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## Smallholder Typologies in Pigeon Pea-based Farming Systems: an Application to Rural Uganda

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### Abstract

Worldwide, over 500 million smallholders exist who are diverse and mostly operate in resource-constrained environments that are heterogeneous. Smallholders produce over 30 percent of the food supply and operate 24 percent of the global gross agricultural area, yet they are seldom recognised as critical entities contributing to food security globally. Pigeon pea is an orphan legume crop grown in the semi-arid tropics in Africa and Asia. Despite smallholders' importance, there is little scholarship regarding their diversity and heterogeneity. Against this backdrop, this study sought to cluster smallholders within the pigeon pea-based farming systems and identify the distinguishing characteristics. We gathered data through group discussions to develop a hypothesis about the farming system, in addition to a cross-sectional survey with 257 smallholder households in northern Uganda. Using multivariate analysis, we employed both Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA), and construct six typologies. The six distinct smallholder clusters consisted of 55, 35, 43, 55, 43, and 28 members respectively. Cluster one, two, and six are more livestock reliant because much of their land is dedicated to livestock grazing in addition to owning high TLUs. Cluster three, four, and five are crop-reliant since much of their land is dedicated to crop production and own high units of farm assets. There are further distinctive differences between clusters in terms of farming experience, pigeon pea sales demonstrating a level of commercialisation and access to and use of farm remedies, providing evidence of the large differences between individual households. These results are evidence for targeted and differentiated programs and policies by the government and probable funders.

**Keywords:** Livelihoods, rural-Uganda , smallholders, targeting, typologies