Feature Article

Smallholder dairy farming contributes to household resilience, food, and nutrition security besides income in rural households

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Implications

- Smallholder dairying contributes more than income to rural livelihoods.
- Although total land ownership is similar between dairy and nondairy farmers, land allocation to food crop, cash crop, and other uses is different. Dairy farmers allocate more land for food crop and pasture production while nondairy farmers allocate land to additional cash crops.
- Dairy farmers have far higher food crop yields and annual incomes, more diversified sources of income, and are more resilient to food insecurity than nondairy farmers.
- Dairy farmers own high number of live assets and hence seem to be better placed to improve their socioeconomic status than nondairy farmers.

Keywords: assets, dairy cattle, food, income, resilience, smallholder farmer

Introduction

Smallholder dairy production is important in supporting rural livelihoods. Dairying generates income and contributes to food and nutrition security (Chand et al., 2015). The Malawi Government through the Department of Animal Health and Livestock Development recognizes smallholder dairying as one of the key enterprises to support rural development and implements various programs supporting dairy production. Nongovernmental organizations (NGOs) and other development partners consider smallholder dairying as a tool to enhance livelihood of rural poor households and as a tool in climate change adaptation and resilience (Chagunda et al., 2016). Bryan et al. (2013) reported that there are various benefits that can be derived from dairy production if appropriate and holistic strategies are put in place. Improving household food and nutrition security is linked to increased access to and control of income and women participation in decision-making of household expenditure at household level (FAO, 2011). Enterprises such as dairy production, which provide a regular source of income, provide the ability to increase diversity of food and household need purchases. In comparison to crop enterprises, contribution of dairy farming to household income manifests in various ways. A household can get income from milk sales, animal sales, manure sales, and use of manure as fertilizer. Dairy farmers use the income from milk to purchase other food items such as rice, meat, maize, fish, vegetables, cooking oil, beans, sugar, and salt (Kalumikiza, 2012), nonfood items as well as pay for hospital bills, school fees, and other services. As a component of Capacity Building for Management of Climate Change program, a case study was undertaken in Mayani and Linthipe Extension Planning Areas (EPAs) in Dedza District to determine the contribution of dairying to smallholder household incomes, food availability, and assets in comparison with nondairy farmers.

Data collected in 2014 and 2018 were used in the analyses. A semistructured questionnaire was administered to 273 sampled households of which 46% were dairy farmers and 54% nondairy farmers in 2014 while 199 households (dairy [52%] and nondairy [48%]) were involved in 2018. Selection of farmers utilized a stratified random sampling procedure. Five villages with farmers keeping dairy cattle were systematically selected and thereafter households of dairy and nondairy farmers were randomly sampled. Data collected included household demography, land ownership, land use, income, and household food availability. These were assessed and compared between dairy and nondairy farming households. Descriptive statistics, crosstabs, and *t*-tests were used to analyze the data.

Demographic characteristics of farmers

Smallholder dairy farmers are generally few in Linthipe EPA, making less than 1% of the population. The high cost of

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investment associated with dairy production restricts resource-poor households to participate in dairy farming. Most dairy farmers use support from NGOs or the Government to access dairy animals on loans which they repay by either passing on a heifer offspring to the next beneficiary or cash in agreed installments and period. The demographic characteristics in terms of household size, marital status, gender, and educational level of the household heads were generally similar for both dairy and nondairy farmers in 2014 and 2018. The average household size was around five while marital status was dominated by monogamous marriages (75%) with a few polygamous marriages and individuals that were widowed, divorced, or single. Most household heads were male (about 80%), and about 67% of them had attended primary education while about 18% had attained secondary education. Only a few of the household heads had attained tertiary education (1.5%) and rest did not have any formal education. These characteristics are in line with those reported in National Statistical Office (2017) for Malawi in general. This shows that dairy farmers are not substantially different in terms of their demographic characteristics except that they have an interest in dairy and have access to capital needed.

The age of the participating dairy and nondairy farmers in this study was numerically different. The dairy farmers were relatively older (50 ± 12 yr) compared to nondairy farmers (44 ± 13 yr) in 2014 while in 2018 the ages were 51 ± 15 and 47 ± 16 yr, respectively. There were few young farmers involved in dairy and this could be due to lack of start-up capital and the high labor demand associated with the cut and carry dairy feeding systems that are used. Quddus (2012) and Dehinenet et al. (2014) reported that adoption of dairy farming is negatively correlated to age of head of household in Bangladesh and Ethiopia. However, the farmers in the area of focus in Malawi have been in dairy farming for 8 yr on average which shows that the farmers started dairy farming at relatively younger age. This may indicate that dairy farming has relatively few new entrants potentially due to high capital requirements. This could be an indication of the need for deliberate mechanisms to stimulate more entrants into dairy farming and hence avert dwindling of number of farmers in dairy farming over time. For instance, tailor-made training for older dairy farmers to improve technical efficiency since technical efficiency of dairy farmers reduces with age where farmers below 40 tend to be better than those above 40 yr (Masunda and Chiweshe, 2015). Such strategies can build on existing pass-on scheme programs widely implemented by NGOs and political will which have proven to substantially contribute to dramatic increase in number of dairy farmers and animals in developing countries.

Type of dwelling units

Dwelling units were generally made of a variety of construction materials that reflect the socioeconomic status of farmers in both 2014 and 2018. Most farmers had dwelling houses with walls made from burnt bricks (58%), earthen floors (69%), and roofs made of iron sheets (55%). Dwelling houses were different between dairy and nondairy farmers. The walls of the dwelling houses were more likely to be made of mud and poles in the homes of nondairy farmers than dairy farmers. Also, a high percentage of nondairy farmers had houses with earthen floors (76%) and grass-thatched roofs (28%) than dairy farmers (60% and 10%, respectively). On the other hand, significantly more dairy farmers had dwelling houses with cement floors and iron sheet roofs than nondairy farmers. Use of burnt bricks, cement floors, and iron sheet roofs are associated with improved socioeconomic status. This suggests that dairy farmers have greater access to more valuable building materials compared to nondairy farmers. This could be attributed to ability to generate income and access to loans and other services available to dairy farmers that enable them to improve their dwelling houses. Dairy farmers are organized into milk bulking groups (MBGs) where they have a milk collection and cooling center where milk buyers collect milk from. The MBGs leadership is well trained and manages milk sales and access to various services offered by milk buyers (processors) and other stakeholders. Among other things milk buyers offer farmers loans to buy farm inputs and deduct the loan repayment from the payments for the milk sold to them. Such arrangements give dairy farmers access to greater resources than nondairy farmers.

Land ownership and allocation to crops

Total land owned and agricultural land sizes were generally similar between dairy farmers and nondairy farmers, at around 1.7 and 0.5 ha in 2014, respectively. In 2018 dairy farmers owned significantly more total land and agricultural land (1.23 ± 0.94 and 1.06 ± 0.88 ha) than nondairy farmers (0.70 ± 0.59 and 0.64 ± 0.49 ha), respectively. The bigger size of agricultural land for dairy farmers could be attributed to availability of more income or resources that enabled access to more land. The land was either an upland or wetland (*dimba*) and was generally used for crop and pasture production. Dairy farmers tended to allocate more land to maize (0.8 ha) and pasture (0.1 ha) than nondairy farmers (0.6 and 0.03 ha), respectively. Maize is the staple food and more land allocation to maize may reflect ability to purchase inputs which most nondairy farmers cannot afford. Inorganic fertilizer is the key input in maize production. Dairy farmers tend to combine use of both organic manures from their farms and inorganic fertilizers. This seems to work well for dairy farmers and enables to increase land size and productivity. Other farmers have developed formulae of combining organic manure and inorganic fertilizer to produce enough fertilizers to apply in maize production. This combination of organic and inorganic fertilizers works well as part of integrated soil fertility management and mitigation of climate change challenges. It not only improves soil fertility but also soil texture and water holding capacity and hence raises the potential for high productivity.

Nondairy farmers also allocated wetlands to cash crop farming while dairy farmers used wetlands more for pasture production. Wetlands enable farmers to produce crops or pastures even after the rainy season. This implies that nondairy farmers supplement their incomes with cash crops. However,

this is at a very small scale and may not support the farmers throughout the year.

Crops grown

Farmers normally grow more than one crop and regardless, maize was the major staple crop grown by 99% of households followed by Irish potatoes at about 24% in 2014 while in 2018 the same crops were grown by 97% and 31%, respectively. In general, farmers produced a variety of crops grown in both rain fed and irrigated systems. The major cash crops were beans, groundnuts and soya beans which were grown by 78%, 56% and 49% of the respondents in 2014, respectively. The same cash crops dominated in 2018 with relatively lower proportions of respondents involved at 53%, 26% and 27%, respectively. The notable variation in proportions of farmers growing cash crops was probably due to variations in the demand for the cash crops. Decisions to produce cash crops are usually driven by demand and pricing of the cash crops. Interestingly, it was also observed that some nondairy farmers were involved in pasture production which could be used by other livestock but also as a means for income generation if the pastures were sold to dairy farmers. Production of pastures by nondairy farmers can also be a means to increase pasture availability where land size is a constraint for dairy farmers and hence a business opportunity for the nondairy farmers.

Livestock ownership

Most farmers (83.3%) that were interviewed owned at least one species of livestock. Tropical livestock units (TLUs), defined as one local mature cattle equating to 1 TLU, per household was about 3.5 ± 2.94 for dairy farmers and 1.3 ± 1.87 for nondairy farmers (Table 1) in 2014 while it was 3.40 ± 2.61 and 1.59 ± 2.27 in 2018.

The high standard deviations show that there is a wide variation in livestock ownership which depicts inequitable distribution of livestock. Cattle, goats, pigs, chickens, and ducks were the most widely kept species. As expected, dairy farmers had, on average, significantly higher overall TLUs (3.5 and 3.4) than nondairy farmers (1.3 and 1.6) in both years. This means dairy farmers own an equivalent of 3–4 cattle as opposed to 1–2 by nondairy farmers. This gives an indication that dairy farmers own higher numbers of live assets when compared to nondairy farmers.

Dairy cattle accounted for an average of about 57% of the TLUs of the livestock owned by dairy farmers. This shows that dairy and nondairy farmers generally owned similar numbers of the other livestock. Although only a few nondairy farmers (about 5%) owned local cattle, the average TLUs from local cattle was similar between dairy and nondairy farmers meaning that the average local cattle herd sizes were similar between dairy and nondairy farmers. This implies that dairy cattle ownership is over and above the routine enterprises that smallholder farmers produce. Dairy farmers are therefore much more diversified in terms of livestock species kept and crops grown such that they are likely to be much more resilient to shocks that negatively affect livelihoods in rural areas. Figure 1 shows dairy cattle in a typical smallholder farm in Malawi.

Table 1. Livestock ownership and herd sizes by dairy and nondairy farmers in Mayani and Linthipe EPAs in 2014 (n = 273)

				Herd size	
Species	Farmer status	*N*	% Keeping	Mean	SD
Cattle	Dairy farmer	229	99.60	3.06	3.11
	Nondairy farmer	17	7.00	3.71	2.37
Goats	Dairy farmer	146	63.50	4.45	2.88
	Nondairy farmer	108	44.60	3.87	2.63
Sheep	Dairy farmer	3	1.30	3.33	2.52
	Nondairy farmer	6	2.50	2.33	1.97
Pigs	Dairy farmer	81	35.20	4.56	3.72
	Nondairy farmer	67	27.70	3.48	3.15
Chickens	Dairy farmer	177	77.00	13.53	11.79
	Nondairy farmer	127	52.50	10.18	9.08
Ducks	Dairy farmer	11	4.80	6.09	4.09
	Nondairy farmer	7	2.90	8.14	8.28
Rabbits	Dairy farmer	8	3.50	4.50	2.88
	Nondairy farmer	2	0.80	4.00	2.83
Guinea fowls	Dairy farmer	8	3.50	2.88	1.96
	Nondairy farmer	9	3.70	6.00	4.82
Pigeons	Dairy farmer	13	5.70	10.23	8.12
	Nondairy farmer	11	4.50	53.09	96.61
Total TLUs*	Dairy farmer	229	99.60	3.51	2.94
	Nondairy farmer	188	77.70	1.28	1.87

*TLUs = tropical livestock units defined as one local mature cattle equating to 1 TLU.

Food availability

Food availability in households was variable with differences between dairy and nondairy farmers. In 2014, overall, about 62% households reported that they did not face food shortage throughout the year. From these, 35% were dairy farmers and 27% nondairy farmers. Within groups, 75% of dairy farmers indicated that they did not face food shortage as opposed to 51% of nondairy farmers. Further, by November 2014, about 85% of dairy farmers indicated that they still had staple food reserves available in the household vs. 73% of nondairy farmers. Crop harvest in Malawi is generally in April and in 2014 some nondairy farmers indicated that they had run out of staple food reserves as early as July 2014 while dairy farmers indicated staple food reserves starting to run out in October 2014. A similar trend was observed in 2018 where 58% of the respondents indicated that they never ran out of staple food and 38% of these were dairy farmers which accounted for 72% of all dairy farmers. This suggests that dairy farmers mostly have prolonged food availability compared to nondairy farmers. This is likely due to increased crop outputs from gardens of dairy farmers compared to nondairy farmers. The availability of cash from milk sales also enables dairy farmers to purchase staple food thereby increasing their resilience to challenges that

Figure 1. Dairy cattle in smallholder farms in Malawi.

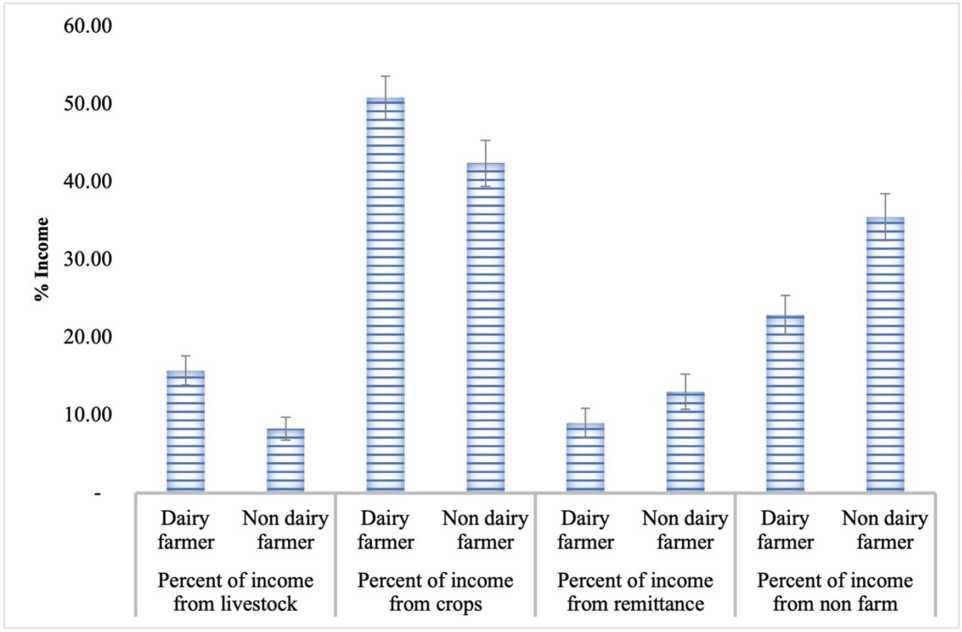

Figure 2. Contribution of household income from different sources among dairy and nondairy farmers in Linthipe and Mayani EPAs in Malawi in 2014 and 2018 (n = 273,472; error bars show standard error of the mean).

might result from natural shocks including those related to climate change and variability.

Household income

Household income was variable and significantly ($P < 0.05$) higher among dairy (MK302,638.89) than nondairy farmers (MK123,951.45), 1 USD = MK720.00. The overall proportion of the income was dominated by crops (maize, groundnuts, and a few from tobacco) and nonfarm sources such as businesses, daily paid labor, and sales of natural resources (Figure 2).

Apart from remittances, significant differences ($P < 0.05$) were noted on other sources of incomes between dairy and nondairy farmers. Dairy farmers had higher overall household income and income from livestock and crops than nondairy farmers. This may imply that dairy farmers were more dependent on farming as their business than nondairy farmers. The higher interest in business could be facilitated by better access to inputs and markets compared to nondairy farmers. Better access to inputs and other services is often facilitated by dairy processors (milk buyers) who offer dairy farmers loans to access both crop and livestock inputs. Dairy farmers had a higher degree of mixed or integrated farming systems meaning that they capitalized on biological synergies that exist in integrated farm systems such as nutrient recycling where by-products from one system are inputs in another

system. For instance, use of animal manure as organic fertilizers and use of crop residues as feed.

Nondairy farmers had higher percentage of income from nonfarm sources including remittances than dairy farmers (Figure 2). Usually such means of income are likely nondesirable coping mechanisms to inadequate crop yields (Mavhura et al., 2015).

Household assets

Grouping assets according to Njuki et al. (2011) showed that farmers have transport, domestic, farm, and livestock assets. Overall dairy farmers had more assets in each of the categories than nondairy farmers. Dairy farmers also had a higher diversity of assets compared to nondairy farmers with an overall average value of MK231,751 vs. MK86,427 (exchange rate: 1 USD = MK762) per household, respectively. This is an important aspect as Ellis (2000) reported that diversification among poor communities has a positive attribute on livelihoods security. The asset ownership further confirms that dairy farmers are better placed to be more resilient to diverse shocks such as weather, economic and social factors, and political unrest than nondairy farmers.

The results on food availability, household income, and asset ownership generally show that dairy cattle play an important role in the socioeconomic status of rural households. Chagunda et al. (2016), using examples from Kenya, Malawi, Mozambique, Tanzania, and Zambia, similarly demonstrated that dairy farming is an important agricultural enterprise that supports food and nutrition security as well as household income for poor households. Smallholder dairy enterprises do not only serve individual households but also supply the bulk of the milk in the dairy value chain in developing countries and a considerable contribution to national gross domestic product (Chagunda et al., 2016; Odero-Waitituh, 2017). Kabunga et al. (2017) associated less child stunting and improved income with dairy ownership in Uganda while Yasmin and Ikemoto (2015) associated dairy farming with substantial reduction in poverty among women in Bangladesh. Similar contributions from dairy are reported in other developing countries (Olwande et al., 2015; Chagwiza et al., 2016; Kebebe, 2017). Generally, the findings of our study confirm previous reports on the importance of smallholder dairy farming and provide more evidence in terms of specific benefits from the enterprise.

Conclusion

Findings show that dairy farmers were relatively better in terms of food security, household income, and assets. There is strong signal that dairy farmers are more resilient to food shortage with high likelihood of improvement of their socioeconomic status as reflected by having less dependence on nonfarm income, having better dwelling houses, and owning more assets, among other factors. Smallholder dairy farming is not only a source of household income, but also a major contributing factor to household resilience, food, and nutrition security. It is therefore important that dairy development programs should consider the important role that dairy farming plays in livelihoods of smallholder farmers and hence support to the dairy sector to be done with a much wider lens than is currently the case.

About the Authors

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