International Journal of Agricultural Extension and Rural Development ISSN: 3254-5428 Vol. 2(1), pp. 031-040, February, 2015. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Influence of Agro-Ecological factors and cultural practices on Heifer in-trust schemes in Njombe and Shinyanga Regions of Tanzania

Msangya M L[*], Urassa J K[1] and Mahonge C P[2]

[*]Sokoine University of Agriculture (SUA), Development Studies Institute (DSI), P.O. Box 3024, Morogoro, Tanzania.
[1]Sokoine University of Agriculture (SUA), Development Studies Institute (DSI), P.O. Box 3024, Morogoro, Tanzania.
[2]Sokoine University of Agriculture Centre for Sustainable Rural Development (SCSRD), P.O. Box 3035 Morogoro, Tanzania.

Accepted 3 February, 2015

Dairy farming can be a panacea to addressing rural poverty. The Heifer In-trust Schemes (HIS) in Njombe and Shinyanga regions aimed at reducing food and income insecurity. However, the influence of seasonality, traditional livestock grazing systems, animal treatment and protection practices challenge the schemes objectives. The study's main objective was to assess the influence of agro-ecological factors and cultural practices on HIS. Specifically, the study determined the influence of seasonality unavailability of quality pasture, milk and income, and explored the implications of traditional livestock grazing systems, treatment and protection. Study adopted a cross-sectional design. Data were collected from 402 randomly selected HIS households. Results show that during the wet season average daily milk production increased by six litres per cow. Results also show that more milk is sold during the dry season as the demand is higher while production is low. Results further show that traditional grazing systems and animal protection practices led to low milk production and less income. The diverse agro-ecological factors and cultural practices have influenced HIS in the study areas. HIS beneficiaries should establish pasture plots to address negative agro-ecological influences, reduce free range-grazing methods and avoid adverse traditional animal treatment and protection practices.

Key words: Agro-ecological, animal, cultural, factors, grazing, influence, practice, traditional, treatment, Tanzania.

INTRODUCTION

Literature on small-scale dairying in Tanzania and elsewhere has ignored the agro-ecological factors and cultural practices affecting access to materials and assets that enhance smallholders' livelihood improvement. In fact, smallholders' livelihood is shaped by dynamic contextual factors such as the influence of rainfall patterns and traditional practices among others. This study was conducted to address this knowledge gap by assessing the influence of agro-ecological factors and cultural practices on Heifer In-trust Schemes (HIS) in Njombe and Shinyanga regions.

Smallholder dairy farming in Tanzania faces various challenges including those related to seasonal variability translating into temporal availability of quality pastures and fodder, traditional livestock grazing systems, use of the traditional herbs for animal treatment and to traditional animal protection practices. According to Thornton (2010), seasonality may have substantial effects on global livestock production and productivity. Dry season in most cases has a negative effect on livestock production and productivity. According to Mselle et al. (2013), frequency of dry spells and observed diminishing duration of rainfall are among the climate-related challenges experienced by farmers. Poor income from dairy farming due to effects of seasonality variability, therefore, challenge smallholder farmers' vision to ensure continued supply of their livelihoods. This calls for pro-poor initiatives to address these dairy farming related challenges in Tanzania.

According to Msangya et al., (2014), the Heifer In-trust Schemes (HIS) which is one of the dairy livestock credit

*Corresponding author. E-mail: mlamsangya@yahoo.co.uk
Tel: +255 784 726 746

schemes is among the initiatives that have been adopted to address smallholder farmers livelihood's challenges in Tanzania. Worldwide, the HIS idea was founded by Dan West (1893-1971) who was a Midwestern farmer in Spain in 1944. West was ladling out rations of milk to orphans and refugees during the Spanish Civil War when this vital idea of reducing dependency and enhance relief through dairy farming came to his mind. West founded the Heifer Project International (HPI) and HIS for Relief which is highly dedicated to ending hunger, poverty and care for the planet earth. In Africa, HIS was introduced in 1974 with Tanzania and Cameroon being the very first countries on the continent to implement the scheme. In Tanzania, this scheme was first introduced at Kitulo dairy farm in Makete District in Njombe Region with the purpose of establishing the foundation herd farms to produce improved dairy heifers for distribution to communal (*Ujamaa*) villages. Since its initiation the Government of Tanzania and development partners have adopted various small-scale dairy farming initiatives in trying to address rural poverty in terms of food security and income improvement among others. Some of these initiatives are the District Agricultural Development Investment Programme (DADIPs) funded and implemented by the Government of Tanzania through Local Government Authorities (LGAs), the Northern Tanzania Integrated Sustainable Livestock Program (NTISLP) funded by HPI and implemented by Heifer International Tanzania, the East African Dairy Development (EADD 2) funded by Bill and Melinda Gates Foundation (USA) and the Kilosa and Bagamoyo Livelihoods Improvement project funded by The Meyer Island Fund of the New York Community Trust (USA) and implemented by Heifer Project International Tanzania (Urassa, 2005; HITz, 2013; Msangya et al, 2014).

The HIS model has been used in Tanzania as a major rural livestock credit for alleviating poverty among smallholder farmers for about forty years now. However, there is a dearth of information how this model's performance is influenced by agro-ecological factors and cultural practices as beneficiaries try to improve their livelihoods. The study on which this paper is based therefore aimed at contributing to filling this gap. The study uses Njombe and Shinyanga regions as representatives of highland and semi-arid agro-ecological zones respectively.

HIS was introduced in Njombe and Shinyanga regions in 1998, with each region getting 72 in-calf heifers as seed stocks. In addition, since Heifer International Tanzania (HITz) has phased-out giving support to the study areas for the past 15 years, therefore, the necessity to determine the impact of HIS in these diverse agro-ecological zones. It is imperative that before making strategies they should be informed by field realities, therefore the need to conduct research on various pro-poor issues including the in-kind credit models such as the Heifer-in-Trust Scheme.

This study was guided by a null hypothesis: agro-ecological factors and cultural practices have no significant effects on Heifer In-trust Schemes' performance in highland and semi-arid regions of Tanzania and by a question: 'How do agro-ecological factors and cultural practices influence the HIS objective? The study's main objective was to assess the influence of agro-ecological factors and cultural practices on HIS in these two regions. Specifically, the study aimed at determining the influence of agro-ecological factors on availability of quality pasture, amount of milk produced and income earned and at exploring the implications of cultural practices to HIS objectives. This study is in line with the Millennium Development Goals (MDGs) 1 and 3 that address issues of extreme income poverty and hunger and gender equity; Tanzania's Vision 2025; and Tanzania's National Strategy for Growth and Poverty Reduction (NSGRP) II (URT, 2010).The study contributes knowledge to the existing literature on livelihood and poverty reduction by introducing diverse dimensions of culture (different ethnicities e.g. the Sukuma, Sumbwa, Hehe and Bena) and agro-ecology (highland and semi-arid zones). Conventionally, studies on agro-ecology and culture have treated these dimensions as single entities (monolithically) (Toan, 2012; Mpofu, 2012; Smaje, 2013). Furthermore, the findings from this study provide inputs that practitioners' policy and decision makers can put into use as they design strategies to improve the performance of HIS.

The term agro-ecology stems from the two interdependent words "agriculture" and "ecology". According to Gliessman (1997), agro-ecology, encompass the application of ecological concepts and principles to the design and management of sustainable agro-ecosystems that are both environmentally sound and productive. In this study, agro-ecology means the totality of environment. Agro-ecology variables of focus in this study are altitude and rainfall patterns (unimodal/bimodal) in the study areas. In this study 'influence' refers to both positive and negative outcomes that seasonality has brought to the HIS interventions in terms of quality and availability of pastures, milk production and income from sales of milk, pasture or fodder.

Generally, culture is a way of life fashioned by people in their collective endeavour to live and come to terms with their total environment (Ngugi, 1972). According to Muchira (2001) culture is the sum of people's art, their science and all their social institutions including their system of beliefs and rituals. Thus, culture includes attitudes, values, beliefs, arts, sciences, modes of perception, and habits of thought and activity. According to both Ngugi and Muchira, cultural features are learned but are often too pervasive to be readily noticed from within. They also describe culture as "why things happen the way they do", and can be determined by, practices, assumptions and interpretations of an individual or socie-

tal members. In this study, culture was confined to how the major ethnic groups in the study areas (Bena and Hehe in Njombe and the Sukuma and Sumbwa in Shinyanga) graze their cattle and treat animals, as well as other livestock keeping related practices. In addition, culture also involves the values attached to the animals by these ethnic groups.

MATERIAL AND METHODS

Description of Study Areas

Shinyanga and Njombe regions are found in a diverse agro-ecological environment of Tanzania (Figure 1). Shinyanga Region is situated in the lake zone that forms part of the lowland and semi-arid areas of Tanzania. According to the 2012 Tanzania national population and housing census report (URT, 2013); Shinyanga Region has a population 1,534,800, and covers an area of 50,781 square kilometers (URT, 2011). It is situated between longitudes 31˚ 0' 14' ˚E and 35˚ 0' 11' ˚E and between latitudes 2˚ 0' 15' ˚S and 4˚0' 30' ˚S, and is situated 60 kilometres from Lake Victoria. The altitude of this region ranges between 1000 to 1500 masl (GRN, 2014) and it gets an annual average rainfall of 500 mm (SRCO, 2011). The major ethnic groups in the region are the Sukuma, Nyamwezi and Sumbwa. This study was conducted in 10 villages namely, Uzogole, Mwamagunguli, Chibe, Ihapa, Bushushu, Lubaga, Ndala, Mwasele, Kitangili and Bugayambele.

Njombe Region is located in the southern highlands of Tanzania which forms part of the Southern Agricultural Growth Corridor (SAGCOT). This area has a great potential for supporting the "*Kilimo Kwanza*" (Agriculture First) initiative which is conceived as a private-sector driven mechanism for green revolution in Tanzania's agricultural sector. According to Tanzania's 2012 national population and housing census, Njombe region has a population of 702,097 (URT, 2013), and occupies an area of 21,347 square kilometres (URT, 2011). It is located between longitudes 34˚ 56' 0"E and 36˚ 06' 07'E and between latitudes 9˚ 20' 0'S and 11˚ 0' 0'S, and the altitude ranges between 1,300 and 1,581 metres above the sea level; the region receives an average annual rainfall of 1500 mm (NRCO, 2013). The major ethnic groups in Njombe Region are the Bena and Hehe people. Study was conducted in 8 villages namely, Igima, Mlevela, Nyumbanetu, Numdu, Utalingoro, Itulike, Kibena and Nyombo.

Study Approach

The study used a cross-sectional design which is good for descriptive research (Hall, 2009). Through this design, data were collected once (Bailey, 1998). Basing on HIS beneficiaries' registers, the study's sample size (n) representing 5% of total number of beneficiaries' households' in the two regions was determined. Data collection was done in December 2012 through January 2013. Primary data were collected from 402 randomly selected HIS beneficiaries households using a structured questionnaire. In addition, nine focus group discussions (FGDs) were conducted to complement the surveys so as to allow data triangulation. The following formula was used to determine the study's sample size:

n = sample size;

$n = \frac{Z^2 * p (1 - p)}{d^2}$ (Cochran, 1977, cited by Bartlett et al. (2001), where:

Z = a value on the *abscissa* (horizontal ("x") value in a pair of coordinates) of a standard normal distribution (from the assumption that the sample elements are normally distributed), which is 1.96 or approximately 2.0 and corresponds to 95% confidence interval;

p = estimated variance in the population from which the sample is drawn, which is normally 0.5 for a population whose size is not known;

= acceptable margin of error (or precision), whereby the general rule is that in social research should be 5% for categorical data and 3% for continuous data (Krejcie& Morgan, 1970, cited by Bartlett et al. (2001). In this research, 5% was used since substantial categorical data was collected.

Using a Z-value of 2.0, a p-value of 0.5, a q-value of 0.5, and a d-value of 0.5% (which is equivalent to 0.05), the sample size (n) was determined to be 400 but respondent were 402. Therefore, $n = \frac{2^2 * 0.5 (1 – 0.5)}{}$ =
(4 x 0.25)/0.0025 = 1/0.0025 = 400.

Data Analysis

Primary data collected using structured questionnaire were analysed using Statistical Package for Social Science (SPSS 16) to determine the frequencies and percentages. T-test was used to determine whether there were significant differences in milk production and amounts sold during the dry and wet seasons. The unit of analysis is the household. The qualitative information obtained from the FGDs was analyzed using content analysis which entailed categorization of the information into meaningful themes.

Study Limitations

This study interviewed 402 HIS beneficiaries using structured questionnaire. In due course of the study, the following limitations were realized; there was inadequate record keeping skills by some of the HIS respondents. Some of HIS respondents were unable to quickly respond to questions on issues of units of measure such as kilo-

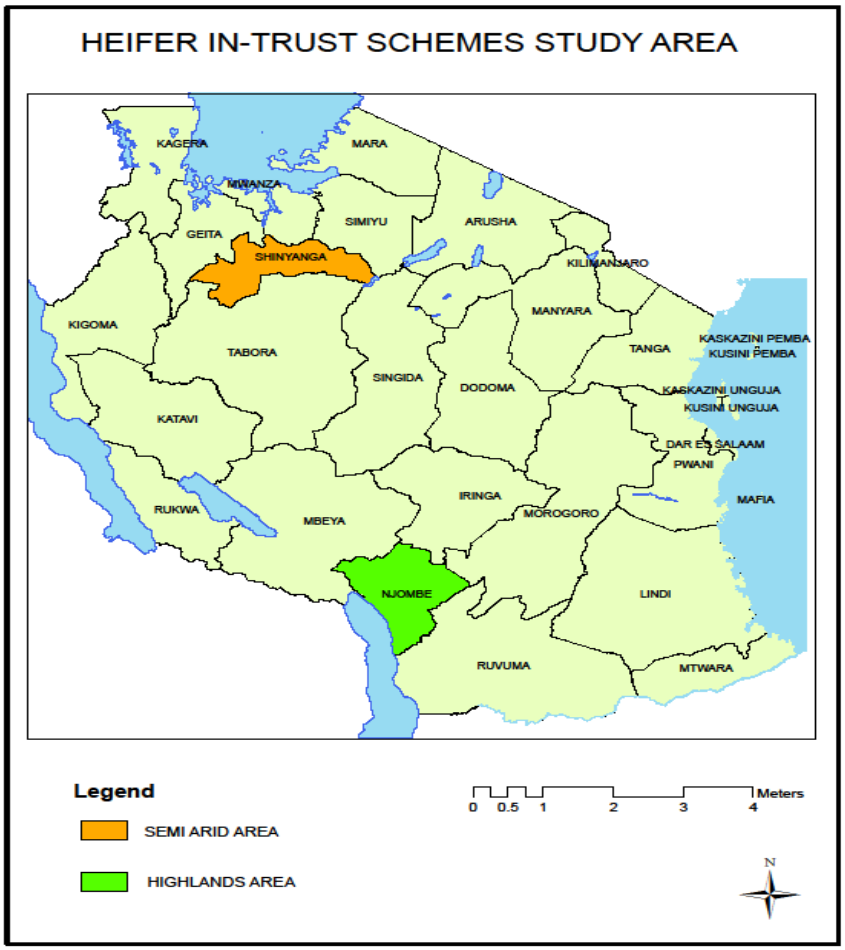

Figure 1. Map of Tanzania United Republic showing study regions.

gram, litres and tonnages as they are used to traditional names and units of measures. In order to overcome this limitation, the researcher used names and units of measures used locally and converted the same measurements into standard units of measures without losing the quality of primary information as delivered by the respondents. Based on the long time (fifteen years) between phasing out of the HIS project in the study areas, it was difficult to get hold of some of the beneficiaries at the first time of call due to out-migration. Therefore, efforts had to be made to trace them to their new locality/villages. For those who died, a household head/representative was interviewed.

RESULTS AND DISCUSSION

Respondents' Profile

This study involved 402 HIS beneficiary households of which 65.6% of the respondents were females. Results from the study show that 93.8% of respondents were household heads with 65.7% Female Household Heads (FHHs). In addition, all 402 had lived in the study area for more than 20 years and lived in their own houses. Most these houses were of good quality; 75.8% were roofed with corrugated iron sheets, 69.8% had floors made of cement and 75.8% had walls made of either burnt bricks or concrete blocks. All of the surveyed households owned land in the range of 1.5 to 10. Observations from the study further showed that none of the HIS beneficiaries had owned a dairy cattle before their involvement in the HIS interventions.

Agro-Ecological Factors and their Influence on HIS Beneficiary Households'

Seasonality and HIS Beneficiaries Milk Production

Observations in Table 1 show that there was an influence of seasonality on the availability of pastures/fodder and milk production.

Table 1. Milk production by season and region (n = 402).

Region	Dry and wet seasons milk production	T-test compared differences			
		Litres	St. deviation	t-value	p-value
Njombe (n – 200)	Average milk production during dry season	18.25	3.791	-45. 634	0.000
	Average milk production during rainy season	24.57	4.139		
Shinyanga (n – 202)	Average milk production during dry season	12.50	2.211	-68.908	0.000
	Average milk production during rainy season	18.13	2.752		
Njombe and Shinyanga	Average milk production during wet season	21.33	4.762	72.962	0.000
	Average milk production during dry season	15.36	4.228		

Table 2. Availability of pastures/fodders, milk production and diseases occurrences by season and region (n = 402).

Region	Wet weather season effects	n (%)	Dry weather season effects	n (%)
Njombe	Increased milk production	83(41.5)	Low milk production	47(23.5)
	Increased pastures availability	100(50)	Poor pastures	100(50)
	Increased fodder yields	17(8.5)	Poor fodder yields	10(5.0)
			Increased livestock diseases	43(21.5)
Shinyanga	Increased milk production	139(68.8)	Low milk production	21(10.4)
	Increased pastures availability	38(18.8)	Poor fodder yields	13(6.40)
	Increased fodder yields	25(12.4)	Poor pastures	123(61)
			Increased livestock diseases	45(22.2)

Numbers in brackets indicate percent

The findings show that in both Njombe (highland) and Shinyanga (semi-arid area) milk production was high during the wet season compared to the dry season. The findings further show that during the wet season milk production in the two regions increased by an average of 6 litres per cow per day from that produced in the dry season. According to Gliessman (1997), seasonality has a negative and positive effect on livestock production. Generally, the dry season has a negative effect to livestock production and productivity as compared to the wet season. Respondents reported that the difference in milk production between seasons was mainly due to seasonal effects that influence availability and quality of pastures and fodder. During the FGDs, discussants also pointed out that milk production was less during the dry season due to poor efforts and commitments of beneficiaries to establish or conserve pastures.

Similarly, milk production was less due to poor quality of pastures. In addition, they pointed out that income from milk sales is less during the dry season unlike during wet season due to low milk produced hence less is sold.

Generally, households can sell milk and other dairy products including manure and live animals to obtain income which can be used to purchase additional food or other food stuffs and other household items. According to Mwakalobo and Shively (2001), an increase in the income improves households' ability to purchase food for more than 40% of the poor families in the tropics. Furthermore, results from the statistical analysis (Table 1) show that seasonality significantly affected milk production in both Njombe and Shinyanga regions at a 95% confidence interval. Therefore, the null hypothesis that states: agro-ecological factors have no significant effect on the performance of Heifer In-trust Schemes in Njombe and Shinyanga regions is rejected.

Seasonality and Availability of Pastures and Fodders for HIS

The results in Table 2 show that seasonality in both Njombe and Shinyanga regions affects availability and

Table 3. Wet and dry seasons milk production and sales by region (n =402).

Region	Regional Variables Compared	T-test compared differences		
		Litres	**t-value**	**p-value**
Njombe (n – 200)	Average daily milk production in dry season	18.25	-45. 634	0.000
	Average daily milk production in wet season	24.57		
Shinyanga (n – 202)	Average daily milk production in dry season	12.50	-68.908	0.000
	Average daily milk production in wet season	18.13		
Njombe (n – 200)	Average household's daily milk sales in dry season	14.30	-30.791	0.000
	Average households' daily milk sales in wet season	18.73		
Shinyanga (n – 202)	Average households' daily milk sales in dry season	7.84	-46.414	0.000
	Average households' daily milk sales in wet season	12.57		
	Interregional Variable Compared	**Litres**	**t-value**	**p-value**
Njombe and Shinyanga (n – 402)	Average daily milk production in wet season	21.33	72.962	0.000
	Average daily milk production in dry season	15.36		
	Average household's daily milk sales in wet season	11.05	-48.584	0.000
	Average household's daily milk sales in dry season	15.00		

quality of pastures. According to Mselle et al., (2013), frequent dry spells and shorter rainfall seasons are among the climate-related challenges experienced by farmers. Despite having plenty of pastures and of a higher quality during the wet season as compared to the dry season in both Njombe and Shinyanga regions, FGDs, discussants pointed out that, seasonality and variability in amount of rainfall received in their area affects pasture establishment in their area. Consequently, this affects availability of quality pastures for their animals during the dry season. The above suggests that poor animal production and productivity is a result of poor quality of pastures and some other animal feeds which are provided during the dry season. Therefore, in order to establish and sustain milk production, availability of quality pastures and supplementary feeds are necessary especially during the dry season.

Table 2 also shows a linkage between seasonality and the occurrence of livestock diseases due to weakness of animal and lack or inadequacy of water supply for hygiene. Respondents reported that HIS beneficiaries' experienced more incidences of animal diseases during the dry season. Consequently, this leads to low milk production, and sometimes animal deaths. Even though the two regions are in diverse agro-ecological zones, during the FGDs in both Njombe and Shinyanga regions it was pointed out that major livestock diseases affecting their cows are; Foot and Mouth Disease (FMD), Babesiosis (Heart water), East Coast Fever (ECF) and skin diseases. It was also reported that, the higher the number of the cows affected, the less the milk produced hence low income earned by the HIS beneficiaries. As a result, livelihoods of these households are affected.

Seasonality and HIS Milk Production and Sales

The results in Table 3 show that the respondents in Njombe sold relatively more milk during the dry season unlike the case with the respondents in Shinyanga Region. The amount of milk sold in Shinyanga was almost half of that sold in Njombe region. This indicates differences in agro-ecological influences on milk production in the two study areas therefore, pointing to the need to avoid simplistic generalisation on influence of agro-ecology on livelihoods, as argued in this study. Table 3 shows further that, more milk is sold during the dry season as compared to the wet season as the demand of milk in former is higher while production is low. The findings imply that even within the same agro-ecology there exists micro-agro-ecological factors which vary along a space of time, and their effects translate into variations in the performance of the livelihood mechanisms. Generally, during the dry season HIS beneficiary households consume less milk as about 95% of the milk produced is sold. This means that, income from milk sales for HIS beneficiaries with the same number of milking cows in the highland and semi-arid areas differs between the wet and dry season due to amount of milk produced and sold. Nevertheless, the HIS beneficiaries earn more income from milk sales during the dry season compared to the wet season due to increases in prices as a result of the low supply and high demand.

According to Table 3 the impact of shortage of rain was more severe in Shinyanga (semi-arid) than it is in Njombe (highland) area. It also means that, HIS beneficiaries in Shinyanga not only get less income from milk sales but also get less milk for food as opposed to those in Njombe. Therefore, livelihoods of HIS beneficiaries in Shinyanga were much more affected than those in Njombe Region. It can generally be derived from these findings that the HIS is influenced by both intra- and-inter-agro-ecological factors, and thus strategies to improve the scheme need to be informed by knowledge on intra-

Table 4. Livestock grazing practices by region (n =402).

Region	Livestock grazing systems	n (%)	Reported implications on HIS in meeting its objectives
Njombe	Intensive grazing (Zero grazing)	182 (91.0)	Increased milk production, more milk consumption, income and reduced animals' diseases' attacks
	Semi-intensive grazing (Mixed)	18 (9.0)	Low milk production and income and reduced animal health status due diseases
Shinyanga	Intensive grazing (Zero grazing)	102 (50.4)	Increased milk production and reduced animals' diseases attacks
	Semi-intensive grazing (Mixed)	85 (42.0)	Low milk production and income and reduced animal health status due diseases
	Extensive grazing (free range)	15 (7.6)	Completely reduced the milk production and income and endangered animal health and sometimes leads to mortality,

Numbers in brackets indicate percentage

site and inter-site influences at spatial and temporal scales.

Implications of Cultural Practices to HIS Objectives

Traditional Livestock Grazing System

This study assumed that Njombe and Shinyanga regions differ in cultural practices and that this was expected to influence the HIS performance. The results in Table 4 show that, different livestock grazing systems had different influences on the HIS performance. Respondents reported that, intensive grazing system had enabled them to increase milk production as well as their ability to access food and earn income from milk sales. Respondents in Njombe and Shinyanga regions reported that semi-intensive grazing practice led to low milk production hence, less income from sales of milk and that the practice endangered animal health and sometimes led to death of the animals. During the FGDs, it was reported that during the dry season, the average milk produced for the extensive grazed improved cattle to be between two and five litres per day. Culturally, in Njombe region, the Bena and Hehe give couples livestock as a present to be intensively grazed (zero-grazing) due to limited land size. In Shinyanga Region, it is a prestige for the Sukuma, Sumbwa and Nyamwezi to have big numbers of cattle; therefore, this also influenced the adoption of extensive (free range) grazing. It was also reported by HIS beneficiaries in Shinyanga region that having many cattle indicates that the household is rich; this increases their social status. For example following the benefits accrued from the HIS some of the beneficiaries in Shinyanga Region went back to their traditional ways of having more livestock so they ignored HIS husbandry requirements. The above observations connotes that culture in terms of beliefs and practices held or observed by specific human groups transcends generational boundaries and is thus hard to be broken by an intervention (e.g. HIS) and can therefore restore especially after the intervention period. While expressing the influence of extensive grazing, a HIS woman beneficiary aged 48 years residing at Kitangili village in Shinyanga Region, on January 15, 2013 had this to say;*"...It becomes very difficult to get enough pastures during the dry season; this is the time when most of the livestock keepers in semi-arid areas take their livestock far from their homes in search of pastures due to both pastures and water being in short supply...I sometimes asked men who practice the extensive grazing system, especially during the dry season to graze my dairy cow with theirs... my observation and experience of the extensive grazing of dairy cattle is that, milk production becomes very low and the cattle become attacked by more ticks resulting to tick-borne diseases and even mortality".*

The above account given by the woman is an indication that there is always an interaction or interdependence between cultural practices and agro-ecological factors whereby adverse influences from the agro-ecology may trigger responses from social actors' actions in keeping with cultural practices which seem to reduce pains from adverse agro-ecological influences.

In trying to reduce some of the adverse implications of cultural practices (Table 4), the HIS requires every recipient of either Original Placement (OP) or passing on the Gift (POG) to abide by intensive grazing for more milk production. Literature (Urassa, 2005; HITz, 2013) shows the importance of intensive farming for promoting animal health and increased milk production. The findings from this study suggest that the way people or communities are used to doing things can affect the intended achievement.

Therefore, it is good to consider cultural beliefs and practice in any developmental initiative in a given society right from the beginning. It also means that, culture has somehow negatively affected HIS objectives as the reported practices led to reduced milk production and lower incomes which means that households' ability to improve their living standard, which is the HIS major objective, was compromised.

Table 5. Traditional medicines used by HIS beneficiaries by disease in Njombe and Shinyanga regions.

Disease	Medicinal plant's name	Preparation	Prevention dose	Treatment dose	Time for cure	Reported implications on HIS performance
Babesiosis	Miyengoyengo tree (roots/stems)	Liquid form	Not applicable	Given two or three times a day	Provided for three days	Overdosing may affect livestock
East & Coast Fever (ECF)	Nsongwanjala tree & hot pepper	Grinding, mix its powder with cold water	Given to calves in the third day after calving-down	Given to calves three times a day	Provided for three days	Overdosing results to mortality
Calf Scours	Milungulungu tree	Liquid form	Not applicable	Given orally, twice a day	Three days	Causes may not be well known and can kill if not well treated
Eye disease	Caustic soda	Liquid form	Not applicable	Wash eyes three times a day	Five days	Over/under dosing may lead to blindness
Foot & Mouth Disease (FMD)	Caustic soda & ashes	Liquid form	Not applicable	Wash mouth and foot twice a day	Five days	Recovery may take longer if not well monitored
Lumpy skin disease	Aloe Vera	Grinding, mix with water	Not applicable	Given 1 litre three time a day	One to two weeks	No implication reported
Worms	Aloe Vera + hot pepper	Grinding and boil in water	Given orally twice a day	Given orally three times a day	One week	Not easy to know the type of worm affecting, may kill if not well administered
Retained Placenta	Unroasted groundnuts	Grinding, mix with water		Given orally, 1 litre every three hours	One day	Treatment sometimes takes a long time and may also kill
Bloat	Caustic + water	Mix caustic with 1 litre of warm water	Not applicable	Given orally, once a day	Within two hours	No implication reported
Diarrhoea	Avocado +water	Grinding dried seeds and mix with water	Not applicable	Given orally 1-2 litters once a day	Six hours	If not well monitored may kill animal quickly
Cough	Wild onion	Grinding, mix with water	Not applicable	Given 1 litre three times in oral from once a day	Three days	May take longer and may lead to swelling of the animal body
De-poisoning/ Detoxification	Yams	Grinding, mix with water	Not applicable	Given 1 litre, orally 3 times a day	Three hours	If not timely administered , the animal may die as the toxin goes quickly in the blood

Influence of Traditional Livestock's Treatment System

The results in Table 5 show that some of the HIS beneficiaries had been treating many animal diseases using traditional herbs. Traditional herbs are prepared and administered in various ways and the cure takes between two hours and two weeks depending on the disease. In addition, there are no standard measurements to be followed for the preparation and administration unlike the case with the modern drugs and vaccines which are mostly readily made available and have expiry dates and dosage instructions. About three quarters (72%) and 35% of the beneficiaries in Shinyanga and Njombe regions respectively reported to have been using traditional herbs to treat their cows. It was further reported by respondents in Njombe and Shinyanga regions that herbs treatments have largely slowed down the diseases but, animals do not get cured. It was also reported by 45% of the beneficiaries in Shinyanga that, under-dosing or over-dosing animals had resulted into delays in their cure or increased mortality. Generally, it was reported that, animal deaths due to the above had reduced milk production, food availability as well as incomes to the beneficiary households. During the FGDs in both Njombe and Shinyanga regions, discussants reported that the use of traditional herbs was an alternative to high priced modern drugs and vaccines. The discussants argued that, herbs have reduced expenditures in managing their cattle. The use of traditional herbs by smallholders is also in agreement with Allan (2011), who reports that modern livestock drugs and vaccines are expensive, unavailable in the rural areas and erratic in their supply. Consequently, smallholder farmers go for alternative methods of ensuring livestock health through the use of medicinal plants. During an FGD conducted on January 2, 2013, a 43 years of old male HIS beneficiary from Lubaga village,

Table 6. Rituals practiced by HIS beneficiaries to protect their dairy cattle.

Type of protection	Cultural ritual practiced	Impact
Preventing cattle from thieves	A calf's carcass is buried in the animal shed (Kraal). This ritual prevents non family members from taking an animal out of its shed.	Sometimes, the smell leads to fighting among the cattle in the shed and this can cause wound, injuries and even lead to death of the wounded animals.
Preventing diseases in the cattle's sheds	Giving a cow's dung mixed with cattle's urine to protect animal from people with evil intentions such as those seeking to send diseases to the cow.	May sometimes cause constipation
Increasing cattle numbers	Leaving cow's manure in the shed (without burning or removing it out of the shed) increases cattle numbers at household.	Not taking manure out of the shed even for farming activities leads to poor soil fertility hence poor crop yields compared to those applying manure in their farms.
Preventing calf from diseases	Calf given milk which is mixed with ashes to protect the calf against diseases hence grow healthier.	If not well prepared and administered, it may cause constipation and stomach complication and even death due to over dosing the calf.
Getting heifers into heat	Milk mixed with some special herbs and caustic soda is given to heifer to stimulate it to get into heat.	Reported that, if frequently applied, to specific cow it may affect the natural heat.
Stimulating breeding bull to mount	Milk mixed with special herb, ashes and pepper is given to a breeding bull to stimulate it to mount tirelessly.	Reported that, sometimes the bull can mount a heifer which is not on heat.

Shinyanga Region expressed his experience on the use of traditional herbs in treatment of livestock by saying;*..."Because of the inadequacy of livestock extension staff in our area and higher prices of modern drugs and vaccines, I mostly use traditional herbs to cure my cows whenever they get sick".* Findings from the FGDs further showed that the continued use of traditional herbs is also aimed at promoting the continued protection of the indigenous knowledge of medicinal plants among the young generation. However, the continued use of traditional herbs may continue to negatively affect the health and well-being of the animals mainly due to either under-dosing or overdosing. These findings mean that, not all traditional herbs are bad for treating animals but, many smallholder farmers lack the skills on herbs dosage. The findings also suggest that, availability and ability of smallholder to access veterinary services including drugs and vaccines are vital for any dairy farming development initiative. It further implies that, refresher training on improved animal husbandry practices is vital for enhancing knowledge and for increased food availability and income. The findings also suggest that, modern drugs and vaccine should be available and affordable by smallholder farmers to reduce the use of traditional herbs.

Influence of traditional beliefs and practices on HIS

It was not easy to see and understand cultural actions as they are deeply embedded into strong beliefs. However, in-depth discussions with respondents helped in getting important information as regards to cultural practices. One can only see the traditional practices which are influenced by certain strong beliefs. Traditional beliefs and practice do manifest in various ways depending on the need for action. Findings from the study show that a quarter (25%) of HIS beneficiaries in Shinyanga Region reported to have been using traditional ways in protecting their animals. The results in Table 6 show the common animal protection done by beneficiaries. The Table also shows some of traditional ritual (*Matambiko*) used by the HIS beneficiaries. Ritual is a traditional practice that results from a strong belief by a certain ethnic group. The practices involve traditional actions and words spoken when the actions are done. In one of the study areas, the study founded that some of HIS beneficiaries were involved in such beliefs and did some of rituals to protect their animals from theft and other evil things from evil doers. Rituals are among the traditional practices reported by respondents to have an influence on HIS. More than a half (57%) of HIS beneficiaries in Shinyanga Region reported that, rituals helped them to protect their livestock against theft, common animal diseases and in increasing the number of animals as well as stimulating heifers into getting on heat and stimulating breeding bulls to mount. During the FGDs in Shinyanga Region, the discussants pointed out that rituals (actions and words) mainly practised in the study area included; washing their animals (cows) with other cow's blood, throwing-out the placenta into the animal's sheds and burying calf's carcass in animal sheds (Kraals). Comparatively, traditional beliefs and practices were more prevalent in Shinyanga Region compared to Njombe Region. The observation could be a result of the literacy levels reported for both regions which are 68.4 and 81.9 percent in Shinyanga and Njombe respectively (URT, 2014). Shinyanga Region also had more agro-pastoralist communities with strong beliefs of keeping large stocks of indigenous cattle.

During the beneficiary survey, a 43 year old male beneficiary from Chibe village in Shinyanga Region on

Table 7. Milk production and animals protection by season by region (n = 402).

Region	Dry and wet seasonality milk production	T-test compared differences				
		Mean	n	St. deviation	t-value	p-value
Shinyanga	Production of milk during dry season	12.50	202	2.211	-68.908	0.000
	Production of milk during rainy season	18.13	202	2.752		
(1: Signifies milk production above 18.13 litres; 0: Signifies milk production below 12.50 litres)						

January 17, 2013 had this to say in relation to why traditional livestock protection is done; *"Our people are not all faithful and not everyone is happy with one's progress. Therefore, to make sure that my cows are healthy, do not contact diseases and produce enough milk, I mix cattle's urine and dung and make the animals drink the mixture to protect them against evil eyes".*

A 59 year old HIS female beneficiary in the same village said; *"You cannot believe everyone you see in the community, each person has his/her own hidden agenda that they want to peruse to derail others' progress. Therefore, to ensure your cow performs well, you have to protect it from those with evil intension".*

In addition to the above, during the FGDs in Shinyanga region, discussants however pointed out that, most of the people nowadays do not use milk from the traditionally protected cows'. It was also reported that, milk buyers (customers) instantly terminate their milk orders upon realizing that the milk they have been buying is from a traditionally protected cow. As a result, the household loses the income from milk sales.

Moreover, it was also reported that following the training on animal husbandry, the reported cases on the use of traditional rituals among the HIS beneficiaries have been declining rapidly. These findings mean that no matter, how strong traditional beliefs are held, proper training and adoption of modern animal husbandry could lead to achievement of the intended outcomes despite those achievements are realized slowly. The findings also suggest that, any initiative on dairy development should consider and plan on how to reduce traditional beliefs and practices related to dairy farming among the targeted communities. In additional to the effects presented in Table 6, further observation according to T-test results in Table 7, hypothesis that states: cultural practices have no significant effects on the performance of Heifer In-trust Schemes in Njombe and Shinyanga regions is rejected.

CONCLUSION AND RECOMMENDATIONS

• Diverse agro-ecology dimensions (highland -Njombe region and semi-arid area Shinyanga region) have been observed to influence, HIS both positively and negatively.
• The negative implications from agro-ecological factors and cultural practices in both semi-arid and highland were observed to be much higher during the dry season compared to wet season. Consequently, HIS beneficiaries' household's milk and income from sales of milk were also higher in the highland area than the semi-arid area.
• Cultural practices such as free range grazing, the use of traditional herbs for livestock treatment and observing of some rituals for livestock protection had more negative influence on HIS in the semi-arid agro-ecology where these practices were more prevalent.
• The study recommends that the Government and dairy sector development partners identify, consider, and integrate agro-ecological factors and cultural practices right from the design stage of rural dairy development initiatives.
• The government should support the private sector to make sure that, imported and locally procured livestock drugs and vaccines are accessible and affordable to farmers for sustainable animal production and productivity. The government should also establish a mechanism for subsidizing modern livestock drugs and vaccines which are too high for famers to afford, and should encourage smallholder farmers to use modern livestock drugs and vaccines for control and treatment of diseases. Doing so will save livestock for unwarranted for deaths due to overdependence on less responsive traditional herbs whose dosage has not clearly been established.
• HIS should prioritize issues of pastures plots establishment and fodder production in order to sustain the small-scale dairy husbandry innovation and good practices in the post-project period.

ACKNOWLEDGEMENT

Authors are grateful to Research on Poverty Alleviation (REPOA) for funding this study and to respondents who gave fundamental information that enabled the study to achieve its objectives.

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