

Household Characteristics and Livelihood Strategies for Beef Enterprise Development in Eastern Province of Rwanda

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Abstract: Consumption of animal products except beef has been increasing consistently in Rwanda. The potential to ignite beef sector development and improve food security and support poverty reduction exist in the Ankole cattle that the poor commonly own. The Eastern province that is the major cattle producing zone is prone area to drought and uncertainties of weather due to climate change. The current status of beef value chain performance, the key actors involved, the physical, institutional, economic and social assets available to the actors, the perceptions, incidences and impact of incidences of climate change are not know. A baseline survey was conducted in two candidate sites selected, the Kirehe and Nyagatare Districts on the basis of perceived risks to climate change using a structured questionnaire in 256 households. Preliminary results indicate the key actors in the beef value chain were similar in household structure, level of education, resource endowment, livelihood strategies and duration of settlement in the area. They kept indigenous cattle predominantly for sale for meat, milk for home consumption and manure for soil fertility management. Grasslands and rivers were the major sources of feeds and water, respectively. Grazing was not adequate for most farmers but they did not use supplement because the materials were not available and costly. They also lacked knowledge on supplementary feeding. Most of the farmers sold animal at or below 1 year of age. But the number of fatteners, butchers were lower than number of producers, suggesting that the animals were sold to distant market. It was concluded that preliminary data analysis justifies beef enterprise development in these sites and a detailed data analysis and market chain analysis is also required.

Key words: Climate change, beef value chain, feed resources, butcher, grazing

INTRODUCTION

The key mutually reinforcing challenges to agriculture development and food security in Rwanda include land and population pressure, plant and animal nutrition in the context of soil fertility and feed resources, water for production in the context of climate change, policies and market access. Government has developed a number of strategies under the Vision 2020 to manage these challenges through a strategic and systematic orientation of agriculture to markets and streamlining the sector into the overall monetary economy. Significant achievements have been improving the performance of the agriculture sector. Therefore agriculture statistics indicate that the consumption of livestock products has been increasing consistently over the last decade (MINAGRI, 2012). The Ankole cattle are the most populous and suitable breed that the poor households in Rwanda or beef production own. Anecdotal pieces of evidence suggest that the private sector interests in beef production are tickling government to investment in infrastructure development in the beef value chain.

Eastern province of Rwanda is the major cattle-producing zone of the country and hence and intervention point for beef enterprise development.

The national adaptation program of action for climate change recognizes the Eastern province as a risk prone area to drought with major impacts of pasture and water for livestock production (MINIRENA, 2006). A baseline survey was conducted in the Kirehe and Nyagatare Districts for beef enterprise development. The main objective of the survey was to assess opportunities and constraints for market oriented beef enterprise development for food security and poverty reduction in the region. Specific objectives were to understand the people their environment and livelihood strategies for coping with climate change for economically viable and socially acceptable value change development.

MATERIALS AND METHODS

The study was conducted in two candidate districts, the Nyagatare and Kirehe. These were identified for beef enterprise development in Eastern province of Rwanda

based on the anticipated level of susceptibility to climate change. The survey tools were structured questionnaires which were administered to households to capture detailed information on household characteristic in terms of gender disaggregated information on leadership, age, education and kinship among household members and their participation in livestock management, household assets in terms of land, labour, water resources and livestock species, institutional capital in terms of inputs and extension services delivery, objectives in cattle production and perceptions and coping mechanism to climate change. A stratified sampling framework was adopted to conduct the survey. The sampling frame of 256 households was randomly selected from 2 districts in the province, 3 sectors (government administration under district) per district, 2 cells (government administration under sector) per sector, 3 villages (Umudugudu-lowest government administration under cell) per cell and 5 households per Umugugudu. Data was analysed using descriptive statistic tools and Chi-square (χ^2) Methods of test of differences among categories.

RESULTS AND DISCUSSION

Household composition: In both districts, the enumerators encountered respondents who were predominantly (>96%) male heads of households followed by spouses (Table 1). Fisher’s exact test confirmed that in the household head category, male respondents were significantly more than the female counterparts ($p = 0.0278$). Proportionately more female spouses were respondents in Nyagatare than in Kirehe ($p = 0.0004$) corresponding to less male than females in Nyagatare and

Kirehe ($p = 0.0218$). The disproportionate participation male members of households reflect the traditional hierarchy of authority in Rwandan households despite aggressive affirmative action in favour of women in national governance and public service participation.

Household participation in the beef value chain: The majority of the households were primary producers of cattle for meat, milk and manure production. Overall the men dominated the enterprise by 73.8% against 26.2% women. Producers were more than fatteners, traders, butchers combined (Table 2). Proportionately more women in Nyagatare were involved in the beef value chain as producer, fatteners, traders and butchers than in Kirehe. The reason for this difference in women participation in the beef value chain was not clear.

Gender disaggregated age structure of households: At mean age of 43.5 and 44.1 years male and female did not differ significantly from each other ($p>0.05$). Minimum and maximum age of male members of household was 8 and 87 years, respectively. The corresponding range in female members was 2 and 76 years, respectively suggesting that females tended to be younger than their male counterparts (Fig. 1a). The slightly higher mean age for females can be partly explained low representation of females in the database (25.7%) most of whom were clustered between 25 and 75 years of age (Fig. 1a). This inference is reinforced by the Kolmogorov-Smirnov Two-Sample (asymptotic) test which showed that below 40 years of age men were proportionately more represented than women. Thereafter, the women were proportionately better represented than men (Fig. 1b).

Table 1: Gender disaggregated household structure in the Nyagatare and Kirehe Districts for beef enterprise development in the Eastern province of Rwanda

Categories	Kirehe				Nyagatare				Two-sided probability
	N	Male (%)	Female (%)	Sample size (%)	N	Male (%)	Female (%)	Sample size (%)	
Household heads	90	88	12	38	109	76	24	62	$p = 0.0278$
Spouse	1	100	-	50	1	100	-	50	NA
Children	0	-	-	-	2	100	-	100	NA
Grand children	1	100	-	33	2	67	-	67	NA
Grand parents	1	100	-	100	-	-	-	-	NA

NA = Not Applicable

Table 2: Gender disaggregated level of household participation in the beef value chain in the Nyagatare and Kirehe Districts of Eastern province of Rwanda

Categories	Kirehe			Nyagatare			Overall	
	N	Male (%)	Female (%)	N	Male (%)	Female (%)	Male (%)	Female (%)
Producer	119	84.03	15.97	239	66.80	27.67	75.14	24.86
Fatteners	0	0.00	0.00	2	50.00	50.00	50.00	50.00
Traders	0	0.00	0.00	7	71.43	28.57	71.43	28.57
Butchers	0	0.00	0.00	4	50.00	50.00	50.00	50.00
Producer+fatteners	1	100.00	0.00	1	100.00	0.00	100.00	0.00
Producers+traders	5	0.00	100.00	0	0.00	0.00	0.00	100.00
Producers+butchers	0	0.00	0.00	0	0.00	0.00	0.00	0.00

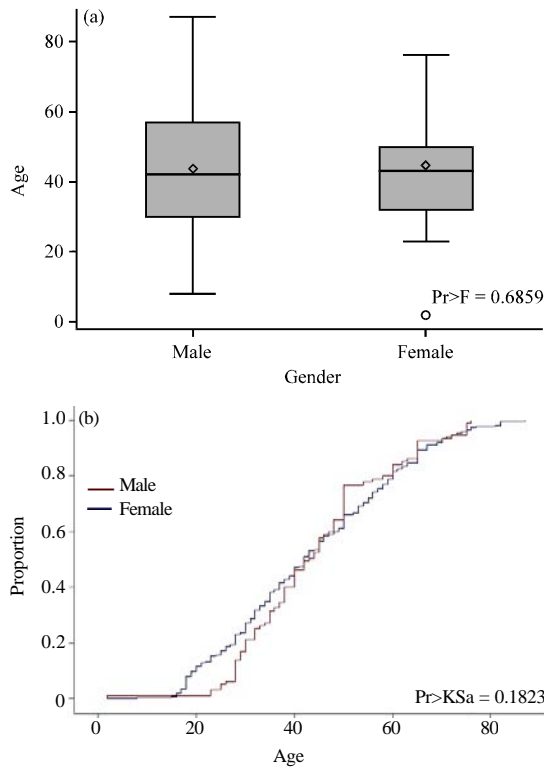


Fig. 1: a) Mean age of male and female and b) the empirical age distribution of male and female members of households members by age categories the two districts; for beef enterprise development in the Eastern province of Rwanda

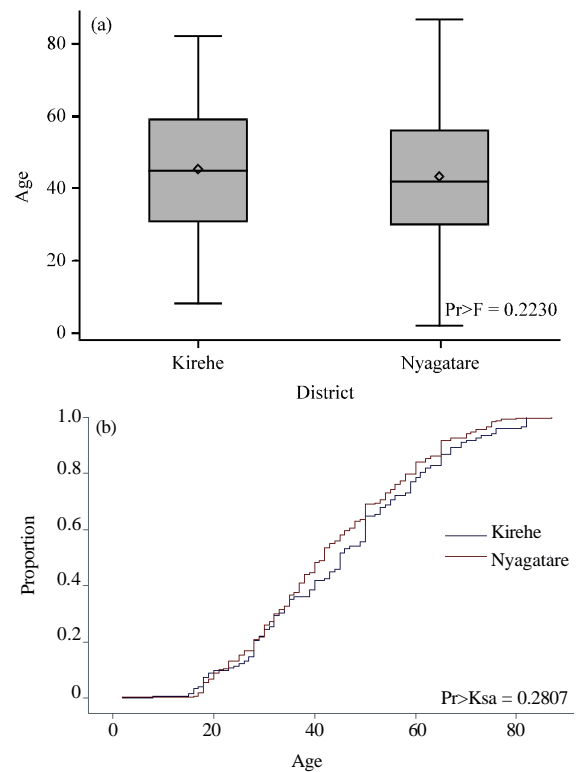


Fig. 2: a) Mean age and b) Kolmogorov-Smirnov empirical distribution across age groups; in the two sites for beef enterprise development in Eastern province of Rwanda

Age distribution by location: With age of 45.4 and 43.1 years Kirehe and Nyagatare, respectively the age distribution did not differ significantly between the two sites (Fig. 2a). There was a consistent tendency for people at Kirehe to be proportionately under represented than in Nyagatare across all age groups (Fig. 2b). This partly explains the slightly higher average age in Kirehe than in Nyagatare District.

Duration of stay (residence time) in the two sites: A large proportion of the pilot sites were reclaimed from Akagera National Park to accommodate returnees from diaspora national park after the genocide of Tutsi in 1994. Hence on average, the residents lived in the area of 11 years (Fig. 3a). This duration of residence did not differ significantly between gender categories and locations. However, the pattern of residence time strongly suggests that Kirehe was settle earlier than Nyagatare and men settled in both areas remembered the period of settlement more than women (Fig. 3b).

Age distribution by livelihood strategy in the beef value chain: The oldest (47 years) age group among the actors in the beef value chain were primary producers-cum-fatteners who constituted approximately 1% of the key actors (Fig. 4). The second oldest were primary producers (44.8 years) who constituted 95% of the actors in the beef value chain followed by fatteners (42.5 years), butcher (30.5 years), producer-cum-traders (28 years) and trader (28.7 years). Despite skewed distribution towards producers NPAR1WAY analysis of variance showed significant different among actors ($p = 0.0163$).

Residence time of the actors in the beef value chain: The average residence time of the actors in areas was 11-12 years (Fig. 5a). The difference among actors was not significant ($p>0.9252$). However, the pattern of residence time there was a continuous inflow of primary producers. Others were old timers who have been in the business for the last 20 to >40 years (Fig. 5b).

Education: The survey revealed that approximately 80% of the household members in Kirehe and 83% in

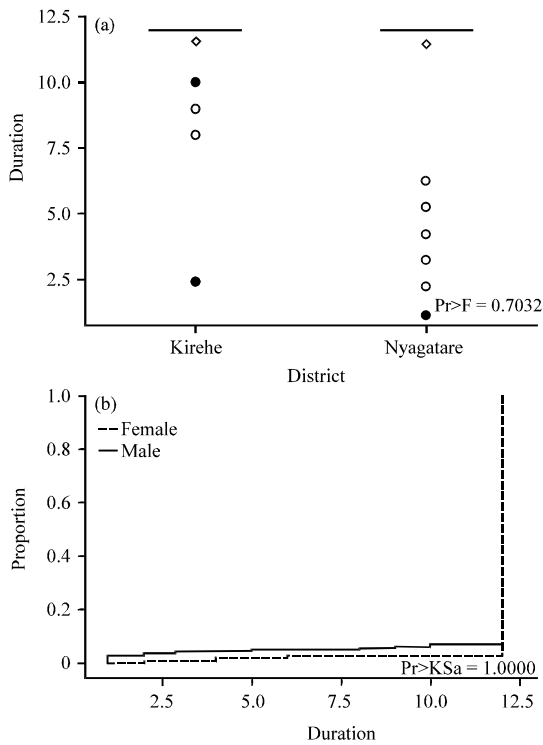


Fig. 3: a) Duration of residence and b) and gender disaggregated on period remembrance; in the two sites for beef enterprise development in Eastern province of Rwanda

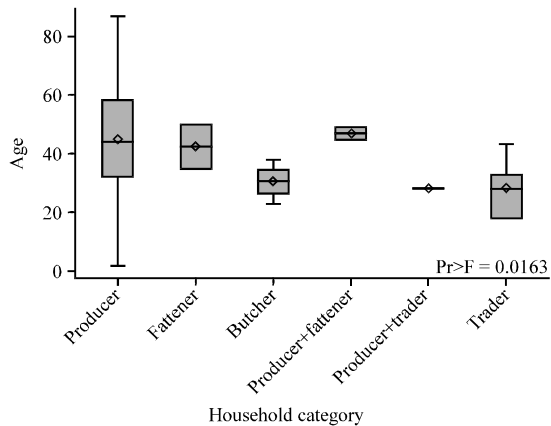


Fig. 4: Average age groups of key actors in the beef value chain in two pilot sites in Eastern province of Rwanda

Nyagatare attend formal education. But the majority of these (~51% in Kirehe and ~53% in Nyagatare) did not exceed primary seven (Fig. 6).

Primary school dropouts at both sites tended to increase exponentially at approximately at 44 and 25% in Kirehe and Nyagatare Districts, respectively (Fig. 7). The

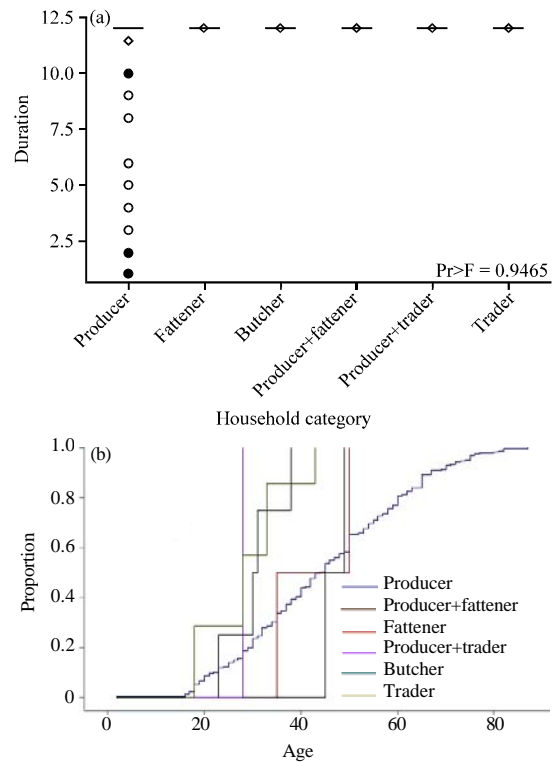


Fig. 5: a) Average residence time and b) and age distribution of key actors; in the beef value chain in the two pilot sites in the Eastern province of Rwanda

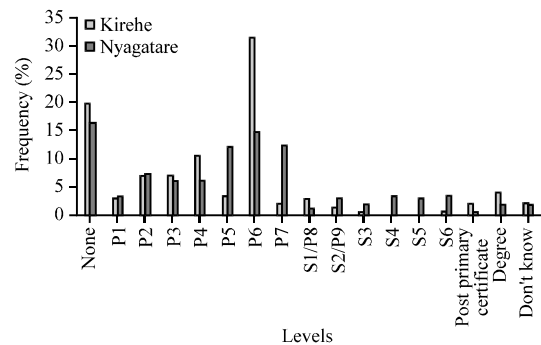


Fig. 6: Frequency distribution of the education levels of household members at the two pilot sites in Eastern province of Rwanda

participation of post-primary school leavers in beef cattle value chain was low in both districts. But in Nyagatare they contributed >30% of the household compared to approximately 15% in Kirehe.

Land and land use in crop production: Historically land has been a key constraint in Rwandan agricultural

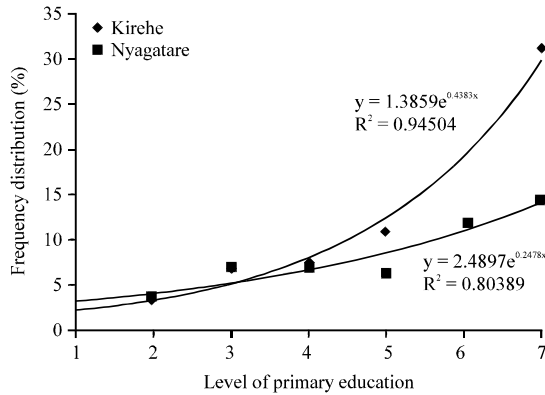


Fig. 7: Non-linear regression analysis of trends in primary school dropout in two pilot sites in Eastern province of Rwanda

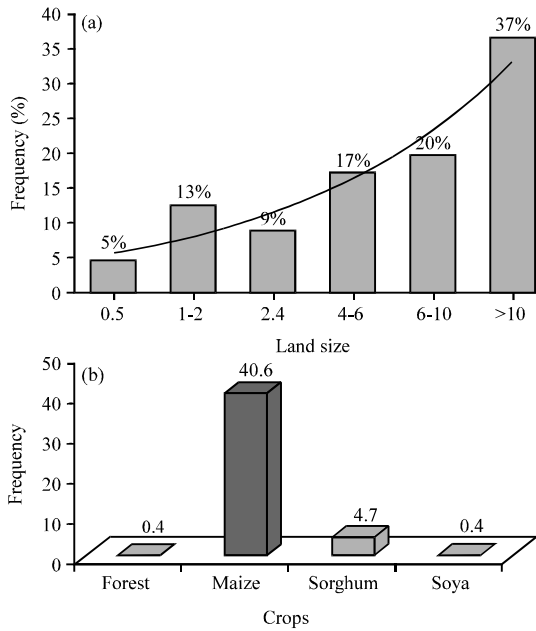


Fig. 8: Frequency distribution of the household by a) land size and b) major crops; in the two pilot sites for beef enterprise development in Eastern province of Rwanda

production largely due to increasing population pressure (Rwamasirabo, 1990) where average land holding is estimated at 0.7 ha per household (Mutimura and Everson, 2012). The proportion of households owning land earlier 0.7 ha tends to decrease with increasing size of land holding. The pattern of it is different in pilot sites chosen for beef cattle enterprise development (Fig. 8). However, the sentiments of the majority of households are that they do not have enough land by 71% of respondent disagreed against 29% of agreed.

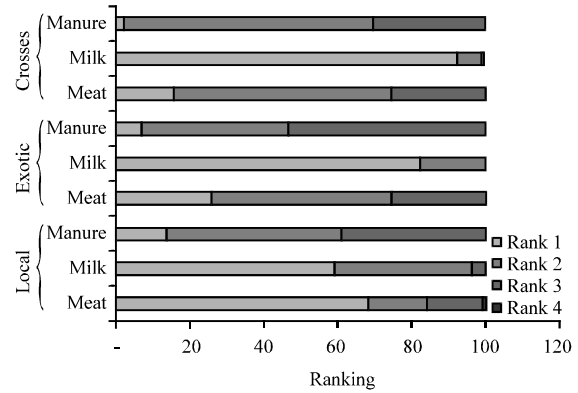


Fig. 9: Ranking of reasons for keeping various indigenous and improved cattle breed for beef enterprise development in Eastern province of Rwanda

The land is used for the production of crops, livestock and forest cover. The major crops grown by majority of households (45.3%) were cereals, legumes (beans and soybeans) (Fig. 8). Maize was a priority crop that was promoted by government policy under crop intensification programme.

Livestock resources: Farmers kept cattle, goats and poultry but the most preferred species are cattle for different purpose. Preference ranking for cattle breed showed that the local cattle were valued for meat (68.2%) followed by exotic (25.5%) and crosses (15.6%), respectively. Crosses were most important for milk (92.1%) followed by exotic cattle (82.1%) and local (58.9%). Manure was least important reason for keeping cattle. But it was the second most important reason for keeping crossbred and indigenous cattle (Fig. 9). This preference ranking reflect farmer’s perception of soil fertility in the area where was relatively virgin since they were reclaimed from the park less than two decades ago.

Feed resources: Grasses constitute the major feed resource base followed by very crops residues and concentrates in very few households. But approximately 84% of the farmers believe that the grazing land is not adequate to meet their needs. Approximately 4% used conserved feeds (hay and or silage) and 1.6% has fodder banks of Napier grass (Fig. 10a).

Farmer did not use supplements for a number of reason. In the majority of the cases (>76%) either the material was not available (30.3%) or not too expensive for the farmers (46.2%). Lack of knowledge was mentioned in a few cases (13%) implying that the key intervention could be training, private sector support in developing the feed value chain and credit facilities for farmers would address more (Fig. 10b).

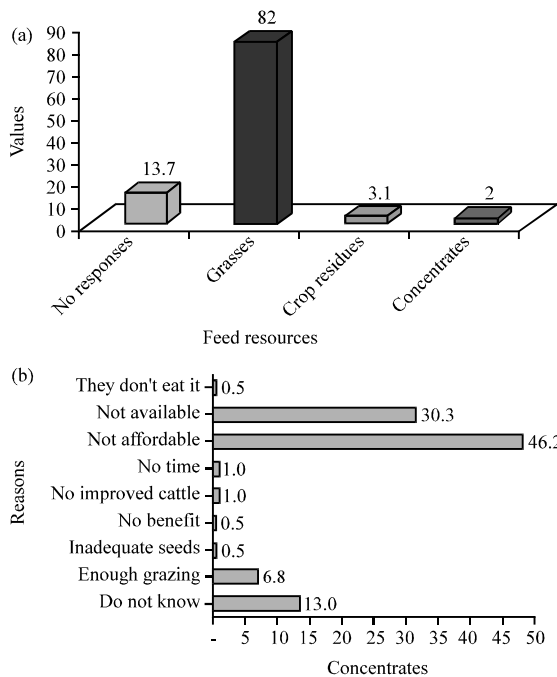


Fig. 10: a) Major feed resources; b) reasons for not feeding concentrates

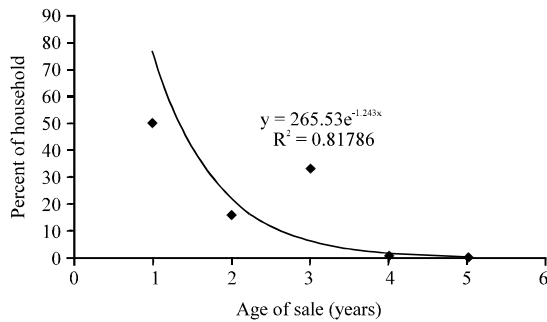


Fig. 11: The proportion of households selling animals by age categories of the animals

Market and marketing strategies: The Rwanda team has not been able to make a comprehensive market chain analysis. Information for households indicated that Farmers preferred to sell their animals within 1 year of age. The percentage of households who keep animals for >1 year before sale declined exponentially with the number of years (Fig. 11). The trends suggest a burgeoning commercial orientation of the beef sector. Unfortunately the number of such households was too few to support conclusive inference.

Water source: There were a number of source of water for animals. The most common sources (44.9%) of water for the animals were rivers (Fig. 12a). Valley dams and farm ponds provided 34% of the households to water the

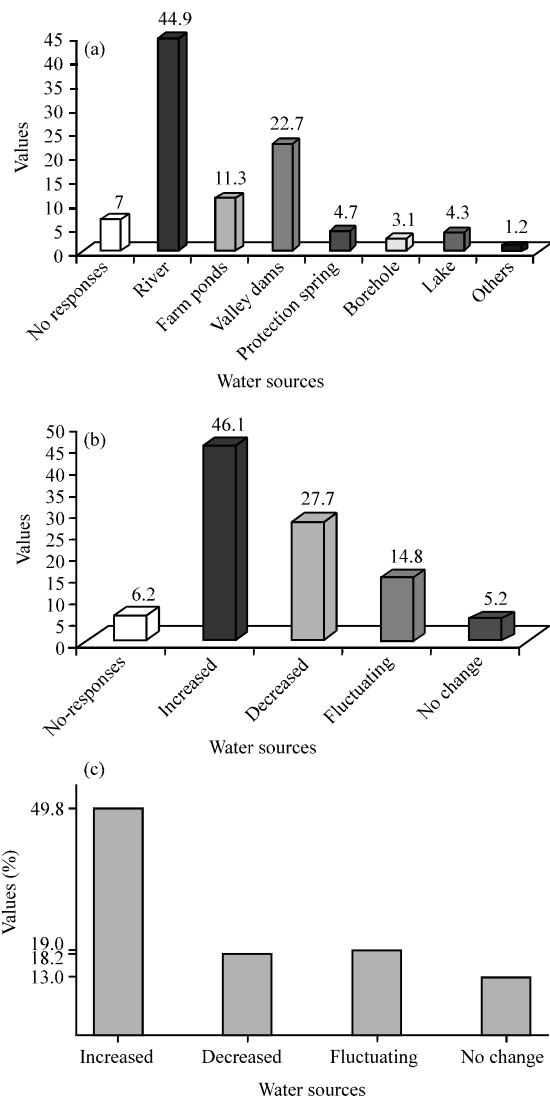


Fig. 12: a) Sources of water for cattle production; b) farmer's perception of impact of climate change on rainfall and c) temperature

animals. Boreholes and Lakes were rarely used (7.3%). These water sources are part of the hydrologic cycle which primarily originates from rain as a key indicator of climate change (Fig. 12b). Farm rarely acknowledged that climate experience of climate change. Adjusted for non-respondents 94.5% of farmers acknowledged that climate had changed with 49.1, 40.2 and 15.8% saying that it has increased, decreased and fluctuating, respectively (Fig. 12c).

Labour resources and utilization in livestock keeping: The survey revealed that the two cattle production systems invested labour differently in the management of the animals. Cattle keepers in Nyagatare spent

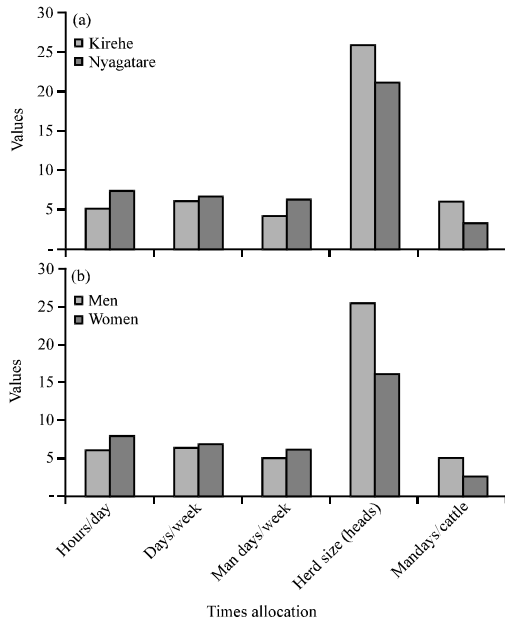


Fig. 13: Time allocation to the management of a) beef cattle location and b) Gender; Nyagatare and Kirehe districts of Eastern province of Rwanda

significantly more hours of the day ($p < 0.001$) days of the week ($p < 0.001$) and consequently more man days in a week ($p < 0.001$) attending the animals (Fig. 13a). Average herd sizes were larger but not significantly ($p > 0.05$) in Kirehe than in Nyagatare. Consequently each man day in a week was attending nearly half of the animals in Kirehe. This is expected because of the policy of paddock grazing in Nyagatare as opposed to agro-pastoralism in Kirehe.

Disaggregation of data by gender showed that women tended to spend more hours in a day, days in a week and consequently more man days in week attending to the cattle than men (Fig. 13b).

Labour by activity: Grazing was the single most time consuming activity in the province, taking take an average of 11 (SE, 0.16) (Fig. 14a). Marketing animals was a sporadic activity taking the least number of days in the week following general husbandry and health care (Fig. 14b). Grazing, feeding collection feeding and watering were daily activities during the week. Grazing alone took approximately 9 man days in a week (Fig. 14c). It was followed by feed collection and feeding. Cattle sale, health care and watering were the least labour demanding activities during the week (Fig. 14d).

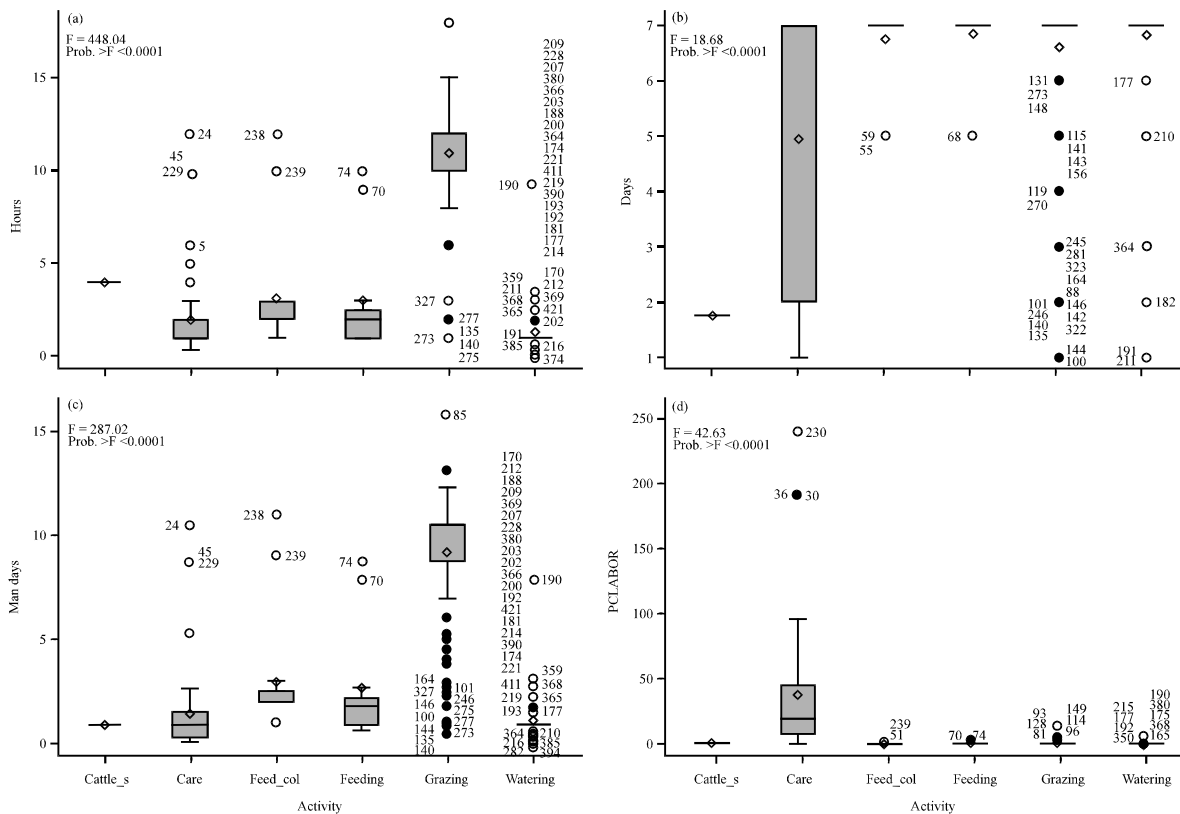


Fig. 14: a) Hours per day; b) days per week; c) man days per week and d) man day per head of cattle for different activity in beef cattle production the two pilot sites in the Eastern province of Rwanda

CONCLUSION

Household characteristics at the two sites were very similar and traditionally oriented in terms of gender roles in decision making; age structure and kinship, livelihood strategies and resource use and levels of education, awareness and perceptions on climate change, participation in the beef value chains. The sites were more land holdings per household than other parts of the country but they still felt highly constrained by land size for crop and livestock production. They are likely to adopt supplementary feeding strategies if they supplements are available, affordable and they are taught how to feed them to cattle. The appreciable participation of women in the some of the components of the beef value chain indicates that they can play key roles if deliberately targeted and facilitated. However, the current database is grossly inadequate without a comprehensive market and market chain analysis. More information on coping mechanism to climate change is needed to design a technically feasible, economically viable and socially acceptable interventions adapting to climate change impacts in beef cattle production, food security and poverty reduction.

ACKNOWLEDGEMENT

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