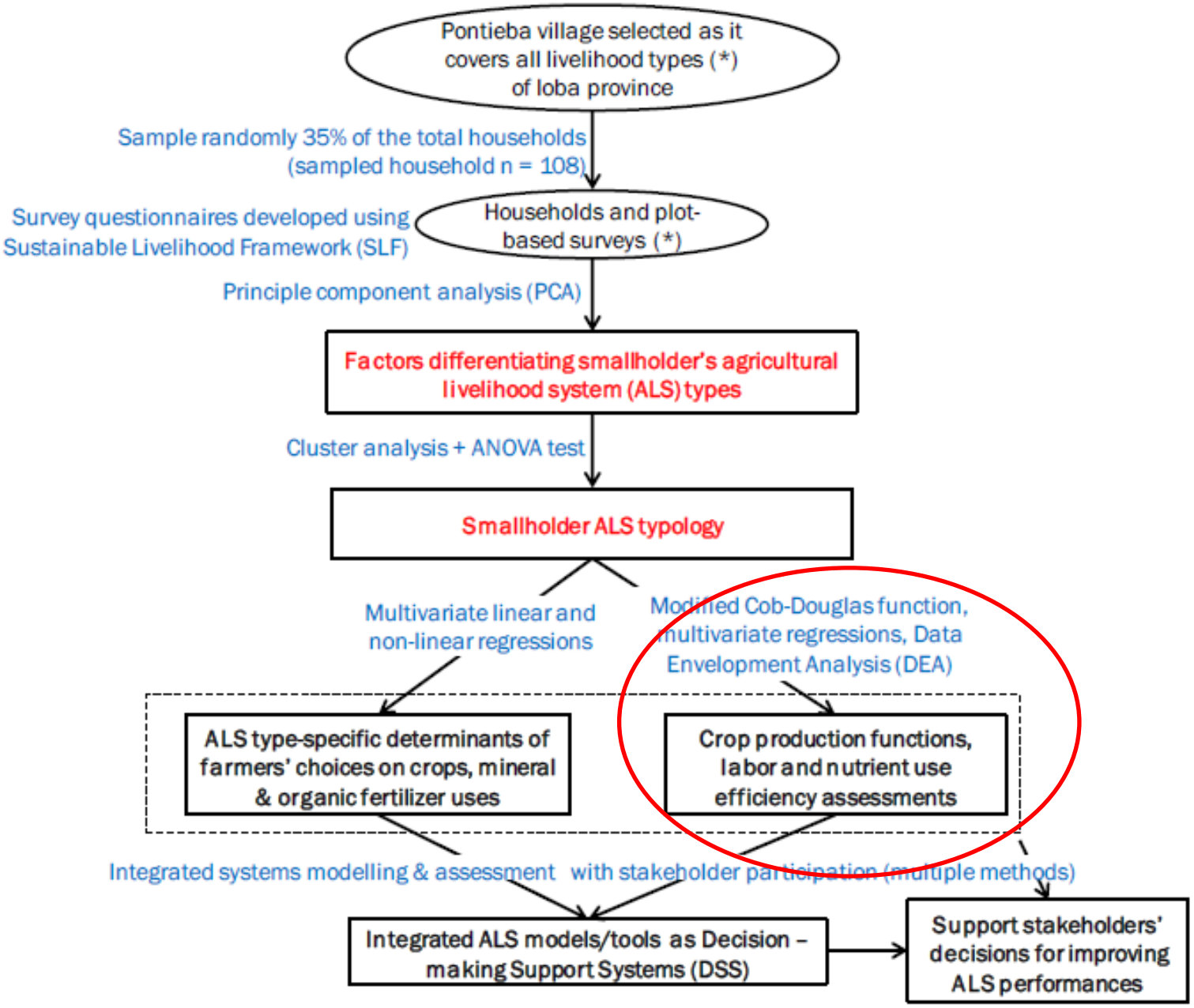
- Assess the efficiency of sole maize production for the different agricultural livelihood type-specific
- Evaluate the efficiency of combined maize–livestock production for the three different agricultural livelihood system (ALS)
- Identify factors constraining or promoting economic efficiencies of farm production

Source: Le et al. (in prep.)

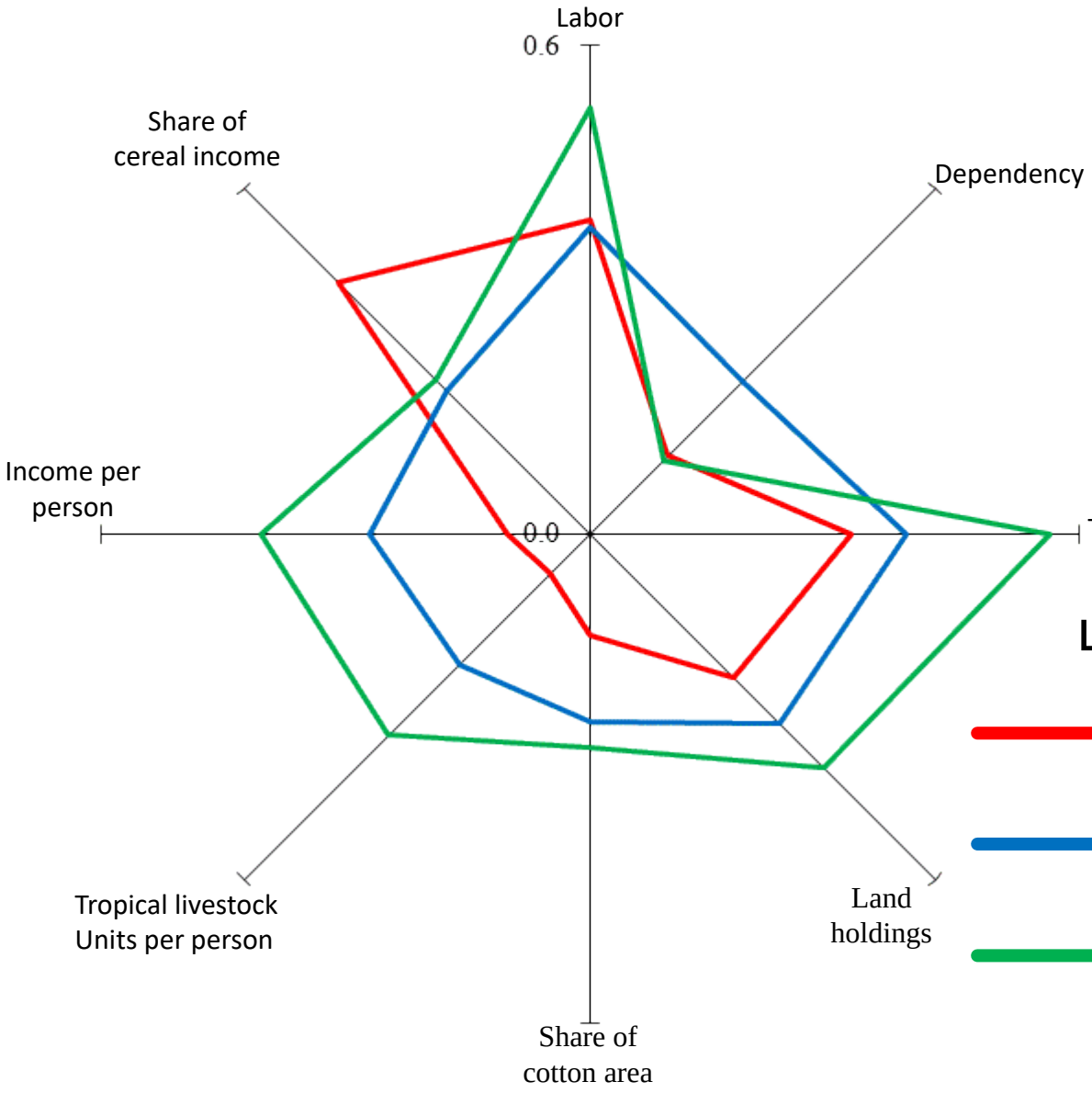
Study area and site



Sampling method and system analysis steps



Smallholders' agricultural livelihood types (recap)

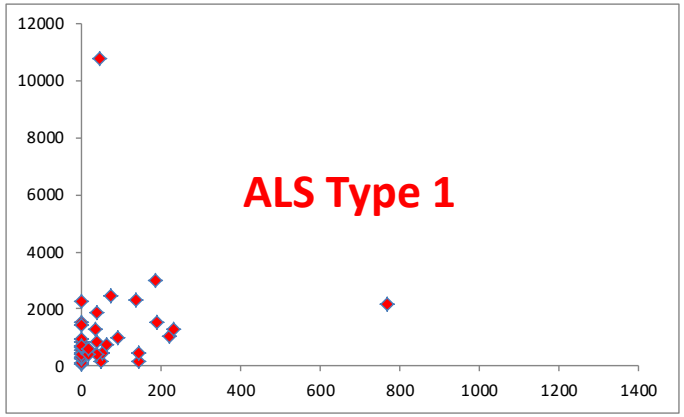


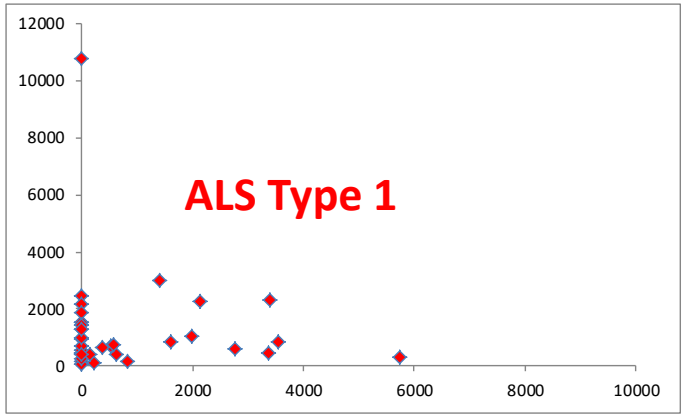
- Previous presentation showed this ALS types are functional regarding crop choices and integrated fertilizer uses/adoptions
- Now, is economic efficiencies of maize and integrated maize-livestock productions different among the types?

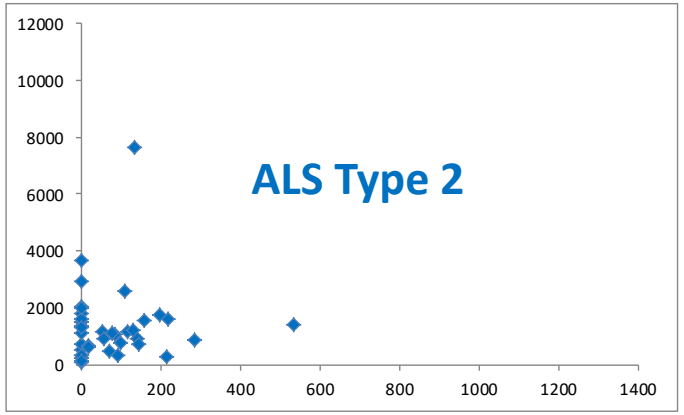
Legend

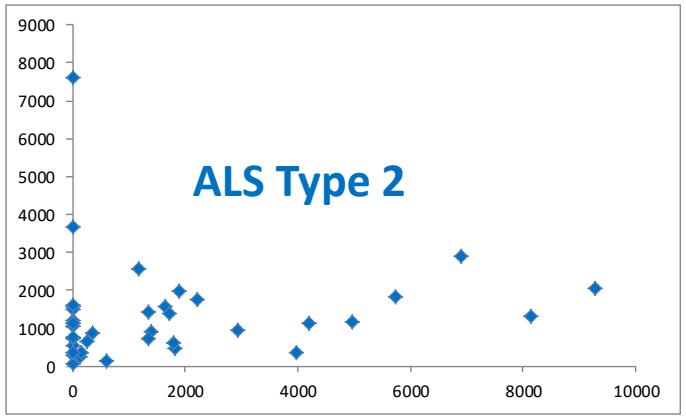
- ALS type 1: Poor, landless and subsistence-based farms
- ALS type 2: Medium-income, high-dependency, cotton-and livestock-turned
- ALS type 3: Better-off, land-and labour-rich, cotton-and livestock-turned

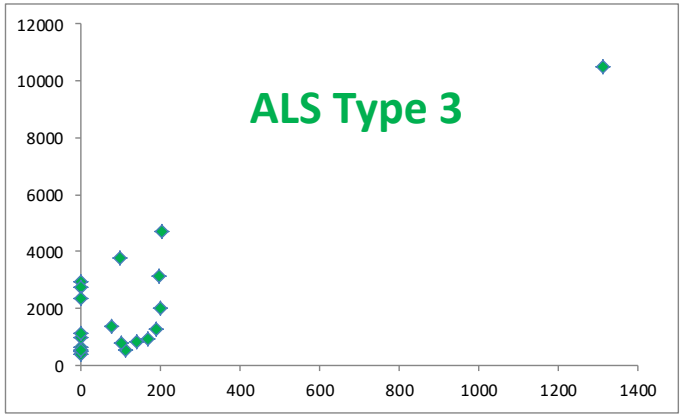
ALS-specific Responses of Maize Yield to Fertilizer Input

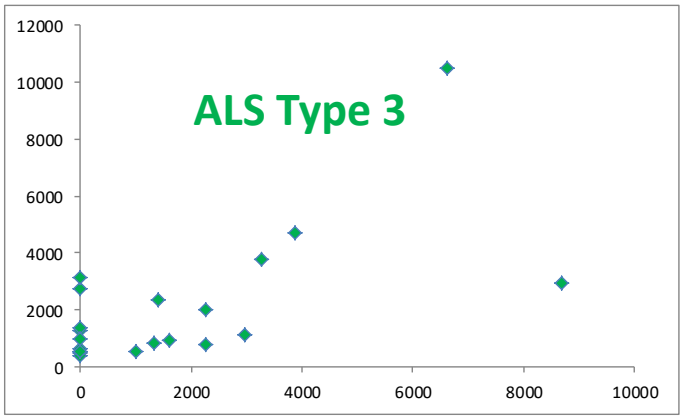












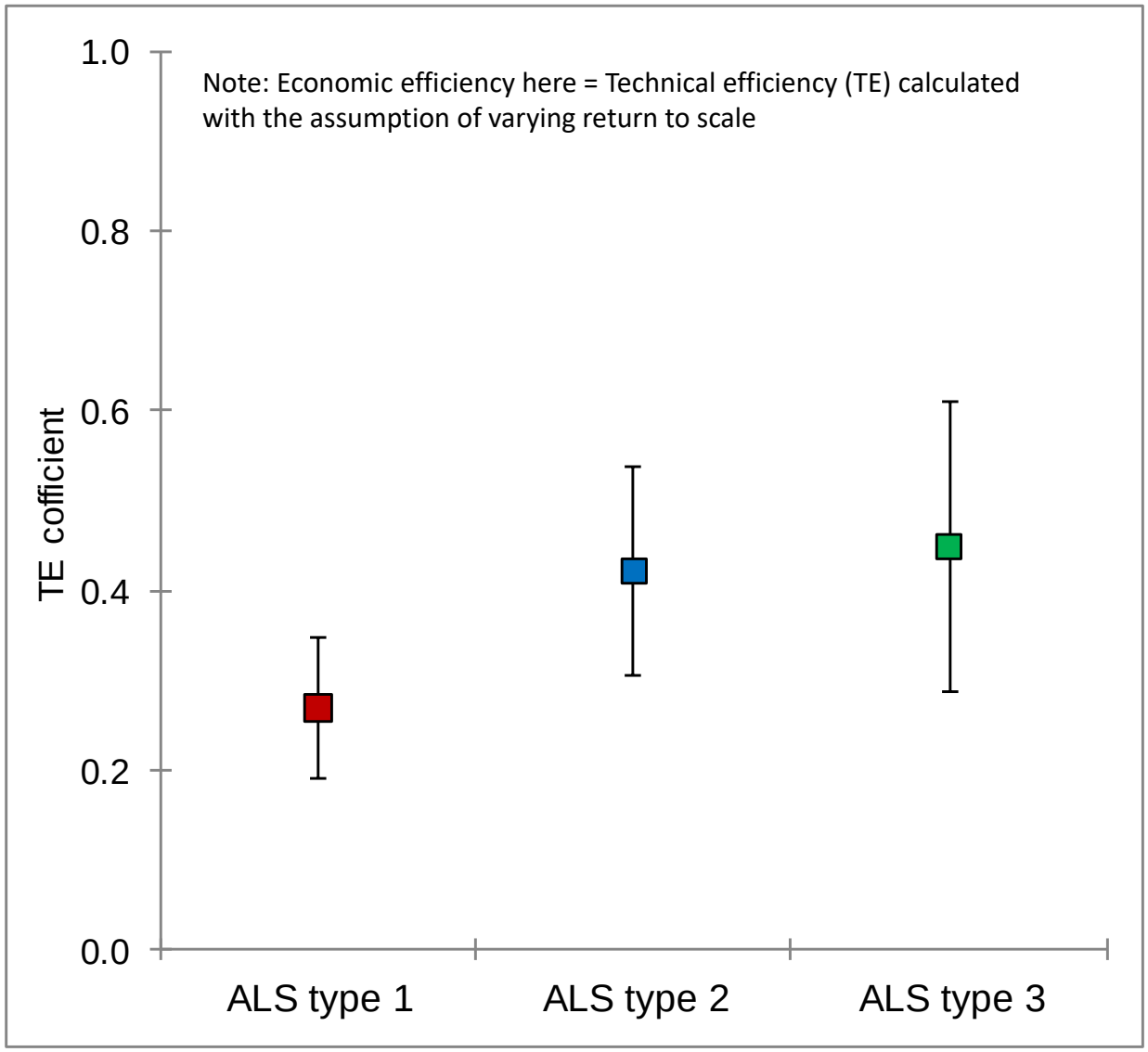
Maize yield (kg/ha/yr)

Mineral fertilizer (kg/ha/yr)

Organic fertilizer (kg/ha/yr)

1 dot =
1 observed farm

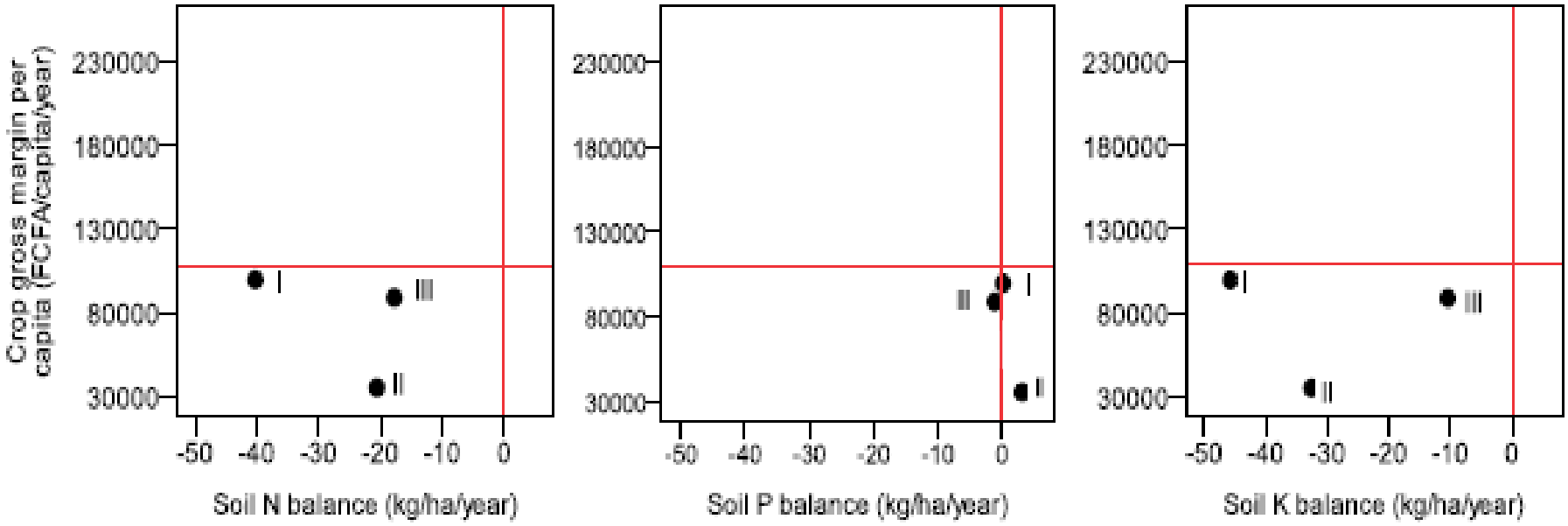
Economic Efficiency (TE) of Maize Production vs. ALS type



- All farms have low maize production efficiency (TE < 0.5)
- Less differentiation among ALS types (esp. types 2 and 3)

Crop gross margin per capita vs. soil nutrient balance

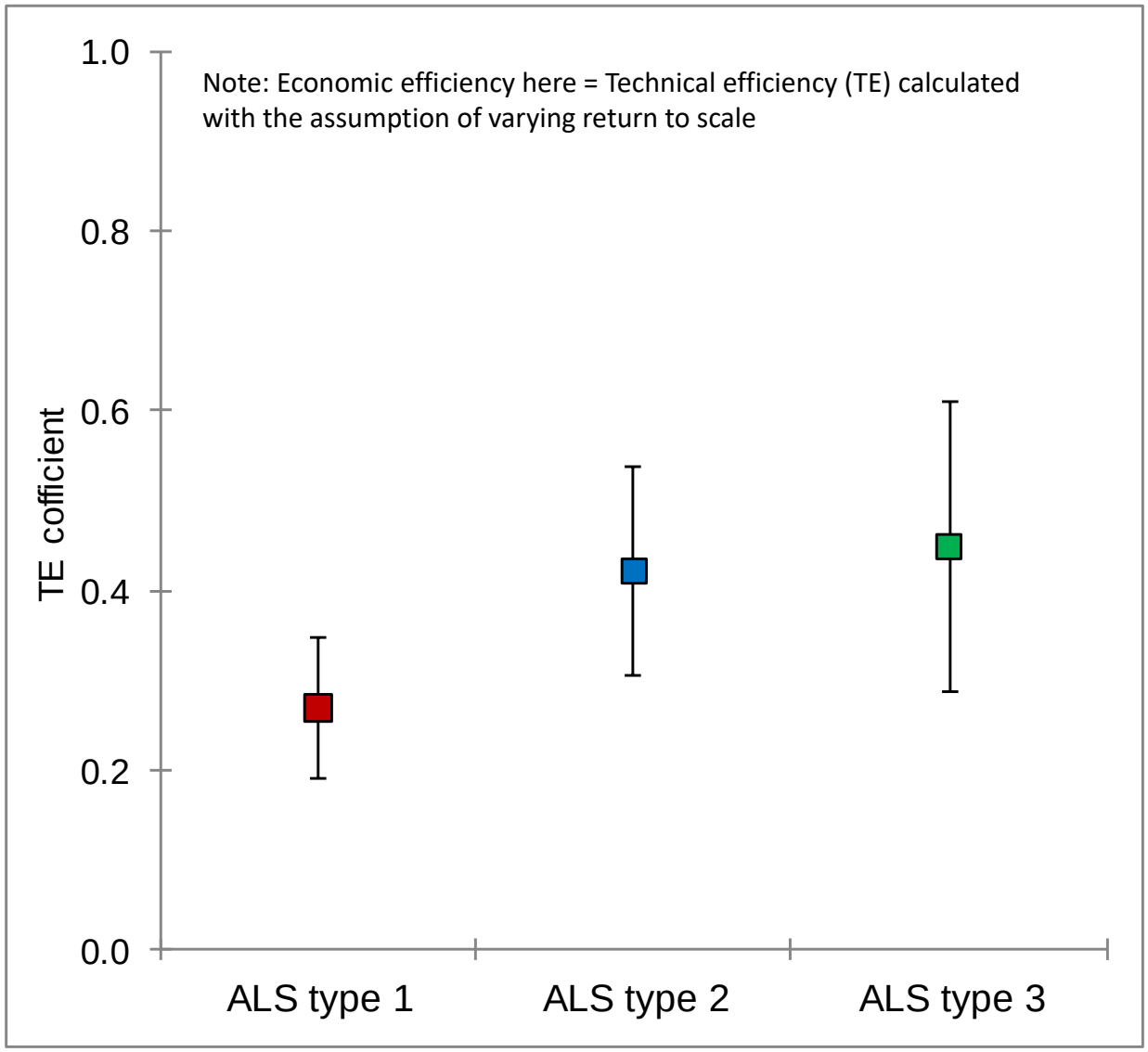
Note: Dots I, II, and III are ALS types 1, 2 and 3, respectively



Source: Thiombiano and Le (2015; submitted)

- The negative balance of soil nutrients (esp. N and K) would explain for the low efficiency of maize production across ALS types
- Crop gross margin/person is below 1.25 USD/day (poverty line) across all ALS types

Economic Efficiency (TE) of Maize Production vs. ALS type



- All farms have low maize production efficiency (TE < 0.5)
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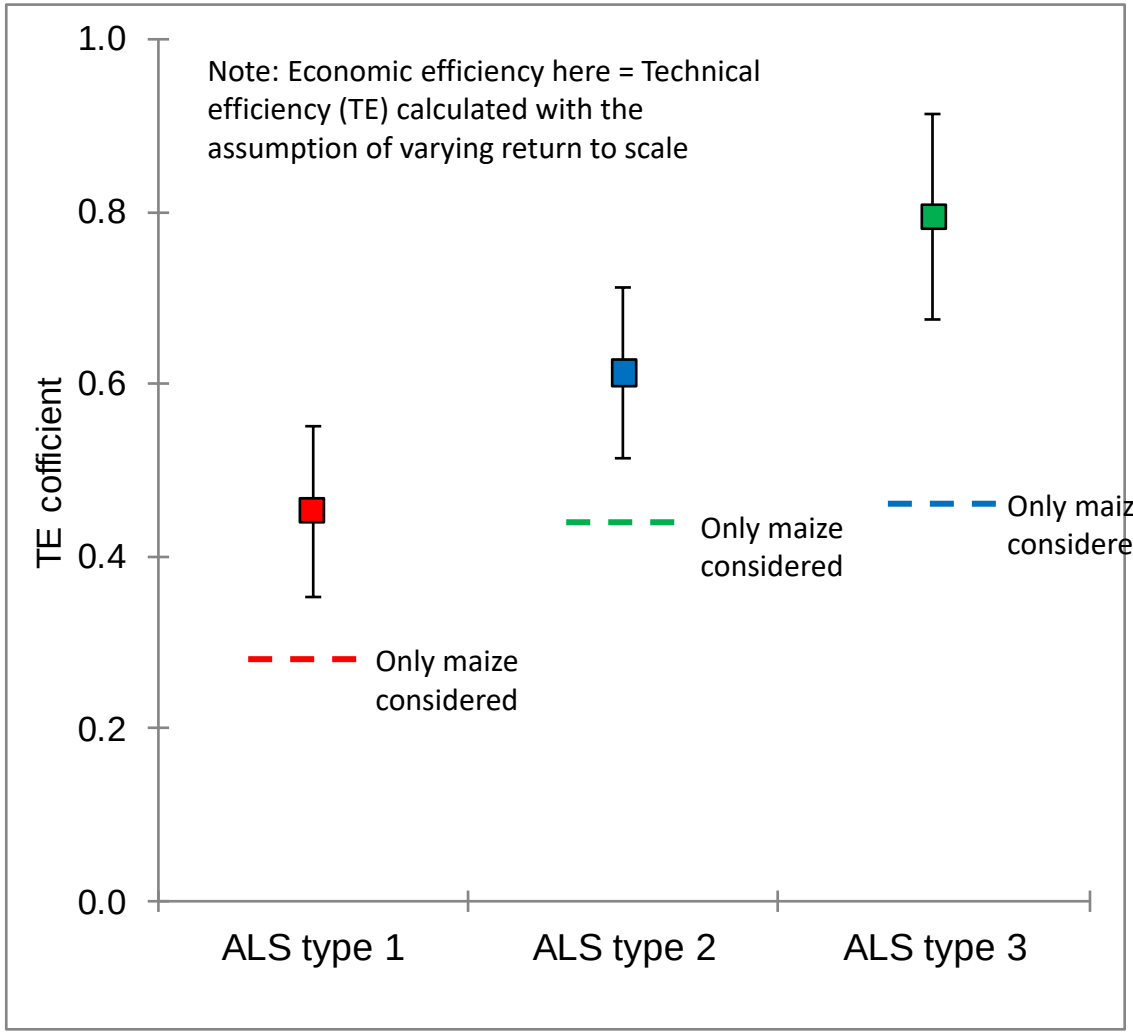
Economic Efficiency of total Maize-Livestock Production vs. ALS types



- Efficiencies of total maize + livestock is higher and more different among ALS types
- Implications evidenced by system analysis:

➢ Focus only on maize production efficiency does not make sense as farmers' goal is total food production & profitability.

➢ Integration livestock in maize-based systems in the area can double system economic efficiency (esp. evidenced by as the case of ALS type 3)

ALS type-specific and common determinants of economic efficiency of maize production

Explanatory variable	Whole Sample (n=93)	ALS type 1 (n= 35)	ALS type 2 (n=38)	ALS type 3 (n=20)
Age	(-)**			
Education level	(+)*		(+)**	
Dependency ratio (dependents/workers)				
Off-Farm income			(-)*	
Cereal area				
Cotton area	(+)**		(+)*	
Number of bullock				
Plots' remoteness			(-)*	
Access to credit				
Constant				

- Disadvantages of considering only whole sample
  - ❑ Overlooking the effects of off-farm income and remoteness of crop fields
  - ❑ The significant factors found in whole population analysis cannot apply to ALS types 1 & 3 (60%of the population.
- Other important factors would be missed by this model of causal analysis.

Note:
(-): constraining factor, (+): promoting factor
*: sig. 90%, **: sig. 95%
empty cell: not significant

Conclusion

- **Economic efficiency** of maize-based smallholder systems in southwestern Burkina Faso **shaped by agricultural livelihood context**

- Economic efficiency of maize production are very low, caused by negative balance of soil nutrients. **With the *status-quo* cultivation practices and degraded soil resources, intensifying inputs for increase maize yield is clearly an unprofitable direction**

- **Integrating livestock in maize-based systems** in the area is proved to be a right strategy to **increase, possibly up to 100%, farming systems' economic efficiency**

- Additional causal analysis for specific ALS group help **avoid mistakes** in applying causal relationship drawn from "uniform blanket" consideration