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Title: Adoption of multiple dairy farming technologies by the Indonesian smallholder dairy farmers: A latent class analysis approach

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Adoption of agricultural innovations are still low, particularly among smallholder farmers in developing countries. Despite a significant amount of literature on the adoption of agricultural technologies, most of the previous studies have focused on the adoption of a single technology and employed univariate analysis in understanding the significant factors that associate with the adoption decisions. However, farmers are more likely to adopt multiple technologies as complements or substitutes and to maximise their expected benefit from the adoption decisions while constrained by their limited budget and access to information. This study contributes to the literature by studying adoption of multiple technology bundles and its implications in the design of strategies to improve dairy extension programs in Indonesia. The increasing demand for milk products in Indonesia creates a market opportunity for domestic milk producers. Most of the domestic milk supply is produced in small dairy farms with an average herd size two to three dairy cows per farm, producing around 10 litres of relatively low-quality milk per cow per day [1]. Adoption of productivity-enhancing and quality-enhancing dairy farm technologies is likely to enable smallholder dairy farmers to capture this market opportunity. This study is part of a large Australian Centre for International Agricultural Research (ACIAR) project called IndoDairy, focused on improving the livelihoods of smallholder dairy farmers in Indonesia. Thus, we use data from our recent survey of 600 dairy farm households conducted in August 2017 in West Java, Indonesia. We analyse the pattern of adoption of multiple technologies at the farm-level. Results from Latent Class Cluster analyses suggest that there are three different clusters of smallholder farmers based on the dairy technologies they adopted, reflecting that smallholder farmers have different technology needs. Socio-demographic characteristics of the smallholder farmers help explain why these clusters are different in technologies they adopted.

Keywords: adoption, multiple technologies, Latent Class Cluster analysis, household survey, smallholder farmers, dairy, Indonesia

[1] Darmawan, B 2017, *Indonesia 2017: Dairy and product annual report*, USDA Foreign Agricultural Service.