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The role of ICT based extension services on Dairy Production and household welfare. The case of iCow service in Kenya

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Introduction

Rural services are at the heart of successful agricultural and rural development (ARD) in developing countries. Effective delivery of services is seen as 'essential if small farms in high potential areas are to intensify production, contribute to economic growth and reduce poverty' (Jayne, 2006). Agricultural extension is one of services that play an important role for growth and transformation of the agricultural Sector in Sub Saharan Africa (SSA), Kenya included (Joseph & Polytechn, 2017; Mukembo & Edwards, 2016). Benefits like high productivity, quality of produce, reduction of diseases and pests and subsequent increase in income among smallholder farmers can be attributed to access to quality extension service (Fu & Akter, 2012). Specifically, in livestock such benefits are gained through use of information like patterns in livestock prices, good livestock management practices, and marketing (Jayne, 2006).

Use of ICT-based extension services Kenya has been prioritized to address the challenge of low farm productivity and improve agricultural performance among smallholder farm households. One of the ICT tools applied in extension in Kenya is the iCow service. The iCow is a platform used in disseminating information among smallholder farmers and is offered by Green Dream Technology (GDT) in partnership with Safaricom Foundation and International Livestock Research Institute (ILRI) with the aim of improving extension services among smallholder farmers. However, the impact of iCow service among smallholders has not been documented. Therefore, this study was designed to evaluate impacts of the iCow services on milk production and household income among smallholder dairy farmers in Kenya.

Material and Methods

The study was implemented in Uasin Gishu, Nyandarua and Bomet counties of Kenya where iCow services have been in existence. The three counties were selected for the study because of the higher density of smallholder dairy farmers. The study used a two- stage stratified random sampling procedure to obtain respondents for the study in the three counties. In the first stage, three dairy cooperatives namely Sirikwa (Uasin Gishu), Olkalao (Nyandarua) and Siongiroi (Bomet) were purposively selected to form the sampling frame for users of iCow services. These are the counties that had been targeted by GDT for piloting and eventual rollout of the iCow services.

Since GDT targeted the entire membership of these cooperatives, it was not possible to find reasonable number of non-users of iCow services among members of the 3 dairy cooperatives. Moreover, any non-users may have been influenced in their livestock husbandry practices owing to their proximity to users. To reduce the challenge of spill overs, the study therefore also targeted three other dairy cooperatives within the same counties. These cooperatives had not participated in the iCow services and were identified approximately 15 kilometres from the dairy cooperatives that participated in the initial rollout of iCow services. These cooperatives were; Tarakwa, Miharati and Ndanai in Uasin Gishu, Nyandarua and Bomet respectively and their membership formed the sampling frame for non-users of ICow services. Further, the study used Propensity Score Matching (PSM) model to estimate the impact of iCow on milk production, household income

Results and Discussion

Descriptive analysis in Figure 1 shows that there are significant differences in the means between regular users of iCow and non-users with respect to milk production and household income. Users of iCow realized higher average annual milk production per cow (2359.32 litres) as compared to non-users (1964.01 litres). There are also significant differences in incomes earned by households with users of iCow services earning Ksh 50,625 and 132,031 more milk incomes and household income respectively than the non-users.

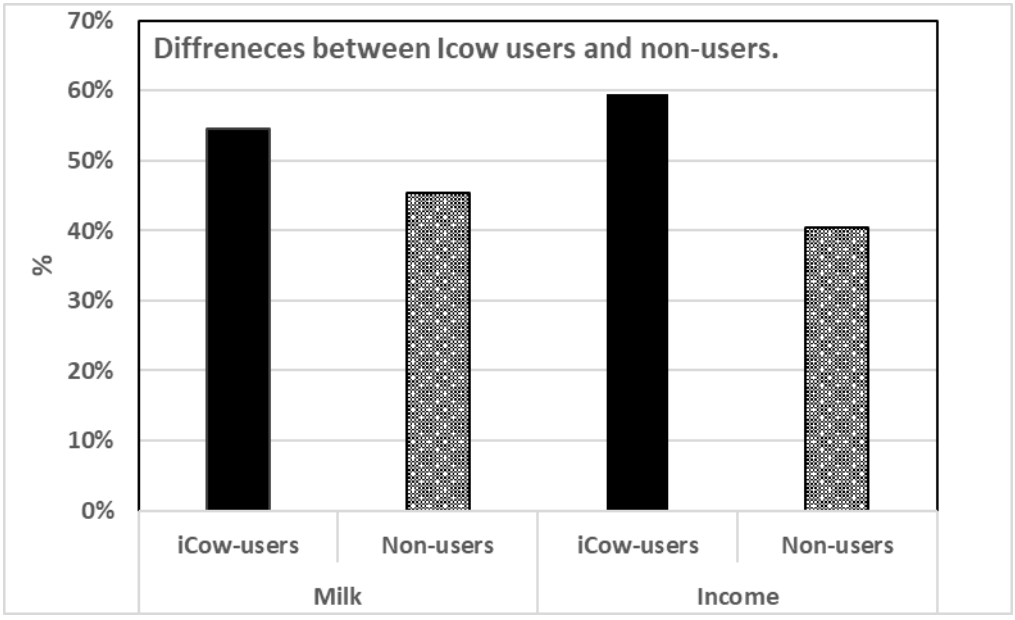

Figure 1: Differences between iCow users and non-users in terms of milk production per cow and household income

The results of PSM model in Table 1 indicates that use of iCow services among dairy farmers had a positive and significant effect on milk production and income. Specifically, the figures reveal that use of iCow services led to increased milk production per cow by 298 to 323 litres and earned Ksh. 62381 to 89,043 more annually. These figures can be considered as an opportunity cost of not using iCow service.

Table 1: Average Treatment effects on Milk production and income

	Matching algorithm	Treated	Control	ATT	Matched Observations	
Outcome Variable					**Treatment**	**Control**
Milk per cow (Litres)	Neighbour matching	2337	2039	298**	189	247
	Kernel matching	2337	2014	323***	189	247
Household income (Ksh)	Neighbour matching	398907	336526	62381*	189	247
	Kernel matching	398907	309863	89043**	189	247

Testing for sensitivity analysis

We also tested for sensitivity of our results to hidden bias using Rosenbaum bounds (Rosenbaum 1999; Hujer et al., 2004). Assuming two individuals have the same observed covariates *z* (as implied by the matching procedure), the two matched observations would differ in their odds of using the iCow services only by the difference in unobserved covariates, measured by the parameter Γ. The procedure involves changing the level of Γ and deriving the bounds on the significance levels of the ATT under the assumption of endogenous self-selection into use of iCow services. This allows for identification of the critical levels of Γ at which the estimated ATT would become insignificant. Results showed that the impact estimates were relatively insensitive to hidden bias in the outcome variables and concluded that our results were robust to unobserved heterogeneity among respondents.

Conclusions and Outlook

The positive impact shows the potential role of ICT-based extension in rural poverty reduction through increased household incomes. The positive correlation of use of phones in getting timely information among farmers suggest partnership between network providers and research institutes should be encouraged as part of bridging the extension gap occasioned by reduced public expenditure on extension services. The findings also highlight the need to scale up the iCow services, due to its proven capacity of enhancing smallholder farmers` access to simple, timely information and digital solution, subsequently improving their production, incomes.

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