Assessment of cropping systems and net economic returns in three agroecosystems of Southern Myanmar

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Introduction

- Loss of biodiverse natural forests in Kyunsu Township of Southern Myanmar, as a consequence of agricultural land expansion
- Decline of ecosystem services

Objective

- To assess cropping systems, their land productivity and production constraints in Kyunsu Township
- To gather information to identify potential interventions that can address production constraints, thereby increase the net economic returns from current croplands

Materials and methods

- Semi-structured interviews with 301 households (15% of the households in the Plantation Zone, 35% in the Lowland Zone, and 50% in the Sea Zone)
- Hierarchical clustering of principal components (HCPC, Housson et al., 2010) to classify cropping households with homogeneous characteristics in each zone
- Principal component analysis → retained principal components (PCs) which showed eigenvalues > 1 and explained variances > 60% → hierarchical clustering
- Kruskal–Wallis test followed by Wilcoxon rank sum test to evaluate significant differences and calculate pairwise comparisons of variables between types of cropping systems in each zone

Results

Hierarchical clustering on principal components

Principal component analysis

2 retained PCs in the plantation zone	3 retained PCs in the lowland zone	4 retained PCs in the sea zone
Hierarchical clustering		
Type 1: Input limited, low productive system Type 2: Input limited, high productive system Type 3: Input intensive, high productive system	Type 1: Input intensive, low productive system Type 2: Input limited, low productive system Type 3: Input limited, high productive system	Type 1: Input limited, low productive system Type 2: Input intensive, high productive system Type 3: Input intensive, low productive system

Figure 1. Types of cropping systems resulting from hierarchical clustering on principal components (HCPC) in the three agroecological zones of Kyunsu Township.

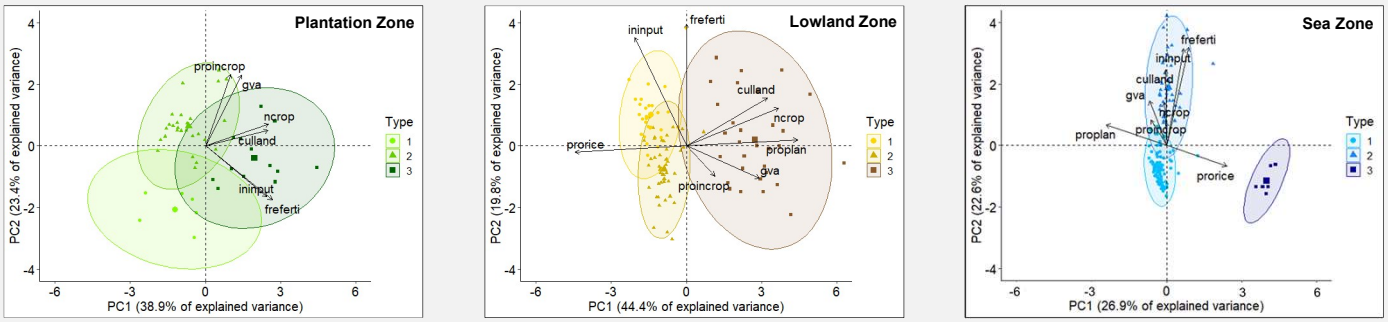

Figure 2. Distributions of the corresponding types of cropping systems in the three agroecological zones of Kyunsu Township by correlation of the two most important principal components (PC1 and PC2) with key variables: culland=area of cultivated land, ncrop=number of cultivated crops, proplan=proportion of cultivated land area with plantation crops, prorice=proportion of cultivated land area with rice, freferti=frequency of fertilizer application, ininput=intermediate input, gva=gross value added, and proincrop=proportion of income from cropping activity.

Performance of cropping systems

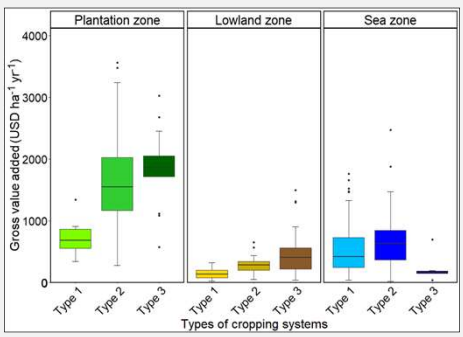

Figure 3. Land productivity of the types of cropping systems within the three agroecological zones of Kyunsu Township.

Constraints encountered

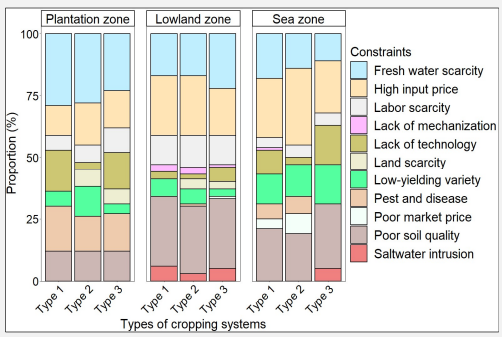

Figure 4. Proportion of major production constraints of the types of cropping systems within the three agroecological zones of Kyunsu Township.

Conclusion and recommendation

- Diversified cropping systems combined with appropriate input utilization exhibit the potential to enhance land productivity in terms of gross value added.
- Farmers' apparent production constraints in each cropping system should be considered in improving land productivity on current cultivated lands. This may help to prevent further encroachment of natural forests in search for enhanced crop production.

Reference

Husson, F., Josse, J., & Pages, J. (2010). Principal component methods-hierarchical clustering-partitional clustering: why would we need to choose for visualizing data. Applied Mathematics Department 17.

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