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The effect of adopting an improved dairy cattle breed on the livelihood of smallholder farmers in the West Shewa zone, Ethiopia

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Abstract

The adoption of improved cattle breeds is one of the means to improve smallholders' dairy production and thereby increase the self-sufficiency of agricultural households (HH) in Ethiopia. Hence, this study aimed at assessing the effects of adopting crossbred Holstein Friesian dairy cattle on the livelihood of smallholder farmers, while investigating the challenges and opportunities of adopting this breed. The study was conducted in West Shewa Zone, Oromia regional state, Ethiopia. Multi-stage sampling techniques were employed to determine the sample households (n = 138). Primary data were collected using a structured questionnaire in randomly selected HH that either had adopted (n = 69) or not adopted (n = 69) the improved cattle breed. A semi-structured checklist was employed in two focus group discussions with randomly selected HH that either adopted (n = 8) or did not adopt (n = 12) the breed.

The results show that the average daily milk production (\pm standard deviation (SD)) was higher in adopters (28 ± 8 L/HH) than the non-adopters (7 ± 2 L/HH), ($P < 001$). The current results also found out that average milk consumption (\pm SD) was higher in adopters' household (HH) than non-adopters' HH which was estimated to be 656 ± 255 and 585 ± 202 , ($P < 001$) for adopters and non-adopters, respectively. Moreover, the estimated results show that average cattle sale income, average milk sale income and average cost per household per year were higher in the adopters' than the non-adopters' HH, respectively. Results also indicate that access to rural services (market information, veterinary service, extension advisory service, training on livestock husbandry and access to credit) were higher in adopters than non-adopter households. Besides, the study found out that adopters' use own saving during dry season whereas non-adopter households sale their cattle and borrow money. This indicates adopters generate more income from crossbred dairy cattle adoption

which would assist the households to develop more capacity in time of crop failure. Therefore, introducing crossbred Holstein Friesian dairy cattle to the smallholder farmers may improve farmers' livelihoods and thereby assure food security of smallholder households in the study area.

Key words: Smallholder, Ethiopia, Improved cattle

Introduction

The livestock sector in Ethiopia contributes about 10% to the GDP of the nation and above 30% the agriculture sector labor employment (Asresie, 2015). The sector plays an integral part in the agriculture of the country, it serves the economy as sources of fertilizer (manure), industrial inputs (as raw material), investment sector, sources of income and food for the smallholder farmers, contributes to food security assurance, foreign exchange earnings through trade (Asresie, 2015). As Wubeneh and Ehui (2006) explained, despite the size of the livestock population the country owns, and favorable condition for dairy sector, per capita production and consumption of milk is very low in the country. Due to this, hybridization and scaling up of dairy cattle breed have been expanded in the country particularly in West Shewa zone. Therefore, the study emphasis on to assess the effects of adopting crossbred dairy cattle on the livelihoods of smallholder farmers' in the study area.

Material and methods

Multi stage sampling techniques were employed to collect the survey data (n = 138) with an equal numbers of adopters (n = 69) and non-adopters (n = 69). Semi-structure questionnaire was employed to gather information on the individual household's characteristics and focus group discussions were conducted to identify the constraints and opportunities of adopters and non-adopters in the study area. Both descriptive and econometrics models were used to analyze the data. Descriptive study was employed to determine the difference across adopter and non-adopter households in their socio economic, rural service access and coping strategies in time of shock. A Probit model was used to identify the determinant factors of crossbred dairy cattle adoption; propensity score matching (PSM) was applied to analyze the effects of crossbred dairy cattle adoption on the adopters' households in the study area.

Result and discussion

Smallholder farming households in Ethiopian highland where mixed crop livestock farming system is the dominant practice is characterized by their typical rearing of Zebu breed with low milk productivity and the products retain for home consumption. In contrary, some farm households rear crossbred cows to increase milk production for both household consumption and surplus to the market (Ahmed *et al.*, 2004). The recent study conducted by Haile (2016) revealed that milk production per cow per day for local breed and crossbred in the West Shewa Zone was 1.5 and 12 liters, respectively. In line with this, the current study found out that the average milk yield of adopters was 28 L/d per household whereas non-adopter

households produced substantially less milk (i.e. 7 L/d), ($P < 0.01$). The research estimates also that the mean income from milk sale was higher in adopters than non-adopters ($P < 0.01$). Similarly, Tegegne et al. (2016) found out that the average income generated from cattle sale was higher in adopter households than non-adopter households ($P < 0.05$). Likewise, the current finding draws a conclusion that adopter households had earned more income in livestock selling than non-adopter households ($P < 0.05$). Similarly, the study found that the per capita income derived from dairy production found to be higher in adopter than non-adopter households which was estimated to be 33,000 and 11,000 ETB, respectively and there was a difference in per capita income across the groups ($P < 0.01$). However, the cost of production per year for crossbred dairy cattle was higher than the local breeds. The study shows that there was a considerable difference in cost of production across the two breed types ($P < 0.01$). In this regard, Ahmed *et al.*, (2004) reported that the households' expenditure on farm inputs was higher in adopters than non-adopters ($P < 0.01$). The research result of Tobergte and Curtis (2013) reported that the average milk consumption on smallholder farmers in Sululta was 1.43 L/d per household which was comparatively similar with the milk consumption of the study area estimated to be 1.69 L/d per household.

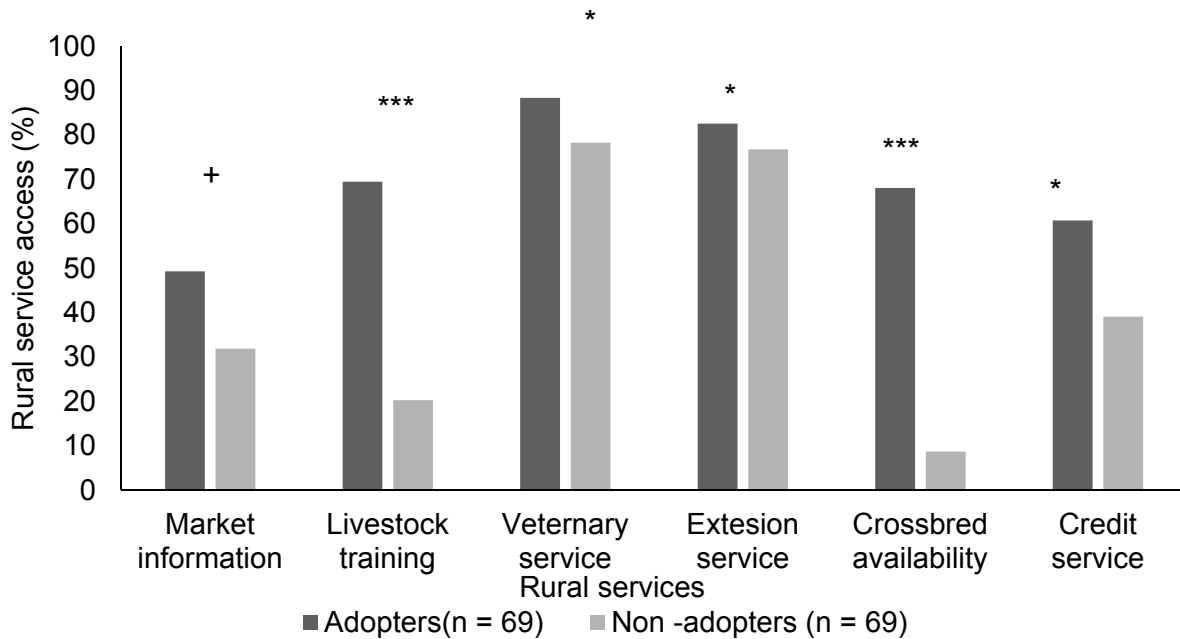
Table 1. Socio-economic characteristics of smallholder households with a comparison of mean difference across adopters and non-adopters in West Shewa Zone Ethiopia.

Variable	Adopter Mean (\pm SD)	Non-adopter Mean (\pm SD)	P value
Household milk production per day (L)	28 (\pm 8)	7 (\pm 2)	$P < 0.01$
Cattle sale income '000 per year (ETB)	14 (\pm 6)	12 (\pm 6)	$P < 0.05$
Milk sale income'000 per year (ETB)	114 (\pm 14)	35 (\pm 11)	$P < 0.01$
Cost of dairy cattle'000 per year (ETB)	28 (\pm 12)	6 (\pm 3)	$P < 0.01$
per capita income'000 per year (ETB)	33 (\pm 20)	11 (\pm 7)	$P < 0.01$
Household Milk consumption per year (L)	656 (\pm 255)	585 (\pm 202)	$P < 0.01$

SD: standard deviation ETB: Ethiopian birr (currency) (000): thousand L: liter

Smallholder households' access to rural services in West Shewa Zone Ethiopia

Adopters and non-adopters had different access to rural services in West Shewa zone, Ethiopia as indicated in Fig.1. The result shows that in all services (market information access, livestock husbandry training, veterinary service, extension service, easy access to crossbred dairy cattle, credit service) in the study area adopters had more access to these services than non-adopter households. This may facilitate adopters' household to implement the use of crossbred dairy cattle more than non-adopter households. The research result found out that market information access was higher in adopters' than non-adopters' ($P < 0.1$) whereas veterinary service, extension service, and credit service differed ($P < 0.05$) and training on the livestock husbandry and crossbred dairy cattle service were varied ($P < 0.01$).

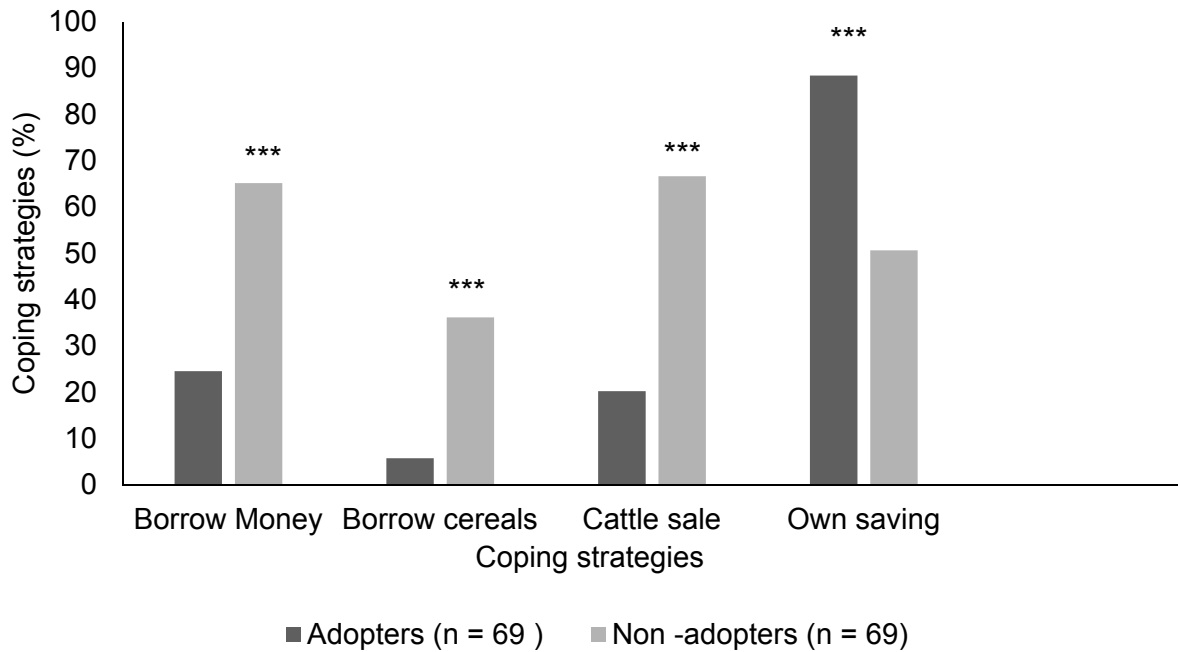


+, *, *** significant at $P < 0.1$, $p < 0.05$ and $p < 0.01$ levels, respectively.

Fig.2. Smallholder households' access to rural services with a comparative study of adopters and non-adopters in West Shewa Zone, Ethiopia

Household coping strategies during dry season in West Shewa Zone Ethiopia

The major household coping strategies in time of shock in West Shewa Zone were borrow money, borrow cereals, cattle sale and own saving. The estimated result indicates that in all coping strategies in the study area there was a difference across adopter and non-adopter households ($P < 0.01$). Fig 3. Shows adopters household mainly depends on own saving whereas non-adopters livelihoods were based on borrowing money and cattle sale. The result shows that households' means of survival during drought and/or the occurrence of irregularity of rainfall in the study area were diverse and different among the adopter and non-adopter households. This indicates non-adopters' households lose their permanent assets during the dry season which resulted in the households tends to permanent poverty trap.



*** Significant at $p < 0.01$

Fig.4. Smallholder households' means of livelihood during dry season with a comparative study of adopters and non-adopters farmers in West Shewa Zone Ethiopia.

Conclusion

Adoption increase milk production, consumption and households' income from milk and cattle sale. In view of this, adopter households acquire more income out of the surplus product sold to the market. Therefore, adopters develop capacity to afford for their livelihoods than non-adopter smallholder farmers. Hence, adopter households can stand with shock without selling permanent household assets (livestock) in the occurrence of dry season.

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