HEIFER IN-TRUST SCHEMES' CONTRIBUTION TO SMALLHOLDERS' WELL-BEING IN DIVERSE AGRO-ECOLOGICAL AND CULTURAL ENVIRONMENTS IN TANZANIA

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A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY OF SOKOINE UNIVESITY OF AGRICULTURE. MOROGORO, TANZANIA.

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EXTENDED ABSTRACT

Diverse agro-ecological factors in terms of seasonality, rainfall patterns, quality pasture availability and cultural environments in terms of beliefs, animal treatment and protection and gender relations' structures pose different challenges on Heifer In-trust Schemes (HIS) in Tanzania. The above have impacts on milk production, income from milk sales, women empowerment and employment generation. These factors have not sufficiently been explored in many studies. This study was conducted in Njombe (highland) and Shinyanga (semi-arid) regions to try to fill in that research gap. The study specifically: (i) explored the role of Heifer-In-trust Schemes to smallholders' self-employment; (ii) determined the implications of the seasonality and rainfall patterns, quality pasture, traditional animal grazing systems and treatment; and protection to Heifer In-trust Schemes objectives; (iii) assessed the participation and benefits of men and women household heads in Heifer In-trust Schemes in the study areas of Njombe and Shinyanga Regions; and (iv) evaluated the performance of households' well-being indicators in the study area. The study adopted a cross-sectional research design in which 402 households were surveyed. Moreover, 9 focus group discussions (FGDs) and 15 Key Informant (KI) interviews including livestock extension workers, leaders of farmer groups, Community Animal Health Workers, Local Government Authorities staff and project holders, and input suppliers. Mixed research methods approach was used for data collection including sequential exploratory design for both qualitative and quantitative information. Purposive sampling was used to select regions, districts and wards. Simple random sampling was used to select villages and HIS respondent. The unit of analysis was a HIS participant. Qualitative data from FGDs and KIs were transcribed into texts and analysed using content analysis techniques whereby the flow of logic and constant comparison between the logic was employed. As regards quantitative data from the households, the Statistical

Package for Social Sciences (SPSS) version 16 was used to determine descriptive and inferential statistics, including t-test, chi-square and Wilcoxon Signed Test. The results showed that HIS had generated employment opportunities among the less formally educated youth, women and men. The results further showed that negative implications of seasonality, rainfall pattern, and quality pasture availability in highland and semi-arid areas were more prevalent during the dry season. Moreover, the results showed that traditional grazing systems, animal treatment and protection had more negative effects on HIS in semi-arid areas. Comparatively, the results show that women had benefited more than men, and HIS had empowered women in terms of resource access, control and ownership. Moreover, the results showed that income before and after the scheme in both Njombe and Shinyanga regions were significant ($p<0.05$). In addition, annual net cash increased almost eight-fold after the HIS, and all male and female participating in HIS were getting above TZS 4 000 000 ($ 2 224) per annum. The results further showed that children's education, assets acquisition and food accounted for 36.2%, 24.3% and 10.5% of income expenditure accrued from HIS respectively. The results also showed that meal frequencies and households' food diversity had improved as meals taken and meals composition before and after HIS were different ($p<0.05$). The results further showed that during the wet season average milk production increased by six litres per cow per day. However, more milk was sold during the dry season as demand was higher while production was low. The study concludes that HIS has significantly contributed to smallholders' well-being in Tanzania. However, any dairy farming for poverty reduction innovation should consider agro-ecology and cultural issues.

DECLARATION

I, Msangya Lameck Msangya, do hereby declare to the Senate of Sokoine University of Agriculture, that this thesis is my own work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

11/11/2015.

Msangya Lameck Msangya **Date**

(PhD Candidate)

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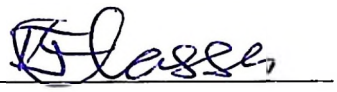

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Paper Two: Influence of Agro-Ecological factors and cultural practices on Heifer in-trust schemes in Njombe and Shinyanga Regions of Tanzania: Msangya M L*, Urassa J K[1]and Mahonge C P[2]. Published in the International Journal of Agricultural Extension and Rural Development Vol. 2(1), 2015 pp.031-040

Paper Three: Heifer In-trust schemes and incomes of smallholder households in the Highland and Semi-arid regions of Tanzania: M L Msangya, J K Urassa[1] and C P Mahonge[2]. Published in the Journal of Livestock Research for Rural Development 27 (1) 2015, number 17

Paper Four: Contribution of Heifer In-Trust schemes to smallholder households' well-being in Highland areas of Njombe Region, Tanzania: M L Msangya, J K Urassa[1] and C P Mahonge[2]. Published in the Journal of Livestock Research for Rural Development 26 (12) 2014, number 233

Paper Five: Role of Heifer In-Trust schemes to smallholder households' well-being in Semi-arid area of Shinyanga Region, Tanzania: M L Msangya, J K Urassa[1] and C P Mahonge[2]. Published in the International Journal Research Publication's: Research Journal of Social Sciences and Management, Volume 5, No 01 (2015)

DECLARATION

I, Msangya Lameck Msangya, do hereby declare to the senate of Sokoine University of Agriculture that the published articles that make this thesis summarize my independent efforts. This is my own original work and will not be part of any another thesis in the published or publishable manuscript format in any other institution.

LIST OF ABBREVIATIONS AND ACRONYMS

ABS	African Breeding Service
AI	Artificial Insemination
BOT	Bank of Tanzania
BRAC	Building Resource Across Community
CAHWs	Community Animal Health Workers
CEFA	*Comitato Europeo per la Formazionel'a Agricoltura* (European Community for Agriculture Formation) An Italy milk processing company in Njombe
CIS	Corrugated Iron Sheet
DADIPs	District Agricultural Development Investments Plans
DAFCO	Dairy Farm Company
DAO	District Agricultural Officer
DED	District Executive Director
DLFDO	District Livestock and Fisheries Development Officer
DSI	Development Studies Institute
EADD	East Africa Dairy Development
ECF	East Cost Fever
ELCT	Evangelical Lutheran Church of Tanzania
ESRF	Economic and Social Research Foundation
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FHH	Female Headed Household
FMD	Foot and Mouth Disease
FYDP	Five-Year Development Plan

GDP	Gross Domestic Product
HH	Household
HHH	Households Head
HIS	Heifer In-trust Scheme
HITz	Heifer International Tanzania
HPI	Heifer Project International
IFAD	International Fund for Agriculture Development
IGA	Income Generating Activities
ILO	International Labour Organization
ILRI	International Livestock Research Institute
IPP-Media	Independent Private Public Media (A group companies in Tanzania for media)
ISS	Institute of Social Studies
LGA	Local Government Authority
MDGs	Millennium Development Goals
MFEC	Mogabiri Farmers Extension Centre
NAIC	National Artificial Insemination Centre
NBS	National Budgetary Survey
NBS	National Bureau of Statistics
NJOLIFA	Njombe Livestock Farmers Association
NRCO	Njombe Regional Commissioner's Office
NSGRP	National Strategy for Growth and Reduction of Poverty
NSGRPII	National Strategy for Growth and Reduction of Poverty II
NTISLP	Northern Tanzania Integrated Sustainable Livestock Project
OP	Original Placement
PHC	Population and Housing Census
POG	Passing on the Gifts

PS	Project Supervisor
RAS	Regional Administrative Secretary
REPOA	Research on Poverty Alleviation
SACCOS	Servings and Credits Cooperative Society
SAGCOT	Southern Agriculture Growth Corridor of Tanzania
SCSRD	SUA Centre for Sustainable Rural Development
SDEP	Smallholder Dairy and Extension programme
SHDDP	Southern Highlands Dairy Development Programme
SNV	The Netherlands Development Organization
SPSS	Statistical Package for Social Sciences
SRCO	Shinyanga Regional Commissioner's Office
SSA	Sub-Saharan Africa
SUA	Sokoine University of Agriculture
TAMPA	Tanzania Milk Processors Association
TAWIRI	Tanzania Wildlife Research Institute
TAWLAE	Tanzania Women Leaders in Agriculture and Environment
TDB	Tanzania Dairy Board
TDV	Tanzania Development Vision
TOT	Training of Trainers
TSDDP	Tanga Small Dairy Development Programme
TZS	Tanzania Shilling
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
URT	United Republic of Tanzania
USD	United States Dollar
USDA	United States Department of Agriculture

VEO	Village Executive Officer
VLSC	Vet's Life Service Consultants
WB	World Bank
WBG	World Bank Group
WcD	Well-being in Developing Countries
WEO	Ward Executive Officer
WFG	World Facts Group
WFP	World Food Program
WHO	World Health Organization
WVI	World Vision International
WW II	World War II

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Poverty is a global phenomenon posing challenges to many poor families. Consequently, smallholder households find it difficult to access self-employment, food, income, assets, and education and health service opportunities. Globally, investment in dairy farming has been among the strategies used by the rural poor particularly in developing world forfood, income and reduction of poverty and promotion of their general well-being.

According to FAO (2005), dairy farming is an investment tool that is commonly used in poor rural areas and vested in traditional herding and safety net system. Dairy production makes a significant contribution to both household and national economic growth, rural livelihoods transformation, poverty reduction and meeting fast growing demands for animal protein in the developing world. According to Mathewman and Dijkman (1993),most of the proportion of the world population living in abject poverty are dependent in part on food and income derived from dairy products. To them, increased promotion in dairy cattle production is pressing the rapidly growing demand for dairy products. However, provision of livestock through credit or pass on the gifts philosophy has been a mainstay of most rural communities, mostly smallholder famers (Urassa, 2006).

Studies that focus on the contribution of dairy farming to poverty reduction and improved famers' well-being have a long history. However, the debate whether the dairy sector has significantly contributed to smallholder farmers' poverty reduction and improved well-being emerged in the 1990s. This debate was inspired by, among others, Mathewman

(1993), Moussa (1995), and De Leeuw *et al.*, 1999). The above information on the dairy sector's contributions to smallholders' poverty reduction and improved well-being did not consider diverse agro-ecological and cultural issues. Despite different challenges which face the sector, dairy farming has improved smallholders' access to food, income, and ability to meet children's education costs, health service expenses and employment opportunities.

According to Mathewman and Dijkman (1993), cited by Bikuba (2011), smallholder dairy farming is a system of keeping dairy cattle for milk production, mainly for family food and surplus for sale. In that system smallholder farmers keep a limited number of cows that they can manage to feed. The system mostly uses zero grazing or intensive methods of rearing livestock. Moussa (1995) categorizes smallholder farmers into two categories: the first one is practised by farmers who keep between 10 and 19 dairy cattle and are known as small-scale dairy farmers, and the second one is practised by farmers who keep more than 19 dairy cattle and are known as medium and large scale dairy farmers, mainly for business. According to De Leeuw *et al.* (1999), the smallholder dairy sector is an integral pillar in socio-economic standing of most of the Sub-Saharan Africa (SSA). To them small scale dairy production at household level is mainly functioning for food security and surplus for income generation roles.

The world milk production from small scale dairy cattle is estimated at 502 325 000 metric tons per year (FAO, 2003), with an average cow producing 5307 litres of milk per lactation for top producing cows in the European Union. Africa carries 16% of the world's small-scale dairy milk production with an average cow producing only 454 litres per year (Morgan, 1999).

In South East Asia Region, dairying is practised by millions of smallholders, medium and large dairy entrepreneurs. Dairy production over the last decade doubled that of global production averages, and it is estimated that 80% of the region's total milk production of 240 billion litres is supplied by smallholders with between 1 and 5 dairy cows (Chantalakhana and Skunmun, 2002). According to Chantalakham and Skunmun, the milk is mainly used for food and income for farming communities.

The smallholder dairy sector has been an integral pillar in socio-economic standing of most of the Sub-Saharan Africa (SSA)(De Leeuw *et al.*, 1999). Dairy production in Sub-Sahara Africa is functioning at household level for both food security and income generation roles. In general, dairy farming industry remains the key player in the livestock sector, accounting for 80% in milk industry. Africa is estimated to produce 20 643 000 metric tons of milk annually considering an ideal lactation period of 305 days. This gives an average of 1.5 litres per cow per day as compared to an average of 17.4 litres per cow per day in Europe. The difference in yields is mainly due to breed type and general management, including feeding and disease control mechanism by farmers. In Africa, most of these are given less attention.

In regard to smallholder dairy farming in the Eastern and Southern Africa, Kenya has the largest dairy sub-sector making available annually an estimated 85-90 litres of liquid milk, equivalent to per capita income based primarily upon well-established milk market-oriented smallholder dairy systems (Muriuki *et al.*, 2001). According Muriuki *et al.*, (2001), dairy plays a vital role in sustaining smallholder crop-dairy system through its contributions to nutrients cycling. This crop-dairy system enhances cropping of the staple food that dominates marketed dairy products and underpin the competitiveness of smallholder dairying in the Republic of Kenya. Elsewhere in Eastern and Southern Africa,

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dairy industry is supported by various organizations. For example, in Malawi, heifer loan project is supported by Shire Highlands Milk Processors Association (SHMPA) and has created opportunities for smallholder farmers to access food and income (Drew, 2008).

Tanzania's National Strategy for Growth and Reduction of Poverty (NSGRP II) puts poverty reduction high on the country's development agenda in additional to being committed to internationally agreed MDGs which target reduction of poverty, hunger, diseases, illiteracy, environmental degradation and discrimination against women by 2025 (URT, 2005). According to NBS (2014), more than a quarter (28.2%) of Tanzania's population are poor. Moreover, rural poverty is relatively higher with 33.3% being classified as poor compared to 21.7% in urban areas.

The NSGRP II puts emphasis on increases in factor productivity by focusing on technological changes with particular attention to rural agricultural productivity and its associated linkages with industry. The major role of agriculture, livestock in particular, has significantly helped smallholder households get out poverty (basic needs and food). Through livestock keeping, households can easily access food, income and mitigate risks during shocks such as drought and floods. In addition, in the African context, livestock owning increases social status and prestige of owners in respective communities. The study, therefore, aimed at assessing the contribution of heifer in-trust schemes to smallholder farmers' households' well-being in diverse agro-ecological and cultural environments of Tanzania.

Globally, Heifer In-trust Scheme (HIS) was founded by Dan West (1893-1971) who was a Midwestern farmer in Spain. West was ladling out rations of milk to orphans and refugees during the Spanish Civil War of 1944 when the idea of reducing dependency and relief

came to his mind. In this process, West thought that the people needed "a cow, not a cup". West thought that people in hunger needed cows that could produce milk, so families would not have to depend on temporary aid. In order to make his idea move forward, West founded the Heifer Project International (HPI) and HIS for Relief in 1944, which is dedicated to ending hunger and poverty. In 1944, the first instalment of Heifer In-trust cows sent abroad were donated by West's neighbours and distributed throughout Europe, following the end of World War II in 1945. Heifer Project International has now expanded its mission and area of operation to America, Asia and parts of Africa. The mission has expanded from dairy cattle only to including goats, camels, geese and guinea pigs to bees, silkworms, water buffalos and chickens. Since the start of the scheme, the credit provision model of dairy development, rural credit and development has been taken up by quite a number of donors and projects worldwide. A number of donors have been investing considerable amounts of money in trying to improve the smallholder farmers' households' well-being through livestock support.

The work of HPI is guided by twelve cornerstones, and the "Passing on the Gift" philosophy is the fundamental cornerstone of the twelve. The twelve cornerstones are: Passing on the Gifts; Accountability; Share and Caring; Sustainability and Self-reliance; Improved animal management; Nutrition and income; Gender and family focus; Genuine need and justice; Improving the environment; Full participation; Training and education and Spirituality. Generally, recipients are required to share the first female offspring of the gift animal with others in need, making them equal partners with Heifer Project International in the fight to end world hunger, poverty and caring for the earth. HPI is also guided by the Honduras manifesto which recognizes that being vulnerable and marginalized is not ''one's choice'', but the result of historical events, economic disparities, agro-ecological differences, social inequalities and injustice. Therefore, HPI

works with vulnerable populations in trying to get them out of their undesirable situation thus enabling them to live better life.

In Tanzania, Heifer Project International started its operations in 1974 at Kitulo Dairy Farm, currently in Njombe Region. Following the new NGOs registration Acts in Tanzania in 1974, the name of HPI has remained as a trade name, but the business name is Heifer International Tanzania (HITz). Since its establishment in Tanzania, HITz worked in 21 regions in Mainland as well as in Zanzibar. For effective and efficient impacts to a critical mass, HITz has developed a 5 years (2012-2017) new strategic plan which targets the three clusters. One of the clusters is the Southern Highlands [i.e. the Southern Agricultural Growth Corridor of Tanzania (SAGCOT)] covering approximately one third of Mainland Tanzania. The SAGCOT is also supported by "*Kilimo Kwanza*" (Agriculture first) initiatives due to the areas having huge agricultural potential. Generally, the area has agriculture and livestock potentials, and hence the government has identified it as a high potential dairy growth area, targeting subsistence and agro-entrepreneur farmers (EADD, 2013).Other clusters are the Southern-Eastern which covers the costal belt (Morogoro, Pwani, Dar es Salaam, Tanga, Pemba and Unguja Islands) and the central corridor cluster which covers the central regions of Dodoma, Tabora and Singida.

HIS, a livestock credit model, has been one of the ways by which the rural poor have managed to acquire improved livestock. Without HIS it would have otherwise been difficult to poor smallholder farmers to get out of poverty. HIS has been prominent among other rural poverty reduction models used for rural poor in developing countries to reduce various shocks or risks and reduce poverty. This livestock credit investment model is commonly used in poor rural areas and vested in traditional hedging and safety net systems (Urassa, 2006). The provision of livestock through inheritance or gifts has been a

mainstay of most rural communities. As such livestock owners use their animals either as a means of production, as capital or both (Kurwijila, 2003).

In Tanzania, HIS was first introduced at Kitulo dairy farm in Makete District in Njombe Region under Dairy Farming Company (DAFCO) in 1974. DAFCO had been tasked by the Tanzanian government to establish the foundation herd farms to produce improved dairy heifers for distribution to communal (*Ujamaa*) villages by then. Since then, HIS went on working and has been a popular rural credit model for more than 40 years. In addition, many dairy development partners are currently involved in this strategy of credit and development. HIS has been a vibrant rural credit development for livelihood and, to the present, this dairy development model has been adopted by quite a number of programmes in the country including Tanga Smallholder Dairy and Extension programme (SDEP) that was sponsored by The Netherlands Development Organization (SNV). The Heifer Project International (HPI) that funded the HIS; and the District Agriculture Development Investment Programme (DADIPS) under the sponsorship of the United Republic of Tanzania (Urassa, 2006 and HITz, 2011).

The introduction of HIS in Tanzania mainly aimed to address the challenges of lack of capital by men and women smallholder farmers. Therefore, the government and development partners since 1974 (during communal Ujamaa villages) have been encouraging the HIS prominent livestock credit model for poverty reduction (Urassa and Raphael, 2001; Mwakalile *et al.*, 2002; Mwankemwa, 2004; Urassa, 2006;Kyomo *et al.*, 2006).

In recognition of central role of smallholder dairy farmers in the development of the dairy sector in the country, the government, with support from bilateral donors agencies,

supported a number of smallholder dairy development initiatives across the regions, including the 5-year (2010-2014) Northern Integrated Sustainable Livestock Programme (NTISLP) sponsored by Heifer Project International (USA). NTISLP was implemented in 10 districts of Kilindi (Tanga), Babati, Hanang and Mbulu (Manyara), Manyoni (Singida), Bunda (Mara), Bukombe (Geita), Igunga and Uyui (Tabora) and Kisarawe (Pwani) and the current 5-year (2014-2019) East Africa Dairy Development (EADD2) programme sponsored by the Bill and Melinda Gates Foundation being implemented in 9 districts of Njombe, Mbeya and Iringa milk shed regions, to mention a few. The major objective of the EADD2 is "improved sustainable livelihoods of 136000 families through a competitive and inclusive dairy industry in East Africa". In Tanzania the programme is targeting 35000 families (EADD2, 2013).

According to a study by Mpila (2006) on poverty reduction through Heifer Project International Tanzania, it was observed that the Heifer In-trust Scheme (HIS) is a vital mechanism of reducing poverty and promoting smallholder farmers' well-being. Through HIS, poor smallholder farmers have great opportunities to increase their households' income. The HIS has been used as a significant tool to contribute towards poverty reduction and enhance household well-being. According to Manyama (2009), many men and women smallholder households have, through HIS, been able to get the financial ability to take their children to school through income gained from the sales of heifer in-trust products such as milk and by-products such as manure, among others. Manyama's observation tallies with West's argument that an individual or poor resource family cannot move out of poverty and achieve well-being if not supported with livestock. According to Urassa (2006), in order to reduce rural poverty and promote their well-being, a vibrant rural economy is required. Urassa (2006) emphasizes that improving agricultural productivity, fostering non-farm activities, developing rural infrastructure and expanding

markets are necessary for farmers' increased income. Generally, literature shows that poverty among smallholder farmers needs to be dealt with from different angles in order to bring their sustainable well-being. Based on the Heifer In-trust context, existing literature (Mwankemwa, 2004; Urassa, 2006; Kyomo *et al.*, 2006; Manyama, 2009) link poverty reduction strategies with heifer in-trust scheme as well as with the improvement of well-being of the rural people. However, there is still a gap as regards lack of knowledge on how heifer in-trust schemes are influenced by diverse agro-ecological and cultural factors. The research on which this thesis is based was done to fill in that gap.

On the other hand, agroecology uses ecological concepts and principles for the design and management of sustainable agroecosystems whereby external inputs are replaced by natural processes such as natural soil fertility and biological control (Miguel *et al.*, 2012). According to Miguel and Nichol (2012), the global south has the agro-ecological potential to produce enough food on a global per capita basis to sustain the current human population, and potentially an even larger population without increasing the agricultural land base.

The agro-ecological and cultural issues have large variations amongst livestock production systems among various zones as well as among men and women household heads in trying to improve the smallholder farmers' well-being. As regards agro-ecology, for example, in mountainous ranges, livestock production can be said to be forest-based as such areas are a main source of fodder (through gazing and cut and carry system). However, in the indo-gangetic plains zones, crop residues are the major sources of fodder for livestock, and majority of animals are stall-fed or only particularly grazed as there is hardly any migration (Laura, 2014). On the cultural perspectives, assets such as land ownership, access to other productive resources and the organization of agricultural and

livestock production, are influenced by cultural structures, beliefs, practices and traditions. For example, some agro-ecological factors influence agro-pastoralism due to big areas of uncultivated land among others, traditional structural rules of land access and inheritance (by lineage, gender and/or other culturally determined characteristics). These are core determinants of effective access to resources, including land for agriculture and livestock. Cultural aspects are thus of central importance for the understanding and devising of appropriate interventions in agriculture and food security for smallholder farmers' well-being. Apart from farming, cultural issues are also central to adequate food, given that the appropriateness of foodstuffs, food taboos and food distribution along age and gender lines are culturally determined.

1.2 Problem Statement

Although smallholder farmers make up a large part of the agricultural production work force; their participation does not always transform their well-being; poverty remains high in rural areas. More than a quarter (28.2%) of the population in Tanzania is poor (WBG, 2015). Despite several attempts by the government and development partners to improve smallholder farmers' well-being, the rural poor fail to transform their well-being, partly due to poor knowledge on agro-ecological factors and cultural practices effects among rural poor and development partners. These factors and practices have been a challenge for smallholders' farmers and dairy sector development for a long time in Tanzania. For example, most of smallholder farmers do not know whether too much or less rains influence the availability of quality pastures and milk production which leads to less milk production for food and for income from sales of milk, leading to poor well-being. On the other hand, farmers also have inadequate knowledge on how cultural beliefs and traditional practices amongst others may positively or negatively influence crop and

livestock production and productivity which are key factors for household well-being improvements.

Understanding those factors and practices by men and women smallholders is crucial for their households' well-being improvement. Yet, their enabling/constraining factors over time are not clearly understood. In addition, farmers' perception of the effects of those agro-ecological factors and cultural practices data to improve understanding of their development is not well known in the study regions. Various studies have been conducted on smallholder farmers' well-being in Tanzania and elsewhere (Urassa and Raphael, 2001; World Bank, 2003; Urassa, 2006; URT, 2011). However, in all these studies, well-being was regarded as possessing or access to materials, property and related assets such as income. Moreover, none of the above concentrated on the contextual factors affecting access to those materials and assets. Generally, a household's well-being is shaped by various dynamic factors including seasonality, rainfall pattern, traditional practices and available gender relation in terms of resources ownership, among others. These have been ignored in the existing literature. The study aimed at bridging this knowledge gap and add to the dearth of literature available.

1.3 Justification for the Study

Studies on agro-ecological and cultural effects to smallholders' well-being are scanty and skewed focus-wise. Therefore, there was a need for a study to critically assess contribution of Heifer In-trust Schemes to men and women smallholder farmers' households' well-being in diverse agro-ecological and cultural environments of Tanzania.

The current study is in line with global Millennium Development Goals (MDGs) as well as the Sustainable Development Goals (SDGs). It relates with MDG number 1 that aimed

at eradicating extreme income poverty and hunger by 2015. This goal is similar to SDGs numbers 1 and 2 which also aim at no poverty and zero hunger by 2030. It is further in line with MDG number 2 which aimed at promoting Universal Primary Education by 2015 and also links with SDG number 4 which aims at promoting Quality Education. The study is also in line with MDG number 3 which aimed at Promoting Gender Equity and Empowering Women by 2015 and also links with SDG number 5 which aims at promoting Gender Equity by 2030. Heifer In-trust Schemes (HIS) which aim at enabling poor resources smallholder famers to come out of abject poverty, reduce hunger and empower women through livestock resource support and related training opportunities. In HIS, poor resourced women household heads are given priority. Gender and family focus is among twelve Heifer International cornerstones that are used in governing HIS implementation.

At the national level, the study is in line with major development goals and plans. It is in line with the National Strategy for Growth and Poverty Reduction (NSGPR-II) that aims at boosting the economy and reducing poverty by 2015. It is also in line with the Five-Year Development Plan that aims at increasing people's incomes and boosting household well-being by 2020. It is also in line with the National Livestock Vision which is geared towards promoting the dairy sector to increase production, productivity and reduce poverty by 2025. In Tanzania, HIS is expected by the government and development partners to play a great role in contributing to the achievements of these goals and plans. HIS targets men and women smallholder famers for poverty reduction, ending hunger, increasing food security and income, and empowering women. Therefore, it is imperative to find more evidence of HIS contributions to household well-being for which men and women smallholder farmers are the most targeted.

In addition to the above, most of the Tanzania's poor are found in rural areas, and rural poverty is intimately tied up with agriculture including livestock and fisheries. Yet, the majority of Tanzanians depend on agriculture as their major source of livelihoods for around 77.5% of the population. According to Mnenwa and Maliti (2010),the rural poor are predominantly smallholder agricultural producers and agricultural labourers. As mentioned also in the introductory part, HIS was started to help rural poor resource farmers to get out of poverty thus enabling them to enjoy life.

Since immemorial time, livestock have been used as a means out of poverty. Households with livestock were regarded to be rich compared to those who did not have livestock. Livestock were used during different shocks or risks to either mitigate or get out of them. Various sources of literature (Urassa, 2006; Mpila, 2006; Manyama, 2009) on rural poverty reduction indicate that livestock support poor households. For example, heifer in-trust scheme (HIS) is a vital mechanism of reducing poverty and promoting smallholder households' well-being. Through HIS poor smallholder farmers have great opportunities to increase their households' food security and income. Despite this vital contribution of livestock to poverty reduction among smallholder households, the contextual factors of diverse agro-ecology and culture that have influence on livestock performance have not been given due consideration. These diverse agro-ecological factors such as rainfall partners, quality pasture availability and cultural practices such as traditional animal grazing systems and animal treatment have an influence to HIS performance in terms of milk production and sales of milk, to mention a few.

Generally, a household's well-being is shaped by various dynamic contextual factors including those of agro-ecology and cultural practices. Those contextual factors have been ignored in the existing literature. Therefore, there is still a gap as regards lack of

knowledge on how households participating in HIS are influenced by diverse agro-ecological and cultural factors.

1.4 Objectives of the Study

1.4.1 General objective

To assess the contribution of Heifer In-trust Schemes to smallholder farmer households' well-being in diverse agro-ecological and cultural environment of Tanzania.

1.4.2 Specific objectives

i. To explore the role of Heifer-In-trust Schemes to smallholder's self-employment
ii. To determine the implications of the rains patterns, quality pasture, traditional animal grazing systems and treatment; and protection to Heifer In-trust Schemes objectives
iii. To assess the participation and benefits of men and women household heads in Heifer In-trust Schemes in the study areas of Njombe and Shinyanga Regions.
iv. To evaluate the performance of households' well-being indicators in the study area.

1.5 Research Questions and Hypothesis

1.5.1 Research questions

For guiding the descriptive analysis, the study was guided by the following research questions:

i. How has HIS contributed to formally less educated smallholder self-employment opportunities?
ii. How do rains patterns, quality pasture availability, traditional livestock grazing systems, animals treatments and protection influence the HIS objective?

iii. How has HIS influence the participation of men and empowering women in the study area?

iv. How HIS influence households' well-being proxy indicators in the highland and semi-arid Regions in Tanzania?

1.5.2 Research hypotheses

The study derived its hypotheses from Dan West's Theory of Heifer In-trust Scheme. To West, in order to improve well-being of the poor smallholders in terms of taking them out of abject poverty, to be food and income secure, such people should be supported by in-trust heifers which is a female (in-calf) dairy cow to give milk for food and income to facilitate assets acquisition and other basic household's purchasing ability.

For inferential analysis the study tested the following null hypotheses:

(i) $\mathbf{H_1}$= HIS has no significant role in smallholder self-employment opportunities in highland and semi-arid regions of Tanzania.

(ii) $\mathbf{H_2}$ =Seasonality, rainfall patterns, quality pasture availability, and traditions livestock grazing, animal treatment and protection have no significant effects on the performance of HIS in highland and semi-arid regions of Tanzania

(iii)$\mathbf{H_3}$ =HIS has no significant role in empowering poor resource men and women in the highland and semi-arid regions in Tanzania

(iv)$\mathbf{H_4}$ = HIS has no significant contribution to smallholder farmers' well-being indicators' improvement in the highland and semi-arid areas in Tanzania.

1.6 Theoretical Framework and its Application

1.6.1 Perspectives of in-trust or in-kind Credit

This study used four different In-trust/credit contemporary Theories and One Theory of Change to develop the Framework. The first theory of credit was founded by Dynasty in 1875 after studying the system of credit and banking in the Roman Empire. His theory states that "moral qualities and character may be used for the purpose of purchasing merchandises with a promise to pay instead of actual money", and that when promise is fulfilled it becomes a popular and termed "credit". According to Dynasty, general credit was the centre for greatest wealth to any man doing commerce. The in-kind finance theory states that "it is typically less profitable for an opportunistic borrower to divert inputs than to divert cash (Burkart and Ellingsen, 1999). To Burkart and Ellingsen's in-kind finance theory implies that trade, credit and bank can either complement or substitute for improving borrowers' well-being. Access to credit is important for the productivity and overall welfare of farmers in developing countries (Deb, 2012). According to Deb, farmers get access to credit for inputs under different situations and that the credit is either provided in-kind or as a combination of in-kind and cash for making them produce more and making their living better. Deb argues that, without credit, poor and budget constrained farmers could not afford to use fertilizer despite the financial benefits from the resulting high yields. Therefore, providing farmers with credit was the only way of increasing the supply of export quality produce while enabling them to improve their well-being. On the other hand, Dan West's Heifer In-trust philosophy emphasis is that, in order to improve well-being of the poor, such people should be supported by in-trust heifers. West's in-trust philosophy on poor's well-being is centred on heifer as an in-trust/in-kind credit. As West built his philosophy in the credit theory, this study was also guided by the heifer in-trust philosophy as propounded by West in 1944.

1.7 Conceptual Framework

The framework presented in Fig.1 was informed by four In-trust/credit theories and one Heifer International Theory of Change. From the background variables, HIS participation considers less formally educated, widows and widowers, amongst others, as the key criteria for involvement. The independent and intermediate variables influence HIS participating households' well-being. The change of one variable either due to seasonality or practice may enable or hinder the achievement of HIS aims among its beneficiary. The dependent variables' indicators depend much on the independent and interdependent variables. The study hypothesized that any change of independent and intermediate variables have impacts on HIS performance towards realising household well-being. Dairy farming systems, rainfall patterns, quality pastures availability, animal health and milk production are more determined by agro-ecology. On the other hand, dairy farming system is influenced by grazing style such as free range, semi-intensive and intensive grazing that are determined by cultural practices.

According to the framework presented in Fig. 1, ignoring one or both factors in independent and intermediate variables in any dairy farming system can trigger impact on HIS performance as well as in smallholder household well-being. The impact can be either negative or positive on HIS and its beneficiaries. As pointed earlier, the HIS supporting smallholder farmers cannot play a significant role in poverty reduction and in improving household well-being if rains patterns, quality pasture availability and quality animals potential breeds are not considered. On the other hand, this dream may not come true if traditional livestock zero grazing system, animal treatment and protection are not improved. In so doing, failure to consider and getting-out of the above mentioned factors by smallholders, even with good animal husbandry that includes feeding, housing, breeding and disease control HIS beneficiaries may not get their well-being improved.

This is because the smallholder farmers' well-being which is the dependent variable is measured by proxy indicators of income security (annual net income); food security (type of diet, frequency of meals and food diversity taken per person per day); getting basic services (ability to meet medical cost and to pay children's education fees; type and number of jobs created to HIS beneficiaries; and type of assets acquired (land, house, solar energy, transport facilities and utensils) related to the HIS. Since the community's social and cultural and environmental qualities vary from one agro-ecological location to another one, it is assumed that an individual's or household's well-being is influenced by agro-ecological and cultural factors, among others.

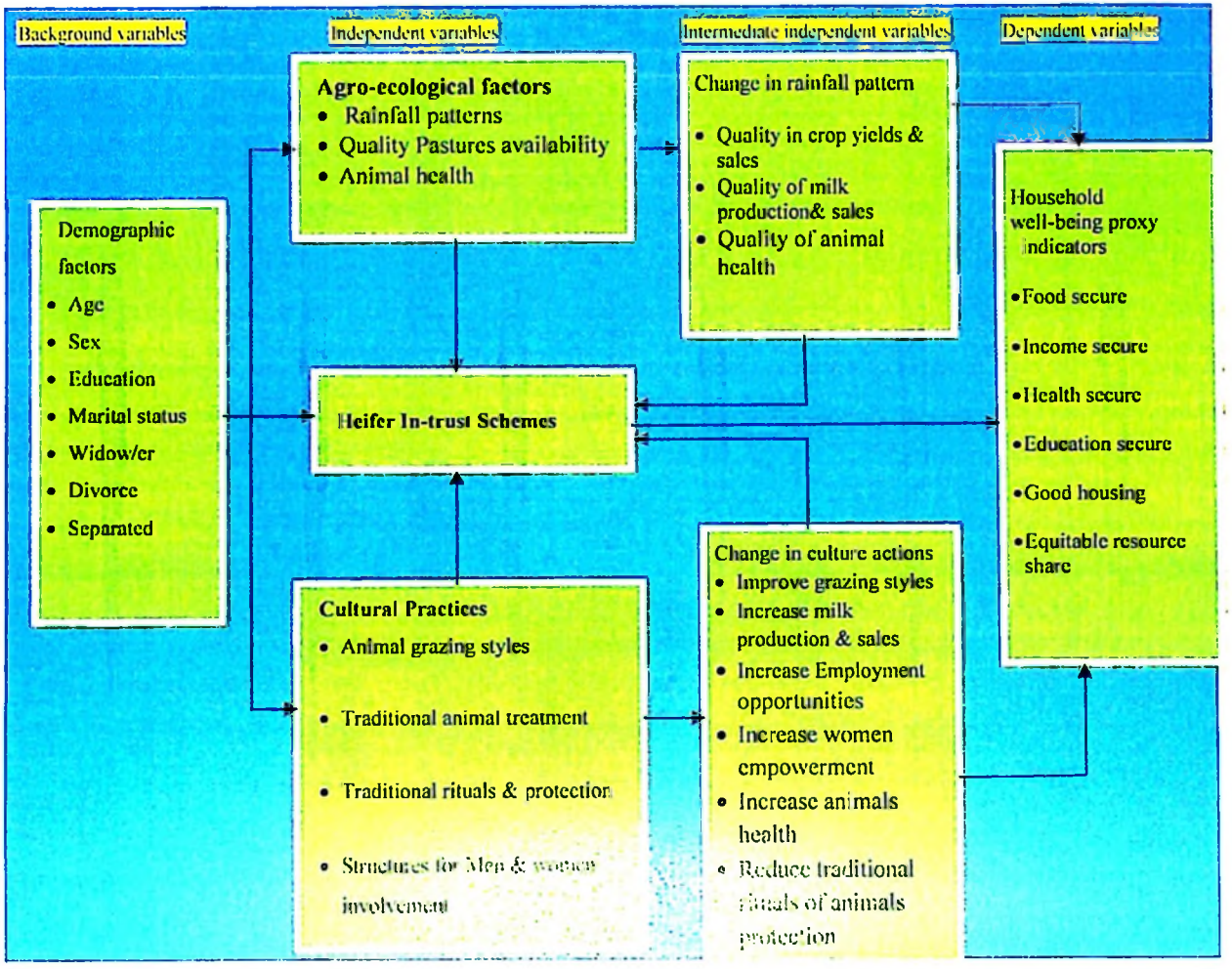

Figure 1: Interactions among variables for the research.

1.8 Organization of the Thesis

The thesis is organized in three chapters. Chapter One presents the introduction which sets background information of the thesis. Chapter Two presents five published papers. Paper One focuses on the role of Heifer In-trust Schemes in employment among smallholder farmers in selected highlands and semi-arid regions of Tanzania. This is followed by Paper Two that is about influence of agro-ecological factors and cultural practices on Heifer In-Trust Schemes in Njombe and Shinyanga Regions of Tanzania. Paper Three focuses on the contribution of Heifer In-Trust Schemes and incomes of smallholder households in selected highlands and semi-arid regions of Tanzania. Paper Four is about contribution of Heifer In-Trust Schemes to smallholder households' well-being in highland areas of Njombe Region, Tanzania. Paper Five deals with contribution of Heifer In-trust Schemes to smallholder households' well-being in semi-arid areas of Shinyanga Region. In Chapter Three, overall conclusion per paper and recommendations are presented. The chapter also presents theoretical implications of the study findings, contributions to the existing literature and proposes areas for further research.

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CHAPTER TWO

PAPER ONE

Role of Heifer In-Trust Scheme in Employment among Smallholder Farmers in Highlands and Semi-Arid Regions of Tanzania

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Role of Heifer In-Trust Scheme in Employment among Smallholder Farmers in Highlands and Semi-Arid Regions of Tanzania

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Abstract

This paper explores the employment opportunities generated by Heifer In-trust Schemes (HIS) in highlands and semi-arid regions in Tanzania. The measurements used are the types and the number of self-employed jobs and the income attributed to HIS self-employment among smallholders. The study adopted a cross-sectional design whereby primary data were collected from 402 randomly selected HIS beneficiaries' households using a pretested structured questionnaire. In addition, nine focus group discussions were conducted to supplement information collected through the questionnaire. Results show that HIS had generated employment opportunities and income among smallholder farmers in highlands and semi-arid areas of Tanzania through rural dairy farming, milk collection, milk vending, water trading, animal health provision and Artificial Insemination (AI) services. HIS has also contributed to rural employment opportunities among low formal educated youth, women and men in the study areas. The study recommends more investments in rural dairy farming to promote self-employment.

Keywords: Less formally educated; Heifer In-trust Schemes; highland; men; semi-arid; self-employment; Tanzania; women; youth

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1. Introduction

Dairy farming initiatives can be a vital model for rural employment. Unemployment among the youth, women and men with low formal education is a big challenge in Tanzania. Globally, the livestock sector provides employment to over 18 million people, nearly 70 per cent of them being women, who mainly prepare feeds and do feeding [1]. In addition, dairy farming, milk collection, animal health service provision and milk processing also provide employment to a significant number of people [2]. The role of the livestock sector in poverty reduction programmes such as Heifer In-trust Schemes (HIS) in developing countries has received considerable attention worldwide [3]. Agriculture which is mainly carried out in rural areas generates most of the new employment opportunities, especially among the youth and women in these countries. Despite the persistent rural to urban migration, a large proportion of the population in many developing countries still lives in rural areas and are mainly dependent on subsistence agriculture [4]. For example in Tanzania, agriculture including livestock forms the mainstay of the economy contributing about 24 percent of the country's GDP [5, 6]. The sector accounts for 95% of the food consumed, and out of this 13 percent is from livestock [7]. In addition to the importance of livestock production to the national economy, livestock has also been contributing to self-employment among the youth and women and to the general well-being of the households [8]. Livestock embody rural savings and act as a risk mitigating reserve against shocks such as drought and floods. According to [9] money from the sales of either live animals or their products can be used in meeting various household major expenses.

Worldwide, HIS, which is a rural livestock credit model, was introduced by Heifer Project International (HPI) with the aim of reducing rural poverty, hunger and promoting well-being of resource constrained households [10]. HIS is dedicated to supporting these households into becoming self-reliant. Through this model, the recipient family is given an in-calf heifer based on an agreement that the family will pay this credit through the first livestock off-spring. The HIS idea originated from Dan West (1893-1971) who was a Midwestern farmer in Spain. West was lending out rations of milk to orphans and refugees during the Spanish Civil War when this idea of reducing dependency on relief came to him. He founded the Heifers Project International (HPI) and HIS for Relief in 1944. In Africa, HIS was introduced in Tanzania and Cameroon in 1974.

As for Tanzania, the HIS was first introduced at Kitulo Dairy Farm in Makete District, in Njombe Region with the aim of establishing the foundation herd farms which would produce improved dairy heifers for communal (*Ujamaa*) villages. In Njombe and Shinyanga regions, the HIS was launched in 1998 with the provision of 72 in-calf heifers to each region as the seed stock to start with. Since 1980, HIS has been known as the credit model for poverty reduction and self-employment opportunities in Tanzania. The Government of Tanzania and other donors have adopted various small-scale dairy farming initiatives to generate self-employment opportunities to address rural poverty and food insecurity. The initiatives included the Northern Tanzania Integrated Sustainable Livestock Program (NTISLP) funded by HPI; the District Agricultural Development Investment Programme

(DADIPs) under the Government of Tanzania and the East African Dairy Development (EADD 2) funded by Bill and Melinda Gates Foundation in USA [11, 12, 13].

Studies on agro-ecology and cultural effects to smallholders' well-being are scanty and skewed focus-wise as most of them considered well-being in terms of materials access. In fact, well-being of a household is shaped by various dynamic factors including agro-ecological influences such as seasonality, rainfall patterns, and traditional beliefs, and practice in the other hand among others. This study on which this paper is based was conducted to address this knowledge gap by exploring HIS employment opportunities in the two study regions. This study is in line with the Millennium Development Goals (MDGs) 1 and 3 that address extreme income poverty, hunger, and gender equity by 2015; Tanzania's Development Vision (TDV) 2025; and the National Strategy for Growth and Poverty Reduction Strategy (NSGRP) II. This study fills the gaps in the existing literature regarding rural employment opportunities. The findings of the study enhanced knowledge among academicians and potential government ministries on solution to underemployment among the less formally educated youth, women and men in rural areas.

Inferentially, this study tested a null hypothesis says Heifer In-trust Schemes has no significant role in smallholder self-employment opportunities in highland and semi-arid regions of Tanzania. Descriptive-wise the study guided by a question: 'How has HIS played the employment opportunities role among smallholder farmers? The study's main objective was to determine the employment opportunities generated through HIS in Njombe and Shinyanga regions in Tanzania. Specifically, the study assessed the types and the number of self-employed jobs generated through HIS and analysed the smallholder's income attributed to HIS jobs. In this study, self-employment refers to a routine commitment of smallholder farming households which brings them consistent income in order to meet their daily needs. This definition is in line with [14] saying that self-employment is a survival strategy for men and women who cannot find any other means of earning an income. In this study, income is defined as the net cash household earns from selling milk, pastures and water. This definition is in agreement with [15] who hold that an income consists of all receipts whether monetary or in-kind of goods and services which are received by either the household or individual members of the households either annually or in more frequent intervals. This study also defined pasture as grass, grazing land or other vegetation used as animal feed. The study also defined Community Animal Health Workers (CAHWs) as progressive farmers with best performance, who are Primary Animal health Care, as first aiders and who graduated and are involved in AI services provision. The study also defined milk vending as an action of trading raw milk by HIS producers. Lastly, in this study Artificial insemination (AI) is defined as the deliberate practice done by CAWHs or other people to fertilize heifers. The definition is in line with [16] which says that AI is introduction of semen into a female's vagina or oviduct for the purpose of achieving pregnancy through fertilization by means other than copulation.

2. Methodology

2.1. Description of study area

Njombe and Shinyanga regions are among 30 Tanzania's administrative regions. These regions are found in two contrasting and diverse agro-ecological environments of Tanzania. Njombe is located in the southern highlands of Tanzania. According to Tanzania's 2012 national population and housing census, Njombe Region had a population of 702,097 [17].

This region has a size of 21,347 km^2 [18]. 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. Njombe Region is at 1,581 metres above the sea level and receives an average annual rainfall of 1500 mm [19]. The major ethnic groups in Njombe Region are the Bena and Kinga people. In Njombe District, the study was conducted in eight villages namely: Igima, Mlevela, Nyumbanetu, Numdu, Utalingoro, Itulike, Kibena and Nyombo.

Shinyanga Region lies 60 kilometres from the Lake Victoria shore that forms part of lowland semi-arid areas of Tanzania. According to the 2012 Tanzania national population and housing census report, Shinyanga Region had a population 1,534,800 [20]. Shinyanga has a size of 50,781 km^2 [21]. 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. The region receives an annual average rainfall of 500 mm [22]. The major ethnic groups in the region are the Sukuma, Nyamwezi and Sumbwa people. This study was conducted in 10 villages namely, Uzogole, Mwamagunguli, Chibe, Ihapa, Bushushu, Lubaga, Ndala, Mwasele, Kitangili and Bugayambele.

2.2. Study approach

The study applied a cross-sectional design which is appropriate for a research whereby data are collected once [23], like the case was for the research for this paper. Through cross-sectional design, data are collected once [24]. Using HIS beneficiaries' registers in Njombe and Shinyanga, 402 beneficiary households were randomly selected, this accounted for 5% of all the beneficiary households in the study areas. Primary data were collected from 402 randomly selected HIS beneficiaries households using a structured questionnaire. For correctness and data triangulation, nine focus group discussion (FGDs) were also conducted to complement information collected through the questionnaire.

2.3. Data analysis

The primary data which were collected through the questionnaires were analysed using Statistical Package for Social Science (SPSS 16). The descriptive statistics was used to analyse quantitative data to determine the frequencies and percentages. T-test was used to determine whether there were significant differences in average incomes earned through HIS self-employment opportunities, and also whether there were significant differences in average incomes between self-employment opportunities against income earned before and after their participation in the HIS. Qualitative data from the FGDs and Key Informants (KIs) were analysed using content analysis which enabled categorization and comparison of the information into meaningful verbal strings and their organisations into logical patterns.

2.4 Limitation of the study

Generally, proper planning of a study enables one to collect data easily. This study interviewed four hundred and two respondents using structured questionnaire. During the course of the study, the following were the limitations; there was inadequate record keeping skills by some of the smallholder farmers. Some of HIS beneficiaries' respondents were not able to quickly respond to questions on issues of units of measure such as kilogram, litres and tonnages as they are used to traditional names and units of measures. In order to overcome this limitations, the researcher used names and units of measures used locally and convert these measurements into standard units

of measures without losing the quality of primary information as provided by the respondents. There was inadequate literature on how small-scale dairy farming provides employment opportunities among less formally educated people.

3. Results and discussion

3.1. Profile of dairy farming households

The study involved 402 HIS household respondents who had lived in the area for more than 20 years. All lived in their own houses, and 75.8% of the houses were roofed with corrugated iron sheets; 69.8% had floor made of cement and 75.8% had walls made of either blocks or burnt bricks. According to the respondents, the construction of the houses had been possible due to income earned from HIS self-employment opportunities. According to the [25] income obtained from HIS has significantly contributed to the construction of good houses, meeting education costs of the children as well as health services costs for families. Ninety point seven percent (90.7%) of the households owned land ranging from 1.5 to 7.5 acres. More than three-fifths (76.1%) of the household heads had completed primary school education.

3.2. HIS and self-employment to less educated youth, women and men

The findings in Table 1 show HIS beneficiaries education status. They were less formally educated youth, women and men who were self-employed in HIS through the dairy sector. All 402 respondents reported that before HIS they had no dairy cattle, but few of them had chickens. Beneficiaries reported that 606 and 302 dairy cattle were owned by female and male headed households respectively. This finding is in line with [26] that reported that the livestock sector provides self-employment to nearly 70 per cent of less formally educated, particularly women. The average number of dairy cattle owned by the respondents ranged from 2 to 3 cows. Similar findings were reported by [27] who reported that smallholder dairy farming in Asia revealed that about 80 percent of the region's total annual milk production of 240 billion litres was supplied by smallholders with between 1 and 5 cows.

Table 1: Education level of HIS beneficiaries by region and sex of household head (n = 402)

		Completed education		
Region	**Sex of household**	**Education parameters**	**Frequency**	**Percent**
Mbeya	Males (n= 94)	No formal education	10	2.4
		Primary school education (Std 1 - 7)	80	20.0
		Secondary school education (Form 1 - 4)	4	1.0
	Females (n= 106)	No formal education	12	3.0
		Primary school education (Std 1 - 7)	93	24.0
		Secondary school education (Form 1 - 4)	1	0.2
Shinyanga	Males (n= 44)	No formal education	20	5
		Primary school education (Std 1 - 7)	21	4.0
		Secondary school education (Form 1 - 4)	3	1.0
	Females (n= 158)	No formal education	34	8.4
		Primary school education (Std 1 - 7)	112	28.0
		Secondary school education (Form 1 - 4)	12	3.0
			402	**100.0**

Generally, the respondents in this study pointed out that the involvement of women and men in HIS had vitally contributed to increased employment opportunities among them. During the FGDs in Njombe Region, a 53 years old women who also was a HIS beneficiary from Igima village said: *"We were idle with no jobs, but through HIS now we are self-employed. We are not idle anymore, and we are very committed to our employment as it gives us income for all of our household needs"* (Focus Group Discussion held on 19 December 2012). Furthermore, the respondents reported that their incomes mainly came from dairy farming. According to the [28] the livestock sector in Tanzania employs 10% of the youth, women, and men. Despite the apparent differences in the benefits generated from dairy farming in these two regions, the respondents reported that the introduction of HIS in the study areas had made them richer as they could then substitute hired labour for household labour with using incomes obtained from own employment. Similar findings are reported by [29] who reveal that, as farmers become richer, they are increasingly inclined to substitute household labour with hired labour, thus creating greater employment opportunities; and that in rural Africa employment opportunities are not only available in large commercial farms but also in the smallholder sector where there is an active labour market.

Regarding gender in relation to employment, the respondents reported that, for the previous decades, women could not be employed in the dairy farming as they were traditionally not allowed to have large types of livestock. Large livestock refers to those animals with high economic value in terms of monetary terms. Such animals include as cattle, goats and sheep to mention a few. Traditionally, in most African communities, women were only allowed to own small animals/livestock such as chicken and rabbits. However, during the FGDs in Shinyanga Region, a 45 year old female discussant from Kitangili village emphatically expressed how dairy farming had employed her and enabled her to improve her household's income by saying: *"The food we eat and the income my household earns come from selling milk. My household also uses the income to pay for our medical expenses and for the costs of educating our children"*. Discussants reported that no longer were cultural barriers that limit women from owning large types of livestock. Men and women can now equally benefit from HIS programmes and can have equal access to employment opportunities. These findings imply that HIS in these two regions has contributed to self-employment among smallholder farmers. The findings also imply that, through HIS, formally low educated people have chances of being employed and earning a decent income from dairy farming. Such people would perhaps never have access to employment opportunities in the formal sector, which normally requires higher levels of education and qualifications.

3.3. HIS and animal pastures production

The study results in Table 2 show that availability of pastures/fodders was favoured by highland agro-ecology. This weather is good for the establishment and growth of pastures. The respondents in semi-arid regions reported that being at the lowland and dry area, it was not easy to establish and maintain pastures. The respondents also reported to have reserved crop residues for the dry season to feed animals. Similar findings are reported by [30] who reveal that, during the time when pastures are not available, smallholder farmers mainly feed their animals with natural herbage including crop residues and leaves from fodder trees. During FGDs in Njombe Region, discussants reported that 50 kilograms of maize crop residue was sold at a mean price of between TZS 5,000 and 15,000 ($ 3 and $ 10). They also reported that the sales of pastures give an average annual net income of between TZS 300,000 and 800,000 ($ 181 and $ 485).

In Shinyanga Region, discussant reported that the price of 50 kilograms of maize stova was sold between TZS 25,000 and 35,000 (S 15 and S 21). They reported that the sales of pastures can give an annual net income of between TZS 600,000 and 1,000,000 (S 364 and S 606). According to the [31] the establishment of pasture plots is very challenging in semi-arid areas.

Table 2: Types of pastures and number of HIS beneficiaries producing them by region and sex (n =193)

Region	Sex of household	Type of pastures produced	n	%
Njombe	Male	Pastures, hay and fodders	86	91.4
	Female	Pastures and fodders	94	88.6
Shinyanga	Male	Pastures and fodders	4	9.0
	Female	Pastures and fodders	9	5.6

3.4. HIS and Community Animal Health Service employment

Community Animal Health Workers (CAHWs) were provided with Veterinary kits (Vet kits) with drugs and simple medicines. Simple drugs and medicines provided include: Oxytetracycline (OTC) Hcl of 10 & 20%; Pen &Strepto - 2 bottles; Sulphers injection - 2 bottles; Anthelmithic -1 litre; Plastic Syringe -1 piece of 20 to 30cc; Needles -5subcuts & 5 intramuscular; Eye & wound powder-1 bottle; Acaricide-Cybadip/Paranex- 1 bottle of 100mls; Ivomec-1 bottle of 50mls; Sprayer pump - 1 piece of 18-20litres and burdizzo. As reported by [32], to promote animal health care in rural areas, there is a need for the government to develop an alternative approach of reaching the poor with clinical veterinary services, that is, the promotion of the use of Community Animal Health Workers (CAHWs). The provision of vet kits generally aims at providing animal health care services sustainably within and outside the HIS. Beneficiaries reported to pay far less amount of money than that paid by none-beneficiaries for animal service. The amount paid also varies according to area and according to region; this was an arrangement agreed by farmers themselves.

In Njombe Region, the reported average amount of cash paid ranged from TZS 3,500 to TZS 5,000 (S 2 to S 3) per cow. This payment included animal spraying which is done at least once every month. One of CAHWs in Njombe Region, reported to have an annual average net income from livestock treatment ranging from TZS 3,000,000 to TZS 4,200,000 (S 1,818 and S 2,545). During the FGDs in Nyombo village, Njombe, a male discussants who was also a CAHW said: *"Through this work my annual net income has increased and this has enabled me to change my life as opposed to life before HIS when I was more idle and without any reliable income generating activity"*. Furthermore, during the FGDs in Shinyanga, one discussant who was a CAHW pointed out that his annual average net income from vet services was between TZS 3,200,000 and TZS 3,850,000 (S 1,939 and S 2,333).

3.5. Milk vending employment

The results in Table 3 show different milk selling points. In Shinyanga Region respondents cited lack of milk processing equipment in their areas as a contributing factor to the selling of un-processed milk.

During in-depth interview with milk vending farmers, they revealed that most of them sold between 25 and 60 litres of unprocessed fresh milk per day. Despite, the small volume of milk sold, they reported to be enjoying high returns of labour per litre of milk sold as compared to those selling at farm gate price. In expressing her feelings on how her life depended much on milk vending, a female milk vender from Chibe village in Shinyanga Region said: *"I have educated all my 4 children from nursery to secondary school using the money I earned from milk vending"*. Generally, these findings mean that there are inadequate milk processing plants in the surveyed regions. It also means that most of the consumers in the surveyed areas consumed raw or locally processed milk more than they consumed pasteurized milk and other milk products such as yogurt, cheese and the like.

Table 3: HIS beneficiaries involved in different types of milk vending and selling points by region (n=343)

Region	Raw milk selling points	Response to raw milk selling	
		n	%
Njombe	Vending and selling to milk Collection centres	129	64.5
	Vending and selling in-village small restaurants	40	20.0
	Vending and selling to individuals Consumers	21	10.5
Shinyanga	Vending and selling to hotels in town	85	42.1
	Vending and selling to small restaurants	41	20.3
	Vending and selling to individuals Consumers	27	13.4

3.6. Employment as milk collectors

The findings in Box 1 show a well-established milk collection centre. The centre sells milk directly to consumers of different types because Shinyangya region has no milk processing plant like CEFA. CEFA, is an Italian acronym for "*Comitato Europeo per la Formazionel'a Agricoltura*, meaning European Community for Agriculture Formation. This CEFA is a dairy processing plant in Njombe town. The centre's employees among others undertake transactions on behalf of the association. This centre collected and sold an average of 1,500 litres of milk daily. Observation from Box 1 shows that having a milk collection centre at famers' communities provides reliable milk market among smallholder farmers. Milk collection centre built the trust among members and provided employment opportunities in rural settings.

Case 1. Lubaga Safina Njema Milk Collection Centre

'SafinaNjema' means an excellent ark is Lubaga village in Shinyanga Region. The centre is serving 102, among whom 78 are females'dairy farmers who received dairy cattle through the HIS intervention. Farmers around the centre up to 15 km away deliver milk to the centre at a price of TZS 610 ($ 0.37) per litre every morning. After the collection, the milk is sold at the centre at a price of TZS 810 ($ 0.50) within five hours. The centre has two female employees who are paid a monthly salary of TZS 100 000 ($ 60) each. The annual milk purchases cost is about TZS 33,400,000 ($ 20,242) whereas annual milk sold brings a gross income of about TZS 44,350,000 ($ 26,878). The centre's annual turnover on milk cost alone is TZS 10,950,000 ($ 6,636). When fixed and intermediate costs are subtracted, the centre remains with a profit of TZS 8,000,000 ($ 4,848) per annum.

The amount is then either divided among group members depending on the amount of milk (in litres) supplied to the centre or carried over as share contribution made by the owners. The centre plans to install a chiller and a pasteurizer and have some individuals trained in dairy processing. They believe that this will become handy as they plan to process the milk if competition from milk vendors becomes stiff. However, experience elsewhere has shown that moving up to more capitalized processing processes entails considerable risks. Anticipated risks include less likely to purchase more costly products by consumers, and the management capacity which is needed to run such an operation. Another risk reported was less consumption of industrialized pasteurized milk. These risks, among others, may limit the success of the process. However, the centre plans to access the rapidly growing middle class market in Shinyanga town, Tinde, Isaka, and Maganzo small towns. The targeted consumers of middle class mainly consume processed milk such as yoghurt and cheese. There is some evidence showing an increasing trend of people from the middle class using processed milk from such suppliers as Mara Milk (Mara), Brookside (Kenya) and even Tanga Fresh (Tanga).

Case 2 indicates a farmers' association in Njombe Region. The centre collects milk from HIS farmers through small milk collection points in villages. During the FGDs, discussants reported that CEFA handles larger volume as compared to other milk traders in the study area. NJOLIFA member contributes at least TZS 500 ($0.30) every day for milk transportation by CEFA vehicle. Respondents reported that having milk collection centre such as NJOLIFA near farmers had created a sustainable milk market among them.

Case 2. NJOLIFA Milk Collection Centre

The Njombe Livestock Farmers Association (*NJOLIFA*) in Njombe Region is a joint milk collection centre with 242 members (198 women). The association collects and sells between 3,500 and 5,000 litres of milk daily. NJOLIFA buys the milk at a price of TZS 800 ($ 0.48) per litre and sells it to CEFA at a price of between TZS 800 and TZS 1,000 ($ 0.48 and $ 0.60) per litre depending on the season and availability of milk. During the dry season, milk production is low and its price gets as high as TZS 1,000 per litre). The Association has a board and an executive committee that oversees the daily operations. The association has employed 25 people (5 are men) as milk centre clerks. Each employee is paid an average monthly salary of between TZS 120,000 and TZS 180,000 ($ 73 and $ 110). The annual milk purchases cost about TZS 64,500,000 ($ 39,090) and annual milk sold is worth to a gross income of about TZS 115,350,000 ($ 69,909). The centre's annual turnover, on the cost of milk alone is TZS 50,850,000 ($ 30,818). According to NJOLIFA representative, when fixed and intermediate costs are subtracted, the centre's profit is about TZS 32,500,000 ($ 20,000) per annum. The profit is divided among group members depending on the amount of milk litres supplied.

3.7. Income obtained from HIS employment

The results in Table 4 show that annual net cash household earnings increased almost 8-fold and 5-fold after the HIS intervention in Njombe and Shinyanga regions respectively. The result also showed that all men and women in HIS interventions were getting above TZS 4,000,000 and TZS 2,800,000 ($2,224 and $ 1,696) in Njombe and Shinyanga regions respectively. The difference in income between the two regions was mainly due rainfall pattern as Njombe receives an annual rainfall of 1500 mm as compared to Shinyanga region that has one season with an

average of 500 mm per annum. The less rains led to poor pastures that reduced milk production. The findings are supported by [33] who reported that difference in seasonality and change of rainfall patterns had greatly influenced milk production in the southern highlands of Tanzania, which in turn had led to decline in incomes from sales of milk. Similar findings are reported by [34] who reveals that rural households' income is greatly determined by rainfall patterns. To him, wet seasons yield more milk due to high availability of pastures. According to [35] dairy production has increased farmers' ability of meeting the growing demand of milk in growing economies. Therefore, null hypothesis that sates: Heifer In-trust Schemes have no significant role in smallholder self-employment opportunities in highland and semi-arid regions of Tanzania is rejected.

Table 4: Household income before and after the scheme by sex of household head (n=402)

Region	Sex	Variable compared	T-test paired differences			
			n	Mean TZS	t-value	p-value'000
Njombe	Male	Households' net income (2012)	94	4,032,600		0.000
		Annual household's net income before the scheme (1998) as expressed in year 2012 prices	94	532,980	-58.588	
	Female	Households' net income (2012)	106	4,025,500		0.000
		Annual household's net income before the scheme (1998) as expressed in year 2012 prices	106	532,640	- 61.042	
Shinyanga	Male	Households' net income (2012)	44	2,884,000		0.000
		Annual household's net income before the scheme (1998) as expressed in year 2012 prices	44	499,770	-20.155	
	Female	Households' net income (2012)	158	2,836,700	- 46.733	0.000
		Annual household's net income before the scheme (1998) as expressed in year 2012 prices	158	506,710	- 46.733	

Income before and after scheme in both Njombe and Shinyanga regions are significant ($p<0.001$)

3.8. Working as Agro-vet inputs suppliers

About 92% and 88.2% of the respondents in Njombe and Shinyanga regions respectively, reported that HIS had potentially helped the graduated HIS Community Animal Health Workers to establish Agro-vet input shops (Case 3 and Case 4). Respondents reported that prices of inputs varied from one shop to another one and according to the types of vaccine and drug needed.

Case 3: Mpete Agro-vet shop

Mpete agro-vet shop is a private joint venture in Njombe town. The shop reported to sell deworming drugs, mineral supplements such as super mark lick and other drugs for livestock. The shop employed 4 para-vet women who were paid an average of TZS 120,000 ($ 73) per month each. The in-charge person reported that his and colleague CAHWs' families and employees depended much on the shop's income. The shop's annual turnover was about TZS 15,000,000 ($ 9,090). After taxes, salaries and other deductions, owners' remained with an average amount of about TZS 6,500,000 ($ 3,939) per annum, which was equal to a monthly turnover of TZS 541,666 ($ 328). There were plans for the shop to expand the business to an agro-vet inputs supply centre.

Case 3 and Case among other things, indicate that agro-vet shops had employment opportunities for individuals or groups of people who previously worked as HIS CAHWs in the study areas.

Case 4: Shinyanga Agro-vet shop (*Duka la Pembejeo*)

The Shinyanga agro-vet shop owner was previously a CAHW under HIS. The shop sold deworming drugs, minerals such as super mark lick and other animal related drugs. The Shinyanga agro-vet shop had 2 para-vet employees (one female) who were paid an average of TZS 100,000 ($ 60) each per month. The owner's family and employees depended on the income from the shop for their livelihoods, and the shop's annual turnover was TZS 10,000,000 ($ 6,060). When direct and indirect costs were subtracted, an average amount of TZS 4,500,000 ($ 2,727) was obtained per annum, and this is equal to a monthly turnover of TZS 375,000 ($ 227).

3.9. Artificial Insemination (AI) services job

Respondents reported that, due to increasing numbers of dairy farmers and dairy cattle, and a decreasing number of the breeding bulls in the area, AI was seen as an immediate solution for cow fertilization. However, AI was reported to be somehow costly and not easily accessible by smallholder farmers. They reported that AI service costs range between TZS 15,000 and TZS 20,000 ($ 9 and $ 12) per insemination due to few trained personnel on AI and inadequate AI facilities. In Tanzania, the registered AI service providers are the African Breeding Services (ABS) and Vets Life Services Consultants (VLSC) in Mbeya Region; the Dule Agro-inputs services in Iringa; Kwamkwale AI group based in Katavi Region; Building Resources Across Community (BRAC) in Mwanza but provide services across the country; and Mogabiri Farmers Extension Centre (MFEC) in Mara Region. During FGDs in Njombe Region one private AI service provider who previously was a CAHW under HIS reported to provide this service at a cost of TZS 15,000 ($ 9,090) per insemination; and that his annual earnings amounted to TZS 5,500,000 ($ 3,333). However, he admitted to be ready to charge lower prices had the costs of liquid nitrogen, transportation, and handling been lower. According to this respondent, despite the establishment of AI zonal offices by the government, the offices are not well equipped with such things as liquid nitrogen which compels them to obtain these materials from National Artificial Insemination Centre (NAIC) in Arusha, which is about 1,500 kilometres (one trip). Similar findings are reported by [36] who reveals that smallholder farmers in Zimbabwe have not been able to use AI due to the costs of equipment and semen; as a result they opted for more breeding bulls than AI.

On the same token, findings by [37] reveal that due to high AI costs, since 1964 to date, the Kenyan Government has heavily subsidized artificial insemination services for about 80% of the total cost. However, this observation is in contrast with [38] report that the costs of AI technology is not as expensive as the costs of imported breeds because AI requires only technical expertise, special equipment for storage of semen and liquid nitrogen in which case a farmer has to pay a mere TZS 20,000 ($ 12) as the cost for a single insemination.

3.10. Water selling employment

Case 5 shows that during the dry season, water selling in Shinyanga Region becomes a major self-employment. About 75.8% of the respondents in Shinyanga Region admitted that water prices vary depending on the water usage (drinking for humans or livestock or washing).

Case 5: Water trading in Shinyanga

A man aged 50 years old and who is among water sellers in Lubaga (Shinyanga) village shared his experience in water trading during the dry season. He had employed 4 male youth who collected water from a distant source and supplied it to HIS farmers who were unable to get the water easily. He reported to supply an average of 120 jerry cans a day each containing 20 litres of water, earning him between TZS 30,000 and 180,000 ($ 18 and $ 277) for water supply for livestock and drinking respectively. The man reported to pay bicycle riders (those who collect water for him) an average of TZS 500 ($ 0.30) each per trip. He reported to earn a seasonal income of between TZS 3,000,000 and 5,500,000 ($ 1,818 and $ 3,333) depending on the length of the dry season and its acuteness. He further reported that the money from water selling had helped him construct a good house and purchase 2 more bicycles that would be used in subsequent dry seasons for collecting and supplying water.

3.11. Challenges to rural dairy farming self-employment opportunities

The respondents in both Njombe and Shinyanga Regions cited competition from other agents, seasonality of supply and demand, and milk spoilage as the major challenges facing milk traders. Other challenges were, high costs of inputs including capital, labour and lack of reliable markets for livestock products. Low pay for multiple tasks, long walking hours, and lack of job security were cited by employees as the major challenges. Lack of training in milk hygiene and marketing was also cited as a challenge as most of the employees attributed low remuneration to lack of special skills in their jobs.

4. Conclusion and recommendation

The study finding indicates HIS as a vital rural poverty reduction credit model. Based on what has been presented in the current study report, it can generally be concluded that, HIS has significantly generated self-employment opportunities among less formally educated youth, women and men in the study areas. It is further concluded that self-employment opportunities included selling of milk, pasture/fodders, water, agro-vet inputs supplies and provision of animal health and Artificial Inseminations services, which have paved the way for improving the livelihoods of smallholder households. It is also concluded that HIS vitally contributed to smallholder income. Statistical findings also indicated that HIS has vitally contributed the smallholder self-employments.

Therefore, due to the importance of dairy farming in the study areas and its substantial contribution to the economy and the livelihoods of smallholder, it is imperative for the Government to prioritize investment in rural dairy farming. Doing this will increase employment opportunities for the less formal educated youth, women, and men.

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PAPER TWO

Influence of Agro-Ecological Factors and Cultural Practices on Heifer In-Trust Schemes in Njombe and Shinyanga Regions of Tanzania

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Full Length Research Paper

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

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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 seasonality, rainfall patterns; and traditional animal grazing style, animal treatments and protection 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, 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 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 in terms seasonality, rainfall pattern, quality pasture availability and cultural practices such as beliefs, animal grazing styles and treatments 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.

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According to Msangya et al., (2014), the Heifer In-trust Schemes (HIS) which is one of the dairy livestock credit 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 (18931971) 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 seasonality, rainfall patterns factors and traditions livestock grazing, animal treatment and protection 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 zones. It is imperative that before making any dairying initiative actors 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 tested a null hypothesis: seasonality, rainfall patterns, availability of quality pasture, and traditions livestock grazing systems and animals treatment and protection have no significant effects on the performance of HIS in highland and semi-arid regions of Tanzania. Descriptively, this study was guided by a question: how do rains patterns, quality pasture availability, traditional livestock grazing systems, animals treatments and protection 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 rains patterns, quality pasture availability towards amount of milk produced and income earned as well at exploring the implications of traditional livestock grazing systems, animal's treatments and protection and women gender structures relation to HIS objectives.

This study is in line with the Millennium Development Goals (MDGs) 1 and 3 and Sustainable Development Goals (SDGs) 1, 2 and 3. The MDGs number 1 is aiming at eradicating extreme income poverty and hunger and goal 3 aiming at Promoting Gender Equity and Empowering Women by 2025. The SDGs number 1, 2 and 5 also aiming at no poverty, zero hungers and promoting Gender Equity by 2030. It is also in line with Tanzania's Vision 2025; and Tanzania's National Strategy for Growth and Poverty Reduction (NSGRP) II (URT, 2010). The HIS are aiming at enabling poor resources smallholder famers to come out of abject poverty, reduce hunger and empower women through livestock resource support and related trainings. 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, Kinga and Bena) and agro-ecology (highland and semiarid 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 endeavor 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 societal members. In this study, culture was confined to how the major ethnic groups in the study areas (Bena and Kinga 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 semiarid 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). The dry and wet seasons were compared in terms of quality pastures availability, rains pattern in relation to milk production and sales. 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. 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; $n = \frac{Z^2 * p(1 - p)}{d^2}$ according to

(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 Zvalue 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, $n = 2^2 * 0.5 (1 - 0.5) = (4 \times 0.25)/0.0025 =$

$1/0.0025 = 400$.

Data Analysis

Primary qualitative data collected using structured questionnaire were analysed using content analysis techniques whereby the flow of logic and comparison were made to bring conclusion. Inferentially, Statistical Package for Social Science (SPSS 16) was used to determine the frequencies and percentages. T-test was used to determine whether there were significant differences in amount of milk produced and sold during dry and wet seasons. 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- 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.

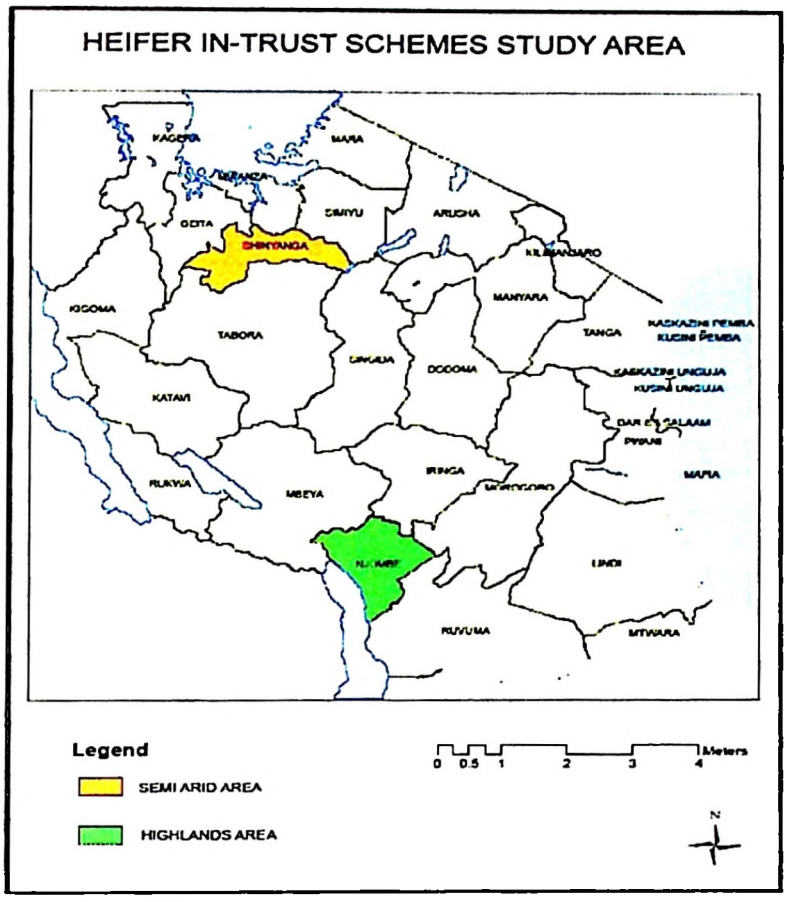

Figure 1. Map of Tanzania United Republic showing study regions.

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' well-being

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	Litres	St. deviation	T-test compare difference 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 & Shinyanga (n = 402)	Average milk production during wet season	21.33	4.762	72.962	0.000
	Average milk production during dry season	15.36	4.228		

Milk production during wet and dry season separately and in both regions are significant at p<0.001

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

Region	Wet season effects	n (%)	Dry 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)

Number in ( ) 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, beneficiaries 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.

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 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 disease due to weakness of animal and lack of 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 agroecology 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-agroecological factors, and thus strategies to improve the scheme need to be informed by knowledge on intra-site and inter-site influences at spatial and temporal scales.

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 season (n = 202)	Average daily milk production in dry	2.50	-68.908	0.000
	Average daily milk production in wet season	18.13		
Njombe dry season (n = 200)	Average household's daily milk sales in	14.30	-30.791	0.000
	Average households' daily milk sales in wet season	18.73		
Shinyanga season (n = 202)	Average households' daily milk sales in dry	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 & Shinyanga season (n = 402)	Average daily milk production in wet season Average daily milk production in dry	21.33 5.36	72.962	0.000
	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		

Daily milk production during wet and dry season separately and in interregional are significant at p<0.001

Implications of Cultural Practices to HIS Objectives

Traditional Livestock Grazing System

This study considered that Njombe and Shinyanga regions had different cultural practices and that 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 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 improved cattle to be between two and five litres per day. Culturally, in Njombe region, the Bena, Kinga 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.

Table 4: Livestock grazing systems by region (n=402)

Region	Grazing type	n (%)	Implication on HIS in meeting its objectives
Njombe (n=200)	Intensive/Zero grazing	182 (91.0)	Increased milk production, more milk consumption, income and reduced animals' disease attacks
	Semi-intensive/mixed grazing	18 (9.0)	Low milk production and income and reduced good animal health status due diseases
Shinyanga (n =202)	Intensive/zero grazing	102 (50.4)	Increased milk production, more milk consumption, income and reduced animals' disease attacks
	Semi-intensive/mixed grazing	85 (42.0)	Low milk production and income and reduced good animal health status due diseases
	Extensive/free range grazing	15 (7.6)	Completely reduced the milk production and income and endangered animal health and sometimes leads to mortality

Number in ( ) represents percent

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	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

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	Milk mixed with special herb, ashes and pepper is given to a breeding bull to stimulate it to mount tirelessly. mount	Reported that, sometimes the bull can mount a heifer which is not on heat.

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. During FGDs 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 FGDs in Shinyanga that, underdosing 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, 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 FGDs 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 in the FGDs 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 practiced 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 *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 development should consider and plan on how to same village said; "*You cannot believe everyone reduce traditional beliefs and practices related to 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.

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

Region	Dry and wet seasonality milk production	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		

Regional milk production during the dry and wet season are significant at p<0.001

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, show that cultural practices had significant effects on the performance of Heifer In-trust Schemes in Njombe and Shinyanga regions.

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 agroecological 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 semiarid 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.

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PAPER THREE

Heifer In-Trust Schemes and Incomes of Smallholder Households in the Highland and Semi-Arid Regions of Tanzania

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Heifer In-trust schemes and incomes of smallholder households in the Highland and Semi-arid regions of Tanzania

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Abstract

Poor household incomes are a major challenge to smallholder farming households' expenses in Tanzania including Njombe and Shinyanga regions. The Heifer In-trust Schemes (HIS) were introduced in these regions purposely to enable vulnerable households to improve their food and income security hence raising such households' purchasing power. The study's main objective was to assess the role of the HIS to smallholder households' major expenditures in the above-mentioned areas. Specifically, the study aimed at exploring the assets and income acquired through the beneficiary household's involvement in the HIS and at examining their ability to meet children's educational and households' health costs. The study adopted a cross-sectional design whereby data were collected from 402 randomly selected HIS beneficiaries' households using a structured questionnaire. In addition, nine focus group discussions involving 135 discussants were conducted to complement information collected through the questionnaire.

Children's education, assets acquisition and food accounted for 36.2, 24.3 and 10.5% of the income accrued from the HIS dairy enterprise. The benefits in Njombe (a highland area) and Shinyanga (a semi-arid area) zones were similar.

Key words: *assets, food, dairying, development, livelihood, poverty*

Introduction

Rural poverty and access to capital is a major problem for smallholder farming households in most developing countries, including Tanzania. According to FAO/ILRI (2003) acquisition of assets and income are critical means of addressing rural poverty and improving the livelihood of smallholder farmers. The term 'smallholder' is also used interchangeably with the terms 'small-scale', 'resource poor' and 'peasant '. According to Dixon et al (2005) smallholder refers to their limited resource endowment relative to other farmers in the sector. In Tanzania, most smallholder farmers are located in the rural areas, where both physical and institutional infrastructure limits their development and expansion. Generally, smallholder farmers lack access to proper roads and this in turn limits their ability to transport inputs and produce and gain access to information. In such circumstances, according to Delgado (1999), acquisition of agricultural resources becomes difficult and the supply of market services becomes limited. Lack of assets, agricultural information and technology, and of access to services, hinders the smallholders' participation in potentially lucrative markets and hence progress. For example, UN (2010) argues that poverty is a major factor in smallholder farmer households' development. Household poverty is manifested by inadequate year-round food supply, income, limited access to the children's education, ill health, inadequate housing and necessary productive resources sufficient to ensure sustainable livelihoods. This calls for pro-poor efforts to address poverty-related challenges in Tanzania.

The above-mentioned issues are a major concern of various governments and development partners, Heifer Project International (HPI) and Heifer International Tanzania (HITz) included. Enhancing food security, poverty reduction and promoting ability of smallholder

farmers to cover major expenses have been a central goal of the above organizations through the Heifer In-trust Scheme (HIS) in communities with limited resource where hunger persists (Dixon and Minae 2006). Globally, the HIS is a rural poverty reduction model initiated by Dan West (1893-1971). West was a Midwestern farmer in Spain and was ladling out rations of milk to orphans and refugees during the Spanish Civil War when this idea of reducing dependency and relief came to his thoughts. He founded the Heifers Project International (HPI) and HIS for Relief in 1944.

The Heifer-in-Trust Scheme (HIS) started in Africa in 1974 and Tanzania and Cameroon were the first countries to operate this model. Through the Heifer-in-Trust Scheme, farmers are advised to organize into groups for outscaling in-kind the credit in the form of a heifer to be passed from one household to another. In Njombe and Shinyanga regions, HIS started in 1998 whereby 72 heifers were provided as seeds to each of these regions. It was expected that HIS would alleviate poverty in terms of, among other aspects, increased income and improved access to food, assets and quality educational and health services (Dixon and Minae 2006; Urassa 2005; HITz 2011).

The HIS model has been adopted as one of the initiatives for alleviating poverty among smallholder farmers in Tanzania for several years now, but there is a dearth of information how this model achieves the aim of improving the life standards of the target beneficiaries. This study therefore aims at contributing to filling this gap by investigating on how Heifer-in-Trust Scheme has influenced the capacity of smallholder farmers to meet their major expenses. Since HIS has been implemented in different agro-ecological regions, this study considers the dimension of agro-ecology by selecting highland (Njombe) and lowland dryland (Shinyanga) regions as representative case studies. The study is in agreement with

the Tanzanian strategies for alleviation of poverty such as National Strategy for Growth and Reduction of Poverty (NSGRP) (URT 2006). It is imperative that in order to make strategies which are informed by field realities, applied research should be conducted on various pro-poor issues including the in-kind credit models such as The Heifer-in-Trust Scheme

The study's main objective was to assess the contribution of HIS to smallholder households' major expenditures in the highlands and semi-arid areas of Tanzania using Njombe and Shinyanga regions as the case study. Specifically, the study aimed at exploring the assets acquired through the beneficiary household's involvement in the HIS and examining their ability to meet children's educational and households' health costs.

It is hoped that the findings will inform researchers, academicians and other stakeholders interested in the wellbeing of vulnerable rural households on how small scale dairy enterprises may or may not help in promoting the capacity of farmers to cover their household expenses. Lastly, the findings may also provide insights to government and other potential development partners including HITz (Heifer International Tanzania) on how HIS works to alleviate rural poverty. HITz terminated support to the study areas 15 years ago, therefore, it was thought necessary to validate the impact of the assistance provided through the HIS.

In this study, smallholder, farming households refer to those HIS beneficiaries who due to the limited resources were producing at subsistence level with no, or very little, surplus to market. Therefore, through the support by HITz it was expected such households would attain food security, earn some income from sale of surplus milk and food crops in excess of their household needs hence enabling them to get out of poverty. Assets are defined as fixed and current items with value owned by smallholders such as land, house(s), bicycle,

telephone and livestock. It does not necessarily mean the current assets such as cash in the bank or at hand. This definition is in agreement with Chimilila (2005) who defined assets as any item having economic value that is owned by an institution or individual. According to this author, assets that individuals own heavily depend on the resources they can access by directly owning those resources, borrowing or renting them. Assets are commonly grouped into current and fixed assets: current assets are such as cash, inventory, and accounts receivables that are currently cash or expected to turn into cash; fixed assets are items such as land, buildings, equipment and intangible items, on which this study focused. This study argues that all forms of the assets mentioned above in one way or another can be acquired through a dairy farming project such as HIS. Education costs are defined as the ability of the household to pay school fees and other school-related costs whereas health cost is defined as a state of households' ability in meeting medical service expenses in order to get out of poor health (WHO 1948).

Methodology

Description of study area

Njombe and Shinyanga regions are found in contrasting and diverse agro-ecological zones of Tanzania. Njombe

Region is located in the southern highlands of Tanzania that form part of Southern Agricultural Growth Corridor

(SAGCOT), which has great potential for supporting the "*Kilimo Kwanza*" (Agriculture First) initiative.

According to Tanzania's 2012 national population and housing census, Njombe region had a population of 702,097 (URT 2013). Njombe Region has a size 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. Njombe Region is at 1,581 meters above the sea level and gets an average annual rainfall of 1500 mm (NRCO 2013). Major ethnic groups in Njombe Region are the Bena and Hehe people. This study was conducted in eight villages.

Shinyanga Region is situated in the lake zone that forms part of semi-arid areas of Tanzania. According to the 2012 Tanzania national population and housing census report, Shinyanga Region had a population 1,534,800 (URT 2013). Shinyanga Region has a size of 50,781 square kilometres (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. Shinyanga Region lies 60 kilometers from the Lake Victoria. The region gets an annual average rainfall of 500 mm (SRCO 2011).

Major ethnic groups in Region are the Sukuma, Nyamwezi and Sumbwa. This study was conducted in 18 villages (8 in Njombe Region and 10 in Shinyanga Region).

Study approach

This study was guided by the null hypothesis that Heifer In-trust Schemes (HIS) beneficiary households' wellbeing in Njombe (highland) and Shinyanga (semi-arid area) has not improved through their involvement in the scheme and by a question: 'what role has the HIS played in the contribution of beneficiary household's major expenditures'? The study employed a cross-sectional design, which is observational in nature and is good for descriptive research (Farzin 2010). Through the cross-sectional design, data is collected once (Bailey 1998).

Based on the HIS beneficiaries' registers in Njombe and Shinyanga, 402 beneficiary households were randomly selected, this accounts for 5% of all the beneficiary households in the two study regions. Data collection was done in December 2012 through January 2013. Data were collected from 402 randomly selected HIS beneficiaries households using a pre-tested structured questionnaire. To allow triangulation, nine focus group discussion (FGDs) were conducted to complement information collected through the questionnaire.

Data analysis

Descriptive statistics was used to determine the frequencies, percentages of the type of assets owned, sex of household heads, school children's school enrolment and proportion of cash income expenses. The FGD qualitative information was analysed using content analysis which entailed categorization of the information into meaningful verbal strings and organisation of the text into logical pattern.

Results and discussion

HIS beneficiaries' profile

The study involved 402 household respondents of which 65.6% were females and 97% were in the productive age of between 28 and 58 years. Results show that 93.8% of respondents were household heads of which 65.7% were female (FHHs). All had lived in the area for a period of more than 20 years. All 402 respondents lived in their own houses. Most these houses were of good quality; 75.8% roofed with corrugated iron sheets, 69.8% with floors made of cement and 75.8% with walls made of either burnt bricks or concrete blocks. All

respondents reported to own land ranging between 1.5 and 10 acres. All respondents reported not to have owned dairy cattle before their participation in the HIS.

Heifer In-Trust Schemes and beneficiaries' households' assets ownership

About one third of the respondents in the study reported that before HIS intervention they lived in family or friend's houses (Table 1). They reported that involvement in HIS had helped them to access building materials to construct their own houses. They also reported that having good houses enabled them to live in a healthier environment. Over ninety percent of the respondents reported that following HIS intervention they were now able to own land bought with income from their dairy enterprise. In Shinyanga Region, 98% of the respondents reported they previously relied on family land, however, after their involvement in the HIS intervention, 83.2% of the respondents lived on their own land. FHHs in Njombe Region increased their land ownership status from 0% up to 95.7% as opposed to 74.1% of the FHHs in Shinyanga Region, the increase being used for cultivation and cattle keeping. These benefits from dairy farming husbandry are similar to those reported by Mwankemwa (2004) who argued that, household income, current value of durable assets and food security status of a household are among the measures of household welfare. Bayer and Kapunda (2006), in their study on dairy cattle for poverty alleviation in southern the highlands of Tanzania, observed that income from milk sales helped some smallholder families acquire additional land and improve their houses. This is in line with the report of Rutasitara (2002) who argued that wealth in form of assets, land and capital are, in addition, a source for further wealth. In addition FAO/ILRI (2003) showed that, in rural areas, land is the dominant asset and the principal source of income and consumption, of status, wealth and security; and that

most rural households with access to land had the ability to produce at least some of their own food requirements.

In appreciating her household's transformation through the use of a motorcycle, a 42 year old woman HIS beneficiary from Uzogole village, Shinyanga Region on 18th January, 2013 said; *"my motorcycle has helped me so much to reduce my work load. Before I got it, I used to walk for six hours to fetch water, but now I hardly use 20 to 30 minutes during the dry season to get water home".*

Table 1: Household ownership of assets in the study area by sex of household head (n=402)

		Njombe Region				Shinyanga Region			
		Before HIS		After HIS		Before HIS		After HIS	
		MMHs	FHHs	MMHs	FHHs	MMHs	FHHs	MMHs	FHHs
Ownership of a house	Own house	70 (74.5)	94 (88.7)	94 (100)	106 (100)	29 (65.9)	140 (88.6)	44 (100)	158 (100)
	Rented house	2 (2.1)	1 (0.9)	0 (0.00)	0 (0.00)	2 (4.5)	2 (1.3)	0 (0.00)	0 (0.00)
	Family/friend house	22 (23.4)	11 (10.4)	0 (0.00)	0 (0.00)	13 (29.5)	16 (10.1)	0 (0.00)	0 (0.00)
Ownership of a house	Family land	90 (95.7)	100 (94.3)	2 (2.1)	5 (4.7)	40 (90.9)	158 (100)	2 (4.5)	15 (9.5)
	Village permitted land	4 (4.3)	1 (0.9)	2 (2.1)	101(95.3)	3 (6.8)	0(0.00)	4 (9.1)	26 (16.5)
	Title deed	0 (0.00)	5 (4.7)	90 (95.7)	0 (0.00)	1 (2.3)	0(0.00)	38 (86.4)	117 (74.1)
Ownership of Assets	Television	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	5 (5.0)	3 (3.0)	2 (4.0)	4 (3.0)
	Mobile phone	0 (0.00)	0(0.00)	0 (0.00)	0 (0.00)	38 (40.0)	42(39.0)	19 (44.0)	79 (50.0)
	Bicycle	3 (3.1)	0(0.00)	10 (22.7)	2 (1.3)	11 (12.0)	17 (16.0)	15 (35.0)	53 (34.0)
	Solar power	0 (0.00)	0(0.00)	0 (0.00)	0 (0.00)	31(33.0)	38 (36.0)	4 (9.0)	15 (9.0)
	Biogas digester plant	0 (0.00)	0(0.00)	0 (0.00)	0 (0.00)	9 (10.0)	3 (3.0)	2 (4.0)	4 (3.0)
	Motorcycle/*Bodaboda*	0 (0.00)	0(0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (2.0)	2 (4.0)	3 (1.0)
	Car	0 (0.00)	0(0.00)	0 (0.00)	0(0.00)	0 (0.00)	1 (1.0)	0 (0.00)	0 (0.00)

MHHs refers to male headed households and FHHs is female headed households. ( ) indicate percent.

Asset ownership by MHHs and FHHs in Njombe and Shinyanga regions before and after are significant at $p < 0.01$

The contribution of income from HIS beneficiaries' dairy enterprise on children's education expenses

Before their involvement with the HIS, the beneficiaries were not able to enroll their children in private schools (primary and secondary) (Table 2). After the beneficiaries' involvement, more than three quarters were able to enroll their children in private primary schools and private schools in both Njombe and Shinyanga regions. Subsequently, most of the FHHs respondents in Shinyanga and in Njombe regions reported to have enrolled children between one and five in the schools after the introduction of the HIS. Respondents reported that before HIS they were unable to pay for school fees as well as other school expenses as they had no income and they were very poor. Respondents further reported that after HIS they had milk that brought them food and income. Therefore, they could use the extra income for their children's education. These observations are in agreement with those of Bayer and Kapunda (2006) who reported that income from dairy farming in the southern highlands of Tanzania alleviated poverty and that income from milk sales among other things helped smallholders to send their children to school. This is also in line with the report of Chantalakhana and Skunmum (2002) whose study on the contribution of smallholder milk production in the tropics (Thailand, Malaysia and Indonesia) showed that crop farmers who had turned into small-scale dairy farmers were able to make enough income and savings to give their children college education.

Table 2: Surveyed households' ability to pay children's school fees and other education costs (n=402)

Region	Sex	Enrolment in private primary school before the introduction of heifer in-trust schemes				
		None	One child	Two children	Three children	Four children
Njombe	Male	92 (97.9)	2 (2.1)	0 (0.00)	0 (0.00)	0 (0.00)
	Female	106 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Shinyanga	Male	44 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
	Female	158 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Enrolment in private primary school after the introduction of HIS				
Njombe	Male	34 (36.2)	41 (43.6)	13 (13.8)	6 (6.4)	0 (0.00)
	Female	40 (37.7)	39 (36.8)	25 (23.6)	2 (1.9)	0 (0.00)
Shinyanga	Male	5 (11.4)	30 (68.2)	8 (18.2)	1 (2.3)	0 (0.00)
	Female	7 (4.4)	12 (7.6)	112 (70.9)	15 (9.5)	12 (7.6)
		Enrolment in private secondary school before the HIS scheme				
		None	One child	Two children	Three children	Four children
Njombe	Male	94 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
	Female	106 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Shinyanga	Male	44 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
	Female	158 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Enrolment in private secondary school after the HIS schemes				
Njombe	Male	4 (4.3)	49 (52.1)	38 (40.4)	3 (3.2)	0 (0.00)
	Female	4 (3.8)	39 (36.8)	44 (41.5)	14 (13.2)	5 (4.7)
Shinyanga	Male	2 (4.5)	9(20.5)	22 (50.0)	8 (8.2)	3 (6.8)
	Female	2 (1.3)	4 (2.5)	49 (31.0)	93(58.9)	10 (6.3)

( ) indicates percentage. The children's school enrolment in private and government school before and after HIS in both Njombe and Shinyanga regions are significant at $p < 0.01$

There was a significant change in the beneficiaries' life standard improvement that can be associated with the introduction of HIS in the study areas (Table 2). Due to HIS, most households were able to send their children to private schools. In expressing her views on how HIS has increased beneficiaries' household's ability of paying school fees, on 12th January 2013, in Lubaga village, Shinyanga Region, a 42 year old woman during the FGDs said; *"....had it not been the dairy cow I got from HIS, all my family would either be tending*

livestock of the rich or my young daughter would have been married due to poverty. I am happy that all my children are in school".

The contribution from HIS beneficiaries' dairy enterprise to households' health services expenses

Before the introduction of HIS most of the beneficiary households' in Shinyanga Region reported to have been seeking medical services from traditional healers (Table 3). In Njombe Region the proportions were less. Respondents reported to mostly having attended traditional healing services because they were cheap as compared to modern health facilities such as dispensaries, health centres and even the hospitals. Furthermore, 45% of the respondents in Njombe Region and 54.2% in Shinyanga , mostly attend the traditional healing services because these facilities were close/near to them and that modern health facilities were very few and very far, which meant an extra cost in reaching them.

After the HIS intervention, beneficiaries started to seek attention from modern health facilities because they were now affordable as they had money from their dairy enterprise, made possible through the HIS. This is agreement with the report of Mwakalobo and Shively (2001) who argued that smallholder dairy farming was regarded as one of the best means of providing resource poor farmers with regular income to pay for their children's education and other family necessities such as food and health services. In expressing their views on how HIS has helped them to access quality health services, a 51-year-old woman from Igima village, Njombe Region, on 19 December 2012 said; *"I had nothing at all, I inherited nothing from my parents and now I am able to meet my family's health expenses just like the wealthy ones, wow!"* Another woman aged 55 from Kitangili village,

Shinyanga Region, on 15 January 2013 said; *"Thank God for Heifer International Tanzania, who considers poor people like us and how we can get-out of poverty and enjoy life like others; I am now healthier and I can work more for my family development"*. Another woman aged 43 years from Itulike village, Njombe Region on 17th December, 2013 said; *"My health is my future, had it not been for my beloved dairy cattle which I got from HIS, all of my family would have died, for where would we have got the money for health services?"*

The above quotations clearly show that, before the introduction of HIS in the study area, the poor lacked money to meet their medical expenses hence they had limited access to health services, which are very expensive for the poor.

Table 3: HIS beneficiary households health services information by region and sex of household head (n = 402)

Region	Sex of household head	Attending medical services before the HIS		
		Health institutions	Traditional healing	Not applicable
Njombe	Male (n = 94)	8(8.5)	40 (4.6)	46 (48.9)
	Female (n =106)	7 (6.6)	43 (40.6)	56 (52.8)
Shinyanga	Male (n = 44)	1 (2.3)	35 (79.5)	8 (18.2)
	Female (n =158)	5(3.2)	5 (3.2)	5 (3.2)
		Reasons for going to traditional healing		
Njombe		Cheap	Treatment on Credit	Paying with other than cash	Not applicable
	Male (n = 94)	29 (30.9)	3 (3.2)	9 (9.6)	53 (56.4)
	Female (n =106)	36 (34.0)	2 (1.9)	3 92.8)	65 (61.3)
Shinyanga	Male (n = 44)	31 (70.5)	1 (2.3)	3 (6.8)	9 (2.5)
	Female (n =158)	119 (75.3)	6 (3.8)	6 (3.8)	27 (17.1)
		Type of attendance to medical facilities after HIS		
Njombe			Health facilities	Traditional healers	Not applicable
	Male (n = 94)		94 (100)	0 (0)	0 (0)
	Female (n =106)		106 (100)	0 (0)	0 (0)

Shinyanga	Male (n = 44)		44 (100)	0 (0)	0 (0)
	Female (n =158)		158 (100)	0 (0)	0 (0)
		Reasons for attending the improved health institutions			
Njombe		Affordable	Doing diagnosis	Trained personnel	Not applicable
	Male (n = 94)	94 (100)	0 (0)	0 (0)	0(0)
	Female (n =106)	104 (98.1)	1 (0.9)	1 (0.9)	0(0)
Shinyanga	Male (n = 44)	42 (95.5)	0 (0)	2(4.5)	0(0)
	Female (n =158)	154(97.5)	4(2.5)	0(0)	0(0)
		Frequency of attendance to health services			
Njombe		Every month	Once a quarter	Every six months	Time of sickness
	Male (n = 94)	0 (0)	13 (13.8)	17 (18.1)	64 (68.1)
	Female (n =106)	0 (0)	15 (14.2)	21 (19.8)	70 (66.0)
Shinyanga	Male (n = 94)	0 (0)	6 (13.6)	11 (25.0)	27 (61.4)
	Female (n = 158)	0(0)	20 (12.7)	34 (21.5)	104 (65.8)

( ) indicates percentage. Before HIS most of people had been opting for traditional treatment and after HIS are opting to improved health facilities

The HIS beneficiaries income and proportionate expenditure on major household needs

Most respondents in Njombe and Shinyanga regions spent their cash income obtained from HIS on children's education, followed by assets acquisition, food purchases, religious issues, health services, clothes, transport, community development matters and communication with less attention is given to recreational matters (Table 4). On average, more than one third of the cash from the dairy enterprise resulting from HIS was spent on children's education, about a quarter on assets acquisition and one tenth on food. These findings are in agreement with those of Rutasitara (2002) who pointed out that wealth symbolized peace and prestige, a sign that the owner was well off at least by the standards of the respective community. This author considered that assets provided people with opportunities and options in the face of

impoverishment. Thus, being asset poor limited people's capacity to improve and safeguard their livelihoods. Thus income from HIS has significantly contributed to children's education in the two regions hence enhancing the children's human capital and this lead to the rejection of the null hypothesis that the HIS had not contributed to improvement of the beneficiary smallholder farming households' well-being.

Table 4: Most items and amount and proportion (%) of cash income spent by HIS households (n = 402)

Region	Sex of Household head	Amount spent in major key items in HIS beneficiary household in every TZS 100,000 ($60) earned									
		Children's education		Food		Assets		Health		Community Development	
		n (%)	('000) (%)	n (%)	('000) (%)	n (%)	('000) (%)	n (%)	('000) (%)	n (%)	('000) (%)
Njombe	Males	27	32,000	11	7,000	10	25,000	7	5,000	8	7,000
	(n=94)	(29.0)	(32.0)	(11.7)	(7.0)	(10.6)	(25.0)	(7.4)	(5.0)	(8.5)	(7.0)
	Female	42	40,000	12	8,000	15	27,000	4	6,000	3	2,000
	(n =106	(39.6)	(40.0)	(11.3)	(8.0)	(14.1)	(27.0)	(3.7)	(6.0)	(3.0)	(2.0)
Shinyanga	Male	14	30,000	6	15,500	8	23,500	3	5,000	3	3,000
	(n =44)	(32.0)	(30.0)	(14.0)	(15.5)	(18.0)	(23.5)	(6.8)	(5.0)	(6.8)	(3.0)
	Female	41	43,000	18	11,500	24	22,000	16	4,000	13	2,000
	(n=158	(26.0)	(43.0)	(11.3)	(11.5)	(15.0)	(22.0)	(10.0)	(4.0)	(8.1)	(2.0)
		Recreation		Religious		Transport		Clothes		Communication	
Njombe	Males	5	5,000	8	5,000	4	5,000	7	5,000	7	4,000
	(n =94)	(5.3)	(5.0)	(8.5)	(5.0)	(4.2)	(5.0)	(7.4)	(5.0)	(7.4)	(4.0)
	Female	1	500	5	6,000	7	3,000	8	4,500	9	3,000
	(n =106)	(0.9)	(0.5)	(5.0)	(6.0)	(6.6)	(3.0)	(7.5)	(4.5)	(8.4)	(3.0)
Shinyanga	Males	2	6,500	4	5,000	2	5,000	1	3,000	1	3,500
	(n =44)	(4.5)	(6.5)	(9.0)	(5.0)	(4.5)	(5.0)	(2.2)	(3.0)	(2.2)	(3.5)
	Female	6	500	10	6,000	10	3,000	12	5,000	8	3,000
	(n=158	(4.0)	(0.5)	(6.3)	(6.0)	(6.3)	(3.0)	(8.0)	(5.0)	(5.0)	(3.0)

( ) indicates percentage. In both Njombe and Shinyanga regions major expenses had been in education, assets and food

Conclusions

- Despite the difference in rainfall variations between the highland (Njombe) and semi-arid area (Shinyanga), HIS had played a big role in the contribution of smallholder's household major expenses.

- Cash income from HIS had contributed to acquisition of assets that had been used to transform and improve the beneficiary households' livelihoods.

- HIS had increased smallholder's ability to meet their children's education expenses as well as family health expenses.

- HIS had contributed to raise its beneficiaries' social status in their respective homes and communities allowing them to contribute to community development and religious matters

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PAPER FOUR

Contribution of Heifer In-Trust Schemes to Smallholder Households' Well-Being in Highland Area of Njombe Region, Tanzania

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Contribution of Heifer In-Trust schemes to smallholder households' well-being in Highland area of Njombe Region, Tanzania

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Abstract

Food insecurity and poor income is a big challenge in Njombe Region. The Heifer in-Trust Schemes (HIS) in this region aimed at reducing food and income insecurity. The study's main objective was to determine the contribution of the HIS farming households' well-being in the highland areas of Njombe, Tanzania. Specifically, the study aimed at determining the contribution of the HIS to food security measured by number of meals and composition of these meals and at exploring the contribution of sales of milk, calves and pastures to household income. The study adopted a cross-sectional design and using HIS registers books, data were collected from 200 randomly selected HIS beneficiary households using a structured questionnaire. In addition 4 Focus Group Discussion (FDGs) were conducted to supplement information collected through the questionnaires.

Results from the study show that dairy farming was the major source of food and income. Despite the variations in seasonality in this highland agro-ecological zone, HIS has enormously contributed to the improvement of smallholder famers' well-being. Generally, smallholder households' food was secured; an average of three meals daily with diversified nutrients was taken and income has increased.

Key words: *agro-ecology, dairy farming, food and income security*

Introduction

Tanzania is one of Africa's most politically stable countries (WEP 2010). It is now more than five decades since Tanzania gained independence from British rule in 1961. However, it is still categorized as a low income developing country, with some 80% of the country's population primarily dependent on subsistence farming for their livelihood. Generally, agriculture in Tanzania forms the mainstay of the economy; it contributes almost 24 percent of the country's GDP (URT 2011; World Bank 2012). Tanzania's agricultural sector accounts for 95% of the food consumed and for more than two-thirds (70%) of rural household's total income - 53 percent from crop production, 13 percent from livestock, and four percent from agricultural wages (Katia et al 2012). About 90% of Tanzania's poor people live in rural areas (IFAD 2011) and poverty remains widespread and is greater in rural parts of the country. More than a quarter (WB 2010) of the Tanzania population falls below the basic needs poverty line and 9.7% fall below the food poverty line (NBS 2011/12). Under these circumstances, the well-being of the people in the country's rural areas is severely compromised. In this study well-being means smallholder farmers having increased food access and reduction of income poverty.

The Heifer In-trust Schemes (HIS) which is one of the livestock credit investment strategies introduced by Heifer International (HI) in the country aim at reduce rural poverty and promote well-being of poor households. The HIS targets poor resource households, which are given a young female cow (heifer) based on an agreement that the household would pay the credit back through the first and second offspring, which are normally passed on to another poor household. Globally, the HIS idea was initiated by Dan West (1893-1971) who was a Midwestern farmer in Spain. West was ladling out rations of milk to orphans and refugees during the Spanish Civil War

when the idea of reducing dependency and relief came to his mind. He founded the Heifer Project International (HPI) and HIS for Relief in 1944, which is dedicated to ending hunger and poverty.

In Africa, HIS was launched in 1974 whereby Tanzania was one of the very first countries on the continent to undertake the scheme. The HIS was first introduced at Kitulo dairy farm in Makete District in Njombe Region under Dairy Farming Company (DAFCO) with the purpose of establishing the foundation herd farms to produce improved dairy heifers for distribution to communal villages known as Ujamaa. In Njombe Region, the HIS was introduced in 1998. Since its initiation in Tanzania, HIS has been a popular credit model for poverty reduction for about 40 years. The scheme has been adopted by many dairy development actors and donors including; the Tanga Smallholder Dairy and Extension programme (SDEP) that was sponsored by The Netherlands Development Organization (SNV), The Heifer Project International (HPI) that funded the HIS; and the District Agriculture Development Investment programme (DADIPS) under the sponsorship of the United Republic of Tanzania (Urassa 2005 and HITz 2011).

The study's main objective was to determine the contribution of the HIS to smallholder households' well-being indicators in highland areas of Njombe Region in Tanzania. Specifically, the study aimed at determining the contribution of the HIS to food security measured by number of meals and meals' composition and at exploring the contribution of milk, calves and pastures to household income. This study is in line with the Millennium Development Goals (MDGs) 1 and 3 that addresses issues of extreme income poverty and hunger and gender equity by 2015: Tanzania Vision 2025, National Strategy for Growth and Poverty Reduction Strategy II; and the National Livestock Policy vision 2025 that state *"By year 2025, there should be a livestock sector, which to a large extent shall be commercially run, modern and sustainable, using improved and*

highly productive livestock to ensure food security, improved income for the household and the nation while conserving the environment" (URT 2006). The study fills the gap in the existing literature on the contributions of dairy farming to smallholder household's wellbeing. Furthermore, the findings will enhance knowledge to academicians on how the factors like lack of credit, agro-ecology and culture influence the well-being of the rural people. Lastly, the findings also would sharpen insights of the government and other development actors including HITz (Heifer International Tanzania) on how HIS alleviates poverty and enhances well-being among smallholder farmers. HITz has phased-out supporting beneficiaries in this area for the last 15 years so it would be a proper time to study the impacts made by the scheme.

Methodology

Description of study area

Njombe is among 30 Tanzania's administrative regions. It is situated in the southern highlands of Tanzania forming part of Southern Agricultural Growth Corridor (SAGCOT) supporting "*Kilimo Kwanza*" (Agriculture First). According to the national population and housing census, the region had a population of 702,097 (URT 2013). Njombe Region has a size of 21,347 square kilometres (URT 2011). It lies between longitudes 34° 56' 0" and 36° 06' 07 and between latitudes 9° 20' 0' and 11° 0' 0'. Njombe Region is at 1,581 meters above the sea level with an average annual rainfall of 1500 mm (NRCO 2011). Major ethnic groups in the region are the Bena and Hehe. This study was conducted in eight villages.

Study approach

This study was guided by a question: 'how has HIS contributed to smallholder household's well-being indicators in highland areas of Njombe region in Tanzania? The study used a cross-sectional

design. This is observational in nature and is good for descriptive research using characteristics that exist in a population to make inference about relationships (Farzin 2011). Through a cross-sectional design, data are collected once (Bailey 1998). Using HIS beneficiaries' registers books, the sample size (n) was determined. HIS beneficiaries households were randomly selected basing on 5% of total number of beneficiaries households in the study areas. Data collection was done in December 2012. Data were collected from 200 randomly selected HIS beneficiaries households using a structured questionnaire. A checklist of items concerning the milk production and sales, pastures establishment and calves was also used to guide the making of personal observations. In addition 4 FGDs were conducted to supplement information collected through the questionnaires.

Data analysis

For the quantitative information, the T-test was used to determine the significant level of milk production, consumption and sales during the wet and dry season. In addition, Chi-square was used to determine associations in net income, crops production and milk before and after the introduction of HIS. The *Wilcoxon* Signed Ranks Test' was used for determining *non-parametric* variables such as proxy indicator for macronutrient consumption and dietary diversity proxy indicator. Wilcoxon signed Rank Test was used to determine the values of meals and meals diversification/composition and significant level of the meals taken by HIS household's beneficiaries. The qualitative information obtained from the FGDs and KIs was analyzed using content analysis following the flow of logic and comparison of the logic.

Results and discussion

Respondents' major characteristics

This study involved 200 household respondents of which 53.0% were females and 52.7% were in the productive age of between 28 and 58 years. Results show that 91.5% of respondents were household heads of which 53% were Female Household Heads (FHHs). All had lived in the area for a period of more than 20 years. All 200 respondents lived in their own constructed houses. Most houses were of good quality; 96.5% roofed with corrugated iron sheets, 87.5% with floors made of cement and 78.5% with walls made of either concrete blocks or burnt bricks. All respondents reported to own land ranging between 1.5 and 10 acres. HIS beneficiaries reported not to have owned dairy cattle before their involvement in the HIS. It was also reported by 65% of FHHs respondents that more women were involved in the HIS intervention due to either being widows or poor or caring for orphans before the introduction of HIS. The main focus of HI globally is to empower women who have been disadvantaged from accessing the benefits of their work. Thus the HIS has helped most poor women to come-out of income poverty and food insecurity.

Heifer In-trust Schemes (HIS) and household food security

In this study, food security is defined as the situation of the smallholder household relative to food availability, accessibility and utilization for making a healthy life. Food security considered the proxy indicators for macronutrients consumption measured by the number of meals eaten/day (must be ≥ 3) and the dietary diversity proxy indicator for adequacy of nutrients consumed measured by type or food groups eaten in a day (must be ≥ 6). The definition is congruent with that of FAO (2003) that defined food security as the situation when all people, at all time, have physical, social and economic access to sufficient, safe and nutritious food which meet the dietary

needs and food preferences for active and healthy life. The definition is also in line with that of the World Bank (2003) which defines food security as access by all people at all times to enough food for an active and health life. In the present study, food security was measured by the number of meals, meal composition, and litres of milk and crop yields produced and consumed at the household level. The 95% of respondents reported that, being beneficiaries of HIS has enabled their households to be food secure as they were now accessing milk which they could consume since it is a complete diet. The smallholder farmers also reported that they sell the surplus milk to earn income which could be spent to buy extra food, animal feeds and supplements. Findings in Table 1provide evidence that HIS contributes vitally to the access to milk mainly used as food and hence addresses problems of malnutrition including stuntedness which have been reported especially among pre-school children (Odhiambo "et al" 2004). In addition, smallholder farmers in the present study reported that cow dung manure was used to increase fertility of their farms hence more crop harvest through increased yields that provided them, with enough food almost year round. They, furthermore, reported that some beneficiaries had surplus cow dung manure that were also sold and added into their households' income. This is in agreement with Haan and Zoomers (2003) who explained that dairy farming is an important agricultural activity in many parts of the developing world, producing valuable products.

Table 1: Households milk production in the surveyed area after the HIS

Region	Variable compare	T-test compare difference			
		n	Mean	t-value	p-value
Njombe	Production of milk during dry season, liters	200	18.2	-45.6	<0.001
	Production of milk during rainy season, liters	200	24.6		

Mean milk production in Njombe Region was less during dry season than during the rainy season. However, milk production during the wet and dry seasons are significant at $p<0.001$

(Table 1). Furthermore, Table 1 show that difference in milk production between dry and wet seasons was mainly due to seasonality effects that influence availability of pastures and fodders. It was also reported by FGD participants that milk production was less during the dry season due poor efforts and commitments of beneficiaries to establish or conserve pastures. In expressing her views on how HIS has contributed to her household's food security, one woman beneficiary of Nyombo village on 13th December, 2012 said; "*I had not enough food at all in my home as I inherited nothing from my parents, thanks to HITz for dairy cow, my family now eats as those who have farms*".

Table 2: Household milk consumption by season and gender before and after HIS (n = 200)

Season	Gender household head	0 litres	0.25-0.50	>0.50
	Male (n = 94)	85 (21)	9 (2.2)	0 (0)
Dry & wet	Female (n =106)	98 (24.3)	8 (2.0)	0 (0)
	Total	**183 (91.5)**	**17 (8.5)**	**0 (0)**
	Milk consumed per household per day after the scheme			
		2- 4 litres	**5 -7 litres**	**9-10 litres**
Dry season	Male (n = 94)	70 (17.3)	24 (6.0)	0 (0)
	Female (n =106)	73 (18.0)	33 (8.1)	0 (0)
	Total	**143 (71.5)**	**57 (28.5)**	**0 (0.0)**
	Milk consumed per household per day after the scheme			
		3 -4 litres	**5 -7 litres**	**8 -9 litres**
Wet season	Male (n =94)	11(3.0)	69 (17.0)	14 (3.3)
	Female (n =106)	19 (5.0)	72 (18.0)	15 (3.3)
	Total	**30 (15.0)**	**141 (70.5)**	**29 (14.5)**

Very few HIS respondents consumed milk before the scheme intervention (Table 2). By contrast, all households consumed milk after the introduction of HIS. Mpila (2006) explained that dairy

farming increases milk consumption among smallholder households. A study by Kisusu et al (2002) also showed that dairy farming increased food security in Mvumi village, Dodoma Tanzania. However, the respondents reported that during the dry season less milk was consumed because most of the milk was sold based on the high demand.

Importance of milk in the diet of poor smallholder households

Most respondents reported that, even though they knew the importance of milk in the diet, prior to HIS intervention, they were unable to allocate money for buying food including milk. Delgado (2003) emphasized that consumption of livestock products rises with the rise in average income. Maltsoglou (2007) also commented that poor households consumed less in both volume and total value of livestock products compared to the less poor ones with the poorest households allocating less than 10% of their food budget for livestock products.

Food crop production and availability

All respondents practised agriculture activities as well as keeping dairy cattle. The yield of maize after the introduction of HIS increased from 850 to 1950 kg, due to use of improved varieties and fertilization with cow manure. Rutamu (2004) in Rwanda showed that manure from dairy farming had improved soil fertility, and hence crop yield.

Household meals and composition

Before HIS intervention households an average only took one meal a day (Table 3). The recommended feeding regime for an adult is three meals per day and for children under the age of

five years is between five to six times per day (UNICEF 1985; URT 2010). However, after the intervention households were able to have three meals in a day.

Table 3: Household's meals and composition before and after HIS (n =200)

Variables Compared	Wilcoxon Ranks Test			
	n	Mean	z-value	p-value
Number of meals taken before heifer in-trust schemes	200	1.95	-13.388	0.000
Number of meals taken after heifer in-trust schemes	200	3.12		
Meals composition before heifer in-trust schemes	200	1.36	-6.538	0.000
Meals composition after heifer in-trust schemes	200	2.12		
	Wilcoxon Ranks Test			
Gender Variables compared	n	Mean	Z-value	p-value
Male Number of meals before heifer in-trust schemes	94	1.96	-9.144	0.000
Number of meals after heifer in-trust schemes	94	3.12		
Female Number of meals before heifer in-trust schemes	106	1.98	-12.741	0.000
Number of meals after heifer in-trust schemes	106	3.11		
Males Meals composition before heifer in-trust schemes	94	1.26	-5.713	0.000
Meals composition after heifer in-trust schemes	94	2.02		
Female Meals composition before heifer in-trust schemes	106	1.44	-4.725	0.000
Food composition after heifer in-trust schemes	106	2.20		

Meal before and after schemes are different at $p < 0.001$ and meals composition before and after the scheme are different at ($p < 0.001$)

Household income

Annual household earnings

Annual net cash household earnings increased almost 8-fold after the HIS intervention and all males and females in HIS intervention are getting above TZS 4 000 000 ($ 2 224) (Table 4).

Table 4: Household income before and after the scheme by sex of household head (n =200)

Region	Sex	Variable compared	n	Mean in TZS	t-value	p-value
Njombe	Male	Households' net income (2012)	94	4,032,600		
	Female	Annual household's net income before the scheme (1998) as expressed in year 2012 prices	94	532,980	-58.588	<0.001
	Male	Households' net income (2012)	106	4,025,500		
	Female	Annual household's net income before the scheme (1998) as expressed in year 2012 prices	106	506,710	-61.042	<0.001

The income before and after HIS are significant at p<0.001. All males and females are earning above TZS 4 000 000. Exchange rate was USD = 1,650 TZS on September 2013 and Annual household's net income were adjusted using *Bank of Tanzania (BoT 2000 and 2013) Economic Bulletin for the Quarter Ending December, 2000 and Economic Bulletin for the Quarter Ending March, 2013 respectively.*

Income from sales of milk

HIS beneficiaries reported selling more milk during the rainy season because they had plenty of milk but low prices ranging between TZS 500 and 710 (US$ 0.30 to 0.43) were realized during rainy season compared to TZS 810 and 1,100 ($0.50 to 0.66) realized during dry seasons. It was further reported that during the rainy season more milk was consumed by smallholder households as they had plenty of milk but demand was very low as compared to the dry season.

Household income from sales of calves

After fulfilling a Passing-on the Gifts (POG) contract, farmers become free to sale the remaining off-spring. In the study area, most MHHs respondents reported they sold calves at an average of six and eight months and that when the age was above six months, prices increased (Table 5). These findings indicate that apart from income from milk sales, calf sales also contributed to households' income hence improved smallholder farmer household's well-being.

Table 5: Household involved in calves sales and income earned from sales by sex (n = 200)

Sex	Household n (%)	Calves sold	TZS per calf	n (%)
Male (n=94)	Yes (86.28)	83	Below 500,000	0 (0.0)
	No (13.8)	0	501,000-600,000	43 (45.7)
			601,000- 800,000	29 (30.8)
			801,000-1,000,000	10 (10.6)
			1,001,000-1,500,000	1 (1.2)
Female (n=106)	Yes (82.1)	87	Below 500,000	6 (5.6)
	No (17.9)	0	501,000-600,000	40 (37.7)
			601,000- 800,000	26 (24.5)
			801,000-1,200,000	15 (14.2)

Household income from sales of green pasture and fodders

Most respondents sold green pastures and crop residues (Table 6). These findings mean that, there were very few HIS beneficiaries who had extra pasture for sale. It also means hay making and selling is challenging perhaps due to either lack of time and or technology needed on this particular activity. The findings also imply that there is an opportunity that can be optimally tapped by smallholder farmer households to produce enough pastures for their own use and for sale to improve milk production and income.

Table 6. Household income from pasture and fodder's sale by sex of household head (n =200)

Sex of household head	Type of forages	n (%)	Sales in TZS	
			301,000 -600,000	601,000 -800,000
Males (n = 94)	Green grass	66 (70.2)		
	Hay	2 (2.1)		
	Crop residue	18 (19.1)	82	4
	None	8 (8.5)		
Females (n -106)	Green grass	91 (85.5)		
	Crop residue	3 (2.8)	88	6
	None	12 (11.3)		

Challenges to HIS beneficiaries in the study area

Most respondents in the study area reported that HIS did not replace the animals that died and that by not replacing them the burden was shifted or transferred to other farmer groups who were still poor at the initial stage of the scheme. It was widely reported that HIS did not consider the training of the Community Animal Health Workers (CAHWs) for the POG recipients. They reported that lacking this essential service jeopardized animal production and productivity. They also reported that HIS did not consider supporting the POG group's CAHWs with Veterinary First Aid Kits as was done for the original recipients in HIS. These findings mean that t the POG recipients never performed better as compared to original recipients due to inadequate or lack of CAHWs and veterinary kits to support their services. The immediate achievement of HIS objectives was delayed as those households whose cattle died had to wait for some time to get replacement from other members after completing their POG cycle.

Conclusions

- Despite the seasonality variations in the highland agro-ecological zone, HIS had significantly contributed to the improvement of smallholder's household well-being.
- HIS beneficiaries' income increased, meal frequencies and meal diversity were improved.
- Training on animal husbandry to original recipients and their CAHWs and the provision of veterinary kits would have promoted HIS growth and continued food and income securities to smallholder farmers' households hence their well-being.
- The study recommends that the Government and dairy sector development partners should promote pastures and fodders establishment skills and technologies among dairy farmers to enable them to provide quality and constant feeds for sustainable animal production and productivity.
- HITz and other dairy sector supporting farmers with heifers should put in place the strategy of immediately replacing heifers that die instead of leaving the burden to original recipients.

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PAPER FIVE

Role of Heifer In-Trust Schemes in Smallholder Household's Well-Being in Semi-Arid Region of Shinyanga, Tanzania

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Role of Heifer In-Trust schemes in Smallholder Household's Well-Being in Semi-Arid Region of Shinyanga, Tanzania

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ABSTRACT

Livestock-In-Kind Credit schemes has been used all-over the world to help the rural poor invest and save. Investment in livestock enables the rural poor to overcome shocks/risks and alleviate poverty. The Heifer in-Trust Schemes (HIS) was initiated in Shinyanga Region (semi-arid) to help reduce food and income insecurity of smallholder households. However, there exists an information gap on the schemes role to the beneficiaries' well-being. As such, this study aimed at determining the role of heifer-in-trust schemes in smallholder household's wellbeing. It adopted a cross-sectional research design. Data from 202 randomly selected HIS beneficiaries were collected using a structured questionnaire. In addition, five focus group discussions (FGDs) were conducted to supplement the data collected through the questionnaire. Results showed that the dairy enterprise was the major source of food and income. Results further show that households' food security increased in terms of the number and diversity of meals taken per day and income increased from milk and animal sales. It is concluded that investing in dairy farming is vital for smallholder households' well-being.

Key words: ***Heifer in-trust schemes, smallholder farming households, well-being, semi-arid, Tanzania***

INTRODUCTION

The Heifer In-trust Schemes (HIS) is a livestock rural poverty reduction credit model that was introduced by Heifer Project International (HPI) in Tanzania. The HIS generally aims at reducing rural poverty and promoting well-being of poor smallholders' households. In this paper, well-being means increased food access and income among smallholder farmers. Generally, the HIS targets poor resource households, which are given an in-calf (pregnant) heifer on agreement that the recipient household would pay back through the first and second offspring which are then passed on to another needy household. Worldwide, the HIS idea was coined by Dan West (1893-1971), a Mid-western farmer in Spain. West was giving out rations of milk to orphans and refugees during the Spanish Civil War when the idea of relief and reducing dependency came to his mind. West founded the Heifer Project International (HPI) and HIS for Relief in 1944 aiming at ending hunger and poverty (HITz, 2011).

In the African continent, HIS was introduced in 1974; Tanzania was among the first countries to implement the scheme. In the country the scheme was first introduced at Kitulo dairy farm in Makete District in Njombe Region, which was under the Dairy Farming Company (DAFCO) established with the aim of establishing the foundation herd farms to produce improved dairy heifers for the communal (*Ujamaa)* villages by then. In Shinyanga region, the HIS was introduced in 1998 (HITz, 2011).

Since Tanzania's independence in 1961, the government and her development partners have adopted various initiatives to address rural poverty, one of which is the HIS credit model. Since the 1980s, HIS has been a popular rural poverty reduction credit model. Programmes in Tanzania that have used the model include, Kagera Livestock

Development Project (KALIDEP), Tanga Dairy Development Project (TDDP), the Southern Highlands Dairy Development Project (SHDDP) in Iringa and Mbeya regions and Autropejcct Association in coast and lake zones to mention a few (Mwankemwa, 2004; Urassa, 2005; HITz, 2011: TDB, 2012). Despite the various poverty reduction initiatives by the Tanzanian government and other development partners, more than a quarter (28.2 %) of the population in the country is poor (The World Bank Group, 2015). In addition, the incidence of poverty is higher in the rural areas compared to the urban areas (World Bank, 2010). In Shinyanga region, most of the rural population lives below the basic needs poverty line, below the food poverty line (NBS, 2013), and below the national poverty line of one USD a day (World Bank, 2010). As a result, most families cannot afford to pay basic services such as education and health care expenses, for their members.

HPI support to beneficiaries in the semi-arid region of Shinyanga region ended 15 years ago but there is lack of knowledge on how the project has influenced the well-being of smallholder households. Therefore, it is ideal that HIS impact on smallholder household's well-being is known, and this is the focus of this paper. The paper is guided by a research question "how has the Heifer In-trust Scheme (HIS) contributed to smallholder household's well-being in the semi-arid areas of Shinyanga region?" It assesses the contribution of the HIS to beneficiary households' well-being in terms of household income earnings and food security (food access and availability). Generally, a household's food security could be enhanced through application of manure obtained from the dairy animals thus, increasing crop productivity. In addition, a household can use income from milk sales to buy improved seeds and other inputs such as fertilizers, pesticides and herbicides all these enable increased crop production. Moreover, households could also use part of the income to buy other foodstuffs not produced by the

households or to add on to the stock of own produced food. The study is in line with (i) the Millennium Development Goals (MDGs) 1 and 3 that aims at addressing issues of extreme income poverty and hunger and gender equity by 2015, (ii) Tanzania's Vision 2025 that aims to make Tanzania a medium income country by 2025 and the (iii) National Strategy for Growth and Poverty Reduction Strategy II. The study contributes knowledge to the existing literature on the interactions between livelihoods, poverty and well-being at household level. Lastly, the findings enhance knowledge to the Government, academia and other development actors on how HIS alleviates poverty and enhances smallholder farmer's well-being in semi-arid areas of Shinyanga region.

In this study, smallholder, farming households refers to those HIS beneficiaries who due to limited resources were producing at subsistence level with no, or very little, surplus to market. Therefore, through the support by HITz it was expected such households would attain food security, earn some income from sale of surplus milk and food crops in excess of their household needs hence enabling them to get out of poverty. Income is defined as the net cash a household earns from selling milk, pastures, live animals, and other goods and services. This definition is in agreement with that of Case and Fair (2007) who hold that an income consists of all receipts, whether monetary or in-kind, of goods and services which are received by either the household or individual members of the households either annually or in more frequent intervals. Food security is defined in terms of food availability, accessibility and ability to utilize food in order to promote a healthy living. The paper uses food security proxy indicators for macro-nutrients consumption which is measured by the number of meals eaten per day: for a household to be considered food secure consumption has to be 3 and 5 meals per day for adults and children respectively. On the other hand when it comes to food diversity as an indicator for food security, the paper considers variety of foods eaten or food groups eaten in a

day i.e. a household must take six food types including protein, fats, carbohydrates, vitamin, minerals and water to ensure their carbohydrates, proteins, vitamins and minerals needs are covered. In addition, the foods should have sufficient amounts of roughages (fibber)' and right quantities of water should be taken. The definition adopted by the paper is in agreement with USDA's (2012) definition, which looks at food security as the availability of food and one's access to it. This is also congruent with FAO's (2003) definition which views food security as the situation whereby all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. According to these sources, a household is considered food-secure when its occupants do not live in hunger or fear of starvation.

MATERIAL AND METHOD

Description of the study area

Shinyanga is one of Tanzania's 30 administrative regions. It is situated south of Lake Victoria. According to Tanzania's 2012 national population and housing census, the region has a population of 1 534 808 in 2012 (URT, 2013). The region has an area of 50 781 square kilometres, which is equivalent to 19 600 square miles (SRCO, 2011), and it lies between longitudes 31° 0' 14' E and 35° 0' 11' E and between latitudes 2° 0' 15' S and 4° 0' 30' S. Shinyanga region is mostly a lowland with semi-arid conditions: on average the region's annual rainfall is 500 mm (URT, 2011). The study was conducted in 10 villages, these are, Uzogole, Mwamagunguli, Chibe, Ihapa, Bushushu, Lubaga, Ndala, Mwasele, Kitangili and Bugayambele.

Research design and data collection

The study used a cross-sectional research design whereby data were collected once. The sample population was determined randomly using HIS beneficiaries' register books. The study's sample size (n) of 202 was 5% of the total number of beneficiaries' households in the study areas. In addition, five FGDs were conducted to trianulate supplement and validate information collected through the questionnaires.

Data analysis

Primary data were analysed using the Statistical Package for Social Science (SPSS 16) whereby descriptive statistics were determined (frequencies and percentages). In addition, T-test was used to determine whether there was a significant association between meals taken before and after involvement in the Heifer in-trust Scheme (HIS). Chi-square was also used to determine associations in net income, crops production and milk production before and after the introduction of HIS. The *Wilcoxon* Signed Ranks Test' was used for *nonparametric* variables of number and frequency of meals and dietary diversity. Information from the FGDs, was categorized into meaningful units and organized systematically to obtain a logical flow.

RESULTS AND DISCUSSION

Respondents' characteristics

The study involved 202 respondents out of whom 21.8% were males, 78.2% were females. Of the surveyed households, 65.7% were female headed household (FHHs) and 30.3% were male headed households (MHHs). All respondents had lived in the area for more than 21 years and were living in their own houses. Most of the houses were of good quality whereby 85.6% were roofed with corrugated iron sheets, 46.5% had cement floors and 30%, had walls made of concrete blocks or burnt bricks bought using income

generated from the HIS. All the respondents reported to own land ranging between 2 and 7.5 acres; the land was used for both cash and food crop production as well as for dairy farming.

Although the Sukuma are traditionally agro-pastoralists, the HIS beneficiaries reported not to have owned dairy cattle before their involvement in the project. Results also show that more than half (52%) of the respondents were women since the HIS generally targeted vulnerable groups including widows, poor FHHs and those caring for orphans. HPI selection of beneficiaries' focused on; the poor and disadvantaged families; families not owning livestock and without resources to buy them; families that were permanent residents in the project implementation area/community; families that owned or had access to at least 0.5 an acre of land for growing fodder; widows with children, disabled people, and families that were caring for HIV/AIDS orphans; families that were willing to attend the scheme's training and ready to follow the schemes' guidelines, ready to cooperate with other farmers; families that were eager to improve their standards of living through improved livestock enterprise (HIT, 2011). Generally, women are among those who have been disadvantaged from accessing the benefits of their labour (HITz, 2011).

The contribution of HIS to beneficiary households' food security

Despite the study area generally being occupied by agro-pastoralists, findings in Table 1 show that 88% of HIS beneficiary households' reported to have not consumed milk at all before the HIS intervention. Table 1 also shows that 98.6% and 95.5% of the FHHs reported to have consumed between two and four and between five and seven litres of milk per day after the introduction of HIS during the dry and wet seasons respectively. The findings on milk consumption in this study are in line with those reported by Mpila

(2006) who asserts that dairy farming leads to increased milk consumption among smallholder households. During the FGDs the participants reported that, HIS has enabled their households to be food secured, they now get milk which is a complete meal for both adults and children. The participants pointed out that, availability of milk at their households has improved growth of their children. This argument is supported by a study by Odhiambo et al (2004) who linked stunting with a poor household's access to inadequate food dietary intake. However, the discussants also uncovered that milk consumption per person at the household is less during dry season because production is low while demand is higher. FGDs participants pointed out that, due to income poverty, milk is sold during the dry season to enable HIS beneficiary households' to earn an income which they use to buy other food items while meeting other household needs. These findings imply that HIS has significantly contributed to availability of milk and its consumption by households which in the past were neither able to produce their own milk nor to buy milk.

Generally, it was observed that though household in Shinyanga region knew the importance of milk in their daily nutrition and healthy life, most of the poor and vulnerable household could not access the same. Therefore, the HIS has really made a difference in their lives as they now have easy access to milk which has improved the beneficiary households' dietary diversity, presumably, this has also led to reduced malnutrition among under-fives, and pregnant and lactating mothers as reported in literature (USDA, 2012). During the FGDs it was further reported by the participants that, milk consumption promotion and campaigns done by diary sector's development actors and programmes during milk weeks has significantly contributed to increased milk consumption in the study area.

Table 1: HIS beneficiary households' consumption of milk by season and household head's sex (n = 202)

Season	Sex of household head	Milk consumed per household per day before the scheme		
		0 litres	0.25-0.50	>0.50
Dry and wet	Male (n = 44)	39 (88.6)	5 (11.4)	0 (0)
	Female (n =158)	139 (88.0)	19 (12.0)	0 (0)
		Milk consumed per household per day after the scheme		
Dry season		**2- 4 litres**	**5 -7 litres**	**9-10 litres**
	Male(n = 44)	19 (43.0)	25 (57.0)	0 (0)
	Female(n = 158)	78 (49.3)	78 (49.3)	2 (1.4)
		Milk consumed per household per day after the scheme		
		3 -4 litres	**5 -7 litres**	**8 -9 litres**
Wet season	Male(n = 44)	6 (14.0)	35 (79.0)	3 (7.0)
	Female(n = 158)	27 (17.0)	124 (78.5)	7 (4.5)

( ) Numbers in brackets indicate percentage

Results as presented in Table 2 show that before the HIS intervention, households took an average of one meal a day, which was below three meals per day required for adults and five meals per day required for under-fives (UNICEF, 1985; URT, 1992). Table 2 further shows that, after the intervention the beneficiary households were able to have three meals in a day. This reported frequency is in line with those suggested by UNICEF (1985) and URT (1992) that, feeding frequencies for adults and for under-fives should be three meals and five/six meals per day respectively. As regards meals composition, the findings show that, before the intervention the diversity of food taken by households was limited; most households consumed only one type of food (maize meal-'*Ugali*' in Swahili). Despite slight variations in the average meals and meals composition in the study area, *Wilcoxon* Signed Ranks Test t-test results as presented in Table 2 show a significant relationship between the number of meals and meals composition taken by HIS beneficiaries before and after the HIS ($p \leq 0.001$). These findings suggest that, HIS has positively contributed to the increase of the number of meals and meals composition among the beneficiary households. This is supported by what was said during a FGD

held in Mwamangunguli village on the 9th January 2013 whereby a 45 years old woman said;

> *"I was not food secured before my involvement with the HIS, during that time I and my household only ate one meal type daily. However, since the introduction of HIS, thank GOD and HITz for the dairy cow, I and my family can now eat a diverse diet with a variety of nutrients."*

Table 2: Meals taken by household and meal composition before and after HIS (n = 202)

		Wilcoxon Signed Ranks Test			
Variables Compared		**n**	**Mean**	**z-value**	**p-value**
Number of meals taken before heifer in-trust schemes		202	1.52	-12.708	0.000
Number of meals taken after heifer in-trust schemes		202	3.02		
Meals composition before heifer in-trust schemes		202	1.00	-5.507	0.000
Meals composition after heifer in-trust schemes		202	1.44		
Sex	**Variables compared**	**Wilcoxon Ranks Test Paired differences**			
		n	**Mean**	**Z-value**	**p-value**
Male	Number of meals before heifer in-trust schemes	44	1.61	-5.970	0.000
	Number of meals after heifer in-trust schemes	44	3.05		
Female	Number of meals before heifer in-trust schemes	158	1.50	-11.245	0.000
	Number of meals after heifer in-trust schemes	158	3.02		
Male	Meal composition before heifer in-trust schemes	44	1.00	-2.682	0.007
	Meal composition after heifer in-trust schemes	44	1.52		
Female	Meal composition before heifer in-trust schemes	158	1.00	-4.888	0.000
	Meal composition after heifer in-trust schemes	158	1.42		

Number of meals taken before and after HIS are significant at $p < 0.001$.

The contribution of HIS to beneficiary households' food crops production

Results in Table 3 show that all the 202 respondents were not only keeping dairy cattle, but were also engaged in crop production mainly for food. The Table shows an average increase of 670 (kg/ha) of maize yield. This was a statistically significant difference in beneficiary households' maize yields before and after HIS ($p < 0.001$). In addition, the FGDs participants pointed out that, their involvement in the HIS has enabled them to increase maize (a staple food) productivity (kg/ha) in the surveyed areas. While the

increased maize yields could be a result of many compounding factors, the contribution of farmyard manure from the dairy animals cannot be ignored. The use of improved maize seeds such as TMV, Kilima and Ukiliguru, has similarly enabled HIS beneficiary households to increase crop yields and hence improve their food security status. Similar results have been reported by Rutamu (2004), in Rwanda where use of cow manure was reported to have contributed significantly to improved soil fertility and hence increased crop yields.

Results from the FGDs further showed that besides the efforts of the government to improve crop production through agricultural extension services and introduction of new maize seed varieties, the HIS helped them to add value through training on integrated farming. These discussants also reported that, HIS enabled households to get manure for their farm and money for buying improved seeds. Thus, it has contributed to increased food production and to crop productivity. However, FGD participants pointed out that the Sukuma, Nyamwezi and Sumbwa in Shinyanga Region are culturally agro-pastoralists keep large numbers of cattle as an indicator of wealth and prestige. As a consequence, it is not easy to accumulate cow dung for farm use. Furthermore, most of the livestock keepers are not used to applying cow dung to fertilize their farms. The FGD participants further pointed out that, some of HIS beneficiaries, in addition to not using manure, had ignored modern livestock husbandry techniques taught to them. Generally, these findings imply that, the application of animal manure in maize production has increased crop yields thus enhanced food availability, accessibility and utilization.

Table 3: Maize crop yields before and after households' involvement in the heifer-in-trust scheme

Variables compared	n	T-test paired differences Mean in Kg	t-value	p-value'000
Maize production before the application of cow's dung manure from the scheme	202	650		
Maize production after the application of cow's dung manure from the scheme	202	1320	-37.778	0.000

Maize production before after application of cow's dung manure are at p<0.001.

The Contribution of HIS to beneficiary households' income

Results in Table 4 show that due to income from milk sales beneficiary households' income increased by almost five times. Results further show that after the HIS intervention all households, regardless of the sex of household heads, were earning at least 2.5 million as their annual income. The observed annual incomes are a great improvement from the TZS 499 000 ($ 302) and 500 000 ($ 303) per annum earned by MHHs' and FHHs' respectively prior to joining the HIS. However, during the FGDs, participants pointed out that there was some fluctuation of income based on the rainfall patterns and that this has a major influence on milk produced and the amount to be sold. Generally, during the dry season milk production and income were lower due to poor quality of pastures and fodder. According to Mpila (2006), a change in climatic conditions, including rainfall patterns has greatly influenced milk production in Tanzania. Low milk production implies reduced income from milk sales. In keeping with Aikaeli (2010) and Urassa (2015), findings of this study generally indicate that dairy farming through HIS has improved rural households income and hence contributed to poverty reduction among the beneficiaries.

The findings presented above are supported by observations from the FGD held in Lubaga village on 12th January, 2013, where a 56 years old woman reported her experiences on how HIS has helped her family by saying;

> *"...I was born and raised in a poor family hence I could not have been able to move out of poverty without external support. However, through HIS I got a dairy cow, now I'm better off. I have been able to buy land and build a good house. In addition, I have taken my three children to good schools..."*

Table 4: Households income before and after involvement in the Heifer In-Trust (n= 202)

Sex of household head	Compared difference	T-test paired difference n	Mean in TZS	t-value	p-value
Males	Households' net income (2012)	44	2,884,000		
	Annual household's net income before the scheme (1998) expressed in year 2012 prices	44	499,770	-20.155	0.000
Females	Households' net income (2012)	158	2,836,700		
	Annual household's net income before the scheme (1998) expressed in year 2012 prices	158	506,710	-46.733	0.000

Household's net income before and after HIS are significant at p<0.001. Annual household's net income were adjusted using Bank of Tanzania (BoT 2000 and 2013) Economic Bulletin for the Quarter Ending December, 2000 and Economic Bulletin for the Quarter Ending March, 2013 respectively

In addition to income earned from milk sales, Table 5 shows that calves were also sold at different ages and prices, this also added to the households' income. Respondents reported that HIS conditions allow beneficiaries to sell surplus animals after fulfilling the 'Passing on the Gifts (POG) contract'. Table 5 further shows that 72.7 % and 84.8 % of the MHHs and FHHs sold calves. The findings also show that older calves were sold at higher price compared to younger ones; generally, it is easier to take care of the older ones whose returns are also quick to realize as they enter the reproductive cycle.

Table 5: HIS household income from sale of live animals by sex of household head (n = 166)

Household head's Sex	Calves sold annually	Price per calf in TZS	Actual numbers sold
Male (n=44)	32	Below 500,000	6 (13.6)
		501,000 - 600,000	17 (38.6)
		601,000 - 800,000	5 (11.3)
		801,000 - 1,200,000	4 (9.3)
Female (n=158)	134	Below 500,000	71 (53)
		501,000 - 600,000	42 (31.3)
		601,000 - 800,000	20 (14.9)
		801,000 - 1,200,000	1 (0.7)

( ) Numbers in brackets indicate percent

In addition to income earned from sales of milk and calves, Table 6 shows income earned from sales of pastures and fodders. However, less income is obtained from sales of pastures or fodders because the study area is semi-arid with a low average annual rainfall of 500mm. During the FGDs, participants pointed out that during dry season animal feeding is a critical challenge as they have to buy grass or fodders from few people selling them at a higher price ranging from TZS 10,000 to 50,000 depending on amount bought: generally, the price takes into account weight (kilograms) and the time spent by the sellers to collect the same. The study findings suggest a need for training on pasture establishment, management and preservation. The training is vital in addition to supplementary feeding if sustainable dairy farming and high productivity are to be realized in a semi-arid area such as Shinyanga region.

Table 6: Household income from pastures/fodder's sale by sex of household head (n =13)

			Annual income from pasture and fodder's sale in TZS (USD)	
Household head's Sex	Type of pastures compared	n (%)	301,000 – 600,000 (S 182 - 364)	601,000 - 800,000 (S 364 - 485)
Male (n=4)	Green pasture	1(25)	0	4
	Fodder-Crop residue	3(75)		
Female (n=9)	Green pasture	1(11.1)	2	7
	Fodder-Crop residue	8(98.9)		

USD 1:00 = 1,650 TZS on September, 2013

CONCLUSION AND RECOMMENDATIONS

Based on the findings from this study, it can generally be concluded that, despite the seasonal variations in the semi-arid area of Shinyanga region, HIS had significantly contributed to the improvement of beneficiary households' well-being. HIS beneficiaries' income has increased; meal frequencies and meal diversity have been improved in the study area. The study recommends that the government and dairy sector development partners should promote pastures plots establishment and conservation skills among dairy farmers in semi-arid areas, Shinyanga region inclusive. This promotion will enable them to provide quality and constant feeds for sustainable animal production and productivity. Similarly, the dairy sector development actors should put in place the strategy of conducting frequent refresher training and perhaps adopt training-of-trainers-approach whereby dairy farmers become locally available trainers to enable farmers to improve dairy husbandry practices in a sustainable manner so as to enhance the contribution of dairy farming sector (including HIS) to smallholder dairy farmers' well-being.

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CHAPTER THREE

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

The following conclusions are drawn from this study titled Heifer In-trust Scheme's contribution to smallholders' well-being in diverse agro-ecological and cultural environments in Tanzania:

(i) HIS has generated self-employment opportunities among less formally educated youth, women and men in the study areas. The self-employment opportunities which included selling milk, pasture/fodders, water, agro-vet inputs supplies and provision of animal health and Artificial Inseminations services have sustainably helped farmers to get income and improve their household's well-being.

(ii) Negative implications from agro-ecological factors in both semi-arid and highland areas were observed to be much higher during the dry season compared to the wet season. Negative effects of cultural practices were much observed in semi-arid areas. Consequently, milk and income from sales of milk were higher among households in highland areas than in semi-arid areas. Similarly, cultural practices such as free range livestock grazing, the use of traditional herbalmedicines for livestock treatment and rituals for livestock protection had more negative influence on HIS in semi-arid areas of Shinyanga where the practices were more prevalent

(iii) In semi-arid agro-ecological areas short rains of an annual average of 500 mm had negatively impacted availability of quality pastures that resulted into low milk production and less income earned from milk sale. Consequently, milk and income from sales of milk were lower among households in semi-arid areas than in highland areas.

(iv) Involvement of more women in HIS has significantly contributed to women empowerment. Most women are in HIS groups' leadership positions and are contestingwith men and youth in different leadership positions at respective communities. It can also be concluded that HIS has significantly contributed to increased gender awareness that paved ways for more women involvement in households and community decision making. It is further concluded that involvement of less formally educated youth, women and men in HIS in highlands and semi-arid areas has improved their households' food availability and income.

(v) Cash income from HIS has significantly contributed to acquisition of assets such as land and houses that are used to transform and improve smallholder households' well-being. It can also be concluded that HIS has increased smallholder farmers' ability to meet their children's educational as well as family health expenses.

(vi) Even within the same agro-ecology there exist micro-agro-ecological factors that vary with space and time and their effects translate into variations in smallholders' well-being mechanisms. Nonetheless, despite these micro-agro-ecological seasonality variations, HIS has contributed to smallholder

households' well-being in highland andsemi-arid areas. It has increased households' meals frequencies and diversity and income. However, dry seasons have caused poor availability of pastures and fodders which in turn has reduced animal production and productivity and hence reduced milk and income from HIS.

3.2. Theoretical Implication of the Findings

This study assessed the Dan West's HeiferIn-trust Theory that explains the dynamic aspects of dealing with hunger and poverty that 'People need a cow not a cup to reduce dependency, improve resilience and their well-being (HPI, 2011).Despite smallholders attaining some level of dependency and resiliency, they have not fully managed limitations to transform dependency effects acquired at individual, group and household levels. West's Theory emphasized only on the provision of in-trust heifers but did not consider other enabling and or constraining day to day factors such as rainfall patterns and seasonality, quality availability of pasture and animal health. On the other hand, the theory did not consider traditional practices and gender structures such as livestock grazing and feeding styles, traditional animal treatments mechanisms and animals' protection rituals as well as gender relations structures in the beneficiaries' communities and at family level.

The study appreciates the contribution of West's in-trust theory, among others. However, agro-ecology and cultural phenomena were ignored, and this is the gap that study filled in. In order to completely improve their households' well-being through HIS, provision of heifer shall need to consider the enabling/ constraining diverse agro-ecological factors and cultural practices in a given community too.

The findings of this study offer some theoretical explanation of the way HIS may contribute or fail to transform smallholders' well-being by also considering agro-ecology and traditions that shape the behaviour and actions of people. The exploration of these influences has laid a learning about dairying in the highlands and semi-arid regions of Tanzania. Therefore, knowledge gap in the existing literature on how HIS are influenced by these factors is filled in.

From the knowledge gap filled by this study's findings, the relationship between the study findings and the theory that guided the study are:

- Heifer In-trust theory is a workable instrument that Heifer In-trust Schemes translate into real practical world.

- Through Heifer In-trust theory, poor resourced smallholder farmers supported through Heifer In-trust Schemes get out of poverty thus improving households' well-being.

- In order to improve the smallholder household's well-being through HIS, consideration of the agro-ecological factors and cultural practices among other dynamic contextual factor is vital.

3.3 Recommendations

3.3.1 Prioritizing and propagating vigorous rural dairying initiatives like HIS for informal employment opportunities

The Ministry of Livestock and Fisheries, Local Government Authorities and dairy sector development actors shall promote and support vigorous rural dairying initiative to provide

more self-employment opportunities. The initiatives like HIS are suited to provide this opportunity because most of rural people are poor and cannot have capital to invest in dairy farming unless they are supported. Furthermore, most of rural people are less formally educated hence cannot be employed in the formal sectors; they can rather employ themselves through such initiatives.

3.3.2 Considering rainfall patterns, seasonality and breed types in any dairy farming interventions

Prior to supporting the intended farmers with dairy cows (heifers) by Local Government Authorities and others dairy sector development partners, an assessment on rainfall patterns, seasonality variations and types of animal breeds that will grow better in such area are important. There are some animals according to breed type that cannot do well in semi-arid areas but can do better in highland areas. The assessment findings will help the supporters to reduce unintentional effects in animal production and productivity. The findings also will reduce the burdens to smallholder farmers by using a lot of money for buying pastures and treating animal diseases.

3.3.3Train, promote and follow-up on the use of cow dung manure

Local Government Authorities should facilitate extension workers to train and follow-up on the use of cow dung manure by every farmer with cattle. Every livestock extension worker at ward and village levels should continue training, making a close follow-up, on the adoption of the farming skills and should reinforce district by-laws related to improving farming including the use of cow dung manure. Most of farmers, Shinyanga Region in particular, are not using manure in their farms. These initiatives, among others, will provide farmers with knowledge and skills on the importance of manure for their crop production and hence increase crop yields for food and surplus for income.

3.3.4 Training on pasture establishment, conservation, and hay and silage making

Local Government Authorities, the livestock development department in particular, should train farmers on pasture plots establishment, provide subsidized pasture seeds based on agro-ecology zones to help farmers grow and conserve own quality pastures year round needs. Local Government Authorities and dairy sector development partners should develop simple technologies for making hay and silage to help farmers make them for own animal feeding and selling surplus for income. Pasture plots establishment, pastures and fodders conservation and hay and silage making skills and knowledge will enable farmers to have constant quality pastures and feeds for sustainable animal production and productivity.

3.3.5Increasing use of additional supplement feeds

Farmers should allocate a budget from own annual income to enable them access traditional animal supplement feeds such as concentrates, especially during the dry season. This will enable farmers to provide constant quality animal feeding for sustaining milk production and hence increase income from sales of milk.

3.3.6Promote more women participation

Local Government Authorities and Development partners should continue to promote the involvement of more women in dairy farming. Since most of the poor population found in rural areas are women, their involvements in dairy farming initiatives such as HIS will enable them to get out of poverty, reduce their dependency form husbands and increase their ability to meet major household expenses that mostly are left to them.

3.3.7Promote milk consumption attitude among households members

Central and Local Government Authorities and dairy development actors should establish a ward and village level milk week consumption day. The campaign, exhibitions and competitions prior to this week will promote milk consumption hence increase consumption rate. LGAs and the department of secondary and primary education should be used to promote the milk consumption among pupils, students and villages at respective schools and nearby villages.

3.3.8 Investing in milk storage facilities and processing plants

Central and Local Government Authorities and dairy private sectors should consider supporting farmers through milk collection centres to install storage facilities and processing plants such as cooling and chilling plants nearby farmers. Doing this will reduce most of the milk that get spoilt and thrown away due to lack of such facilities. Having these services near farmers will increase the amount of milk sold and hence income.

3.3.9 Immediate replacement of dairy cattle which may have died by implementing organization

HITz and other dairy sector development implementing organizations should allocate a budget for immediate replacement of dairy cows that die instead of leaving the burden to original farmer recipients. This will reduce a long list of the recipients who are waiting to get a pass-on livestock, and it will promote group cohesion and togetherness as the time to receive the intended gift is shortened.

3.3.10 Train community animal health workers and equip them with vet simple vet kits

Local Government Authorities and respective dairy development implementing organizations such as HITz should make sure that they allocate budget for training the Community Animal Health Workers (CAHWs) for the Pass on the Gifts (POG) recipient groups as it was done for the original recipients. CAHWs do supplement the work of livestock extension workers service by continuing to roll down the animals' health management skills to new HIS farmer groups through POG even when the project ends. All support provided to Original Placement (OP) farmer group such as training of the CAWHs, vet kits provision and other modern dairy husbandry related resources should also be provided to the POG farmer groups. Doing this will put both the OP and POG recipients at a similar pace of development

3.3.11 Train farmers on the traditional herbs usage

Local Government Authorities, the livestock development department in particular, should develop the initial and refresher training to farmers on the traditional herb dosage. This is because not all traditional herbs used by farmers for treating their animals are bad rather they are lacking knowledge and skills on the proper dosage. The proper dosage will reduce under or over dosing the animals.

3.3.12 Train on attitudinal change on harmful traditional beliefs and practices

Livestock development and community development departments at the respective Local Government Authorities should develop an on-going initials and refresher trainings of farmers on the disadvantages of traditional harmful beliefs and practices to their livestock. Traditional harmful belief such as using rituals to protect animals have negative influence

on income from sale of milk as most of consumers are not willing to buy and consume milk from a ritually protected animal.

Government and dairy sector development actors should continue training farmers on the importance of having fewer cattle that can easily be managed instead of having big flock which is less productive and is difficult to manage. The farmers receiving dairy cattle support should abide by intensive farming practices even after the end of signed contract to avoid them going back to traditional extensive grazing systems that, among others, reduce milk production and income from milk sales. Established by-laws should be reinforced by Local Government Authorities through use of livestock extension workers in respective areas. Despite the globalization market forces, the Central Government should subsidize modern drugs and vaccines and make them more available and affordable by smallholder farmers. This will promote animal health and reduce the use of traditional herbal medicines that contribute to reduced animal production, productivity and sometimes cause animal mortality due under or over dosing.

3.3.13 Subsidize and privatize artificial insemination services

The central government should subsidize the (AI) equipment and appliances that influence high costs of AI service to smallholder farmers. Government also should equip its AI zone offices with liquid nitrogen to reduce high transportation and handling costs from National Artificial Insemination Centre (NAIC) in Arusha by private service providers thus turning the service costly.

The government should promote the use of AI private service providers to take charge of this service to respective areas. Among others, doing this will promote private sector

employment opportunities to livestock expertise retirees and young generation, and reduce operational burden to the government.

3.3.14 Replication and scaling-up opportunities for HIS works

Local Government Authorities should take an initiative to allocate the dairy sector's development budget and introduce a philosophy of 'one dairy cow' per poor family initiative to replicate the good work done by HIS in promoting rural smallholders' livelihoods and economies. In the long run this initiative will lead to less needy population at the district level as well as increasing district revenue to be gained from many farmers who will be selling milk and other products.

3.4 Areas for Further Research

The study recommends the following areas for further research as they are in one way or the other related to Heifer In-trust Scheme. If the suggested researches are done, the findings will fill in the knowledge gap on respective areas:

(i) Determine the relationship between the HIS perceived livelihoods impacts and cost benefits analysis in enhancing well-being. This will allow HIS beneficiaries to know how to determine the cost incurred in due course of the schemes in trying to improve smallholder households' well-being.

(ii) Assess differentiated HIS impacts from the Original Placement (OP) and Passing on the Gifts (POG) to farmers. The OP recipients are supported with heifers, related trainings and resources such as nails, timber, iron sheets, cement for shed construction whereas POG recipients are not getting such opportunities. In order for someone to compare the contribution of HIS in two groups' households' well-

being as one of the perceived benefits among others, all groups should have being receiving similar resources and training.

(iii) Examine the relationship between HIS farmer households' well-being indictors and Social Return on Investments (SROI). In most case, the donors supporting HIS beneficiaries are only looking at economic returns on investments without considering the aspects of social returns on investments. The findings from this area will fill in the knowledge gap on how HIS also contributes to SROI.

(iv) Determine the role of HIS to smallholder farmers living with or caring for people with HIV/AIDS households' well-being. Among others, being a person living with or caring for people with HIV/AIDS are the criteria and targets for HIS. The findings from this area will also fill in the knowledge gap on how HIS have contributing to these vulnerable group that are found to almost every community.

APPENDICES

A PhD Research Questionnaire for Msangya, M. L., SUA Morogoro, Tanzania

Appendix 1: Household Questionnaire

Section 1:

a. Interviewer's identification

Full Name of Interviewer: _____

Institution of the interviewer: _____

Mobile number: _____

b. Code information

Questionnaire Code Number: _____

c. Administrative information

Region: (Njombe = 1, Shinyanga = 2)

District name: _____

Village name: _____

Sub-village name: _____

d. Respondents information:

1. Full name: _____

2. Sex: (Male =1, Female = 2)

3. Age: _____

4. Which education level completed? (Below standard 7= 1. Std 7 = 2, Secondary = 3, College= 4, University = 5)

5. Marital Status: Single = 1, Married = 2, Divorced= 3, Separated = 4, Widow = 5, Widower = 6)

6. Are you a household head: (Yes= 1, No = 2)

7. If No, what is the sex of the household head? (Male= 1, Female = 2)

8. How many years did you lived this community? _____

9. How many Male adults (above 18 years) are in your household? _____

10. How many Female adults (above 18 years) are in your household? _____

11. How many under 18 years' children are in your household? _____

12. Of the children under 18 children in the household, how many are in school? _____

13. What is farming group status are you? (Smallholder =1, medium farmer =2, Big farmer =3)

14. What is the size of your family? _____

15. What is your main occupation for household's livelihood? (Agriculture =1, livestock keeping =2, others =3 (specify)

16. Are you the beneficiary of Heifer Tanzania in-trust scheme?

17. If yes, what is the nature of the in-trust scheme are you in?

Section 2: Original placement, POG and access and control over heifer

18. Did you received an Original or a pass-on from a farmers?

19. Are you aware of the Pass-on the Gift Philosophy of heifer in-trust scheme?

20. Have you ever passed on the gift to another farmer? (Yes =1 No =2)

21. If yes, how many times did you pass-on the gift to another famer?
22. How do you consider the Pass-on the Gifts philosophy of heifer-in-trust scheme?
23. Who has the control over the heifer in-trusted at the household?
24. Why the identified person has the control over the heifer in-trusted at the household?
25. Who has the access over the heifer in-trusted at the household?
26. Why the identified persons above have the access over the heifer in-trusted scheme?

Section 3: Income

27. What was your annual household's cash/net income in general before HIS (TZS)?
28. What is your current annual household's cash/net income in general after the scheme (TZS)?
29. When did your year household's income increased?
30. What were the reasons for this yearly household's income increase?
31. What are the main sources of income for your household?
32. What are other sources of income at your household?
33. From which items /services does your household spend mostly?

Section 4: Livestock

34. Do your household owning any livestock?
35. If yes, what is the type of livestock your family owns? (Dairy cattle =1, Zebu= 2, others=3 specify)
36. If you own the cattle dairy cattle, what is the specific breed of the cattle?
37. How many dairy cattle do your household own?
38 Where did your household/family got this/ese dairy cattle from? (HITz =1, Diocese=2, GoT=3)
39. Do you have your own animal pasture? (Yes=1, No= 2)

40. If yes in above, what is the land area used to cultivate the pasture?
41. What is the type(s) of pasture you cultivated?
42. If No, where do you get the animal pasture/feeds for your livestock?
43. How much money you spend in getting the pasture/feeds to feed an animal per day?
44. What is the amount of milk produced per cow per day at peaks of production?
45. What is the amount of milk you sold per day per cow during peaks of production?
46. What is the amount of milk produced per cow per day at low seasons of production?
47. What is the amount of milk you sold during low season per day per cow?
48. Which season your cattle producing low milk?
49. Do you know why your cattle is producing less during the identified season above?
50. Where do you sell your milk?
51. What is the milk price per litter at high peak season?
52. What is the milk price per litter at low season?
53. Which season you are selling more milk than the other? (High =1, Low =2)
54. What are the reasons for you to sell more milk in the identified season above?
55. What are milk/milk products is mostly used in your family?
56. Why milk/milk product are used or not used in your family?
57. Why the above mentioned milk/milk products are most used/not used in your family?
58. Who are given priority in using the milk/milk products in your family?
59. Why the above mentioned persons are given priority in using milk/milk products in your household?
60. Do the climate change affects milk production in last 2-4 years?
61. If yes above, how the climate change affected your milk production in last 2-4 years?
62. What are other factors causing low productivity of dairy cows?

Section 5: Animal diseases

63 What are the most animal diseases affected your adults livestock in due implementation of heifer in-trust scheme in your area?

64. Have you ever lost your dairy cattle due to any of the above mentioned diseases? (Yes =1, No =2)

65. If yes, how many adult dairy cattle died due to the mentioned above animal diseases?

66. What are the common animal diseases affecting calf (young cattle) in your area?

67. Have you ever lost your calf(s) of below 6 months due to any of the above mentioned diseases? (Yes =1, No =2)

68. If yes, how many calf(s) died in due implementation of heifer in-trust scheme at in your family?

69. How do you prevent you animal from disease attack?

70. How to you treat your effected animal with the mentioned diseases?

71. Are you using traditional herbs/medicine to treat your dairy animal? (Yes =1, No =2)

72. If yes, what are the disease types and names of the herbal you are using to treat your animals?

Section 6: Food and Agriculture

73. Do you own any farm/land? (Yes =1, No = 2)

74. If yes, how many acres (land size) do you own?

75. What are 3 major food crops are gown by your household?

76. What is the seasonal acreage average food crop productivity at your household for last 3 years? (Refer to major crops above)

77. What are 3 major cash crops are grown by your household?

78. What is the seasonal acreage average cash crop productivity at your household for last 3 years? (Refer to major crops above)
79. For the food crops grown, does the yields suffice the household's need for the all year? (Yes =1, No = 2)
80. If No, how many months the yield harvested suffice the household's need for the year?
81. What are other 4 key factors influences your household's food security?
82. How was the food security at your household before the heifer in-trust scheme?
83. How is the food security at your household after the heifer in-trust scheme?
84. How many meals have you been taking before the heifer intrusted scheme at your household?
85. How many meals are you currently taking after the heifer intrusted scheme at your household a day?
86. What was the food contents taken before the heifer intrusted scheme at your household?
87. What is the food contents taken after the heifer intrusted scheme at your household?
88. How do you compare the current household's well-being with that of before the heifer in-trust scheme intervention?
89. Do you think that dairy farming under HIS has improved your household food security?
90. If yes, why do you think so?

Section 7: Residence and housing.

91. Do you live in (Your own house =1, Family house =2, Relative house= 3, Rented = 4)
92. What are major construction materials used for walling your house?

93. What are major construction materials used for roofing your house?
94. What are construction materials used for floor at your house?

Section 8: Land and land holding.

95. What are major types of Land Holdings in your community?
96. What is the amount of Land Owned (ha) by your household?
97. What is the amount of Land Hired by your household?
98. For the land you own what is the size of land farmed?

Section 9: Environment.

99. Do you have your own farm trees/woodlot?
100. If yes above, what is the size of the farm?
101. What are the sources of energy for lighting in your household?
102. What are the sources of energy for cooking in your household?
103. If energy used for cooking is fire wood, what is the amount of woods used per day/week?
104. How do you manage your household organic waste?
105. How do you manage the inorganic waste at your household?
106. What do use cow dung/manure for?

Section 10. Cultural practices

107. Does your culture allow female to own livestock? (Yes=1, No =2)
108. If No, why? Please give the reasons
109. Does your culture allow zero grazing and cleaning a cattle shed every day/daily? (Yes =1, No =2)
110. If No, how are doing (cleaning) on the heifer-intrust cattle shed?

111. Does your culture encouraging to take cow dung to the farm as manure?

112. Do your culture allow pregnant mothers to drink milk? (Yes =1, No =2)

113. If No, why? (Please give reasons)

114. Do you have any traditional ways of protecting animals against theft, diseases etc? (Yes =1, No = 2)

115. If yes, what are those traditional ways of protecting animal that you are using?

116. What are other cultural/traditional issues related to livestock keeping in your tribe?

Section 11: Decision making

117. Who decide about the income use in your home?

118. Who decides which farm inputs to buy?

119. Who decides which food crop to grow?

120. Who decides on home farm produced products?

121. Who decides to buy tools/equipment to work the land or other family use?

122. Who decides to take out loan from friends, relatives and financial institutions?

123. Who decides to buy more animals at your household?

124. Who decides whether children go to school or not?

125. Who has the access and control of key resources at home?

Section 12: Women empowerment

126. Women's time-use in household and farming activities

127. Women's access to New Technology and Support services

128. Women's access to improved technology

129. Women in leadership positions in village/community level

130. Women's legal position in inheriting and acquiring lands;

131. Women's access to credit and collateral

Section 13: Employment opportunities

132. Do you think that heifer in-trust schemes has created any employment opportunities in your community? (Yes =1, No =2)
133. If yes, what type(s) of employment opportunities that has been created by heifer in - trust scheme in your community
134. From the employment types above, who are most employed in this scheme in your community? (Youth =1, women =2, men =3)
135. Why do you think that they are the ones who are employed more?
136. Who you think are the most people benefiting from the employment opportunity created by heifer in-trust scheme (Youth =1, Women =2, Men =3)
137. Do you think that heifer in-trust schemes created employments has any impact on women in your community?
138. What are other social impacts of heifer in-trust schemes in your community?

Appendix 2: Men & women's Focus Group Discussion Guide on Heifer In-trust Schemes

Region: .....District: ..... Ward: ..... Village: .....

Topics for Discussion	Key findings	Remarks
1. Project introduction and beneficiary selection		
Heifer in-trust schemes introduced in the community		
Beneficiaries selection process		
Selection criteria		
Heifer in-trust schemes contract/agreement at household signing		
2. Income		
Main sources of income		
Income before the schemes		
Income after the schemes		
Most items spend from this income		
3. Livestock		
Dairy cattle owning before the schemes		
Dairy cattle owning after the schemes		
Pastures establishment		
Livestock grazing systems		
Milk production at different seasons		
Milk markets, marketing & prices		
Types of livestock owned		
Livestock losses in the last 4 years and response		
Livestock extension services		
Livestock constraints		
Change in livestock production		
4. Animal Diseases		
Common diseases for adult cattle		
Common disease for calf		
Modern vaccines and drugs		
Traditional animal's diseases treatment		
Vaccinations and traditional protection		
Climate/weather and diseases		
5. Food and agriculture		
Land tenure systems		
Average land size		
Average crop production per acre		
Months with/without enough food		
Food consumption habits/taboos		
Types of crops grown		
Agricultural extension services		
Constraints to crop production		

Integration farming (livestock & agriculture)		
Changes in crop production		
Access to livestock and agriculture products markets		
Number of months can meet consumption needs		
Food access in times of scarcity		
Preferences to food access within households		
Trends in food access		
Financial institutions services		
Changes in economic activities in the last 10 years		
How people adapt		
Meals frequency before and after		
Food diversification before and after		
6. Land and housing		
Construction materials		
Walling materials		
Flooring materials		
7. Environment		
Own farm trees/woodlots		
Sources of energy for lightening		
Sources of energy for cooking		
Organic and inorganic waste management		
Cattle's manure for farm usage		
Access to drinking water		
Access to land and local hazards		
Common property access		
Changes in access to agricultural land and wages, gender differences		
Landlessness		
Constraints and opportunities in access to natural resources		
8. Decision making on		
Household income		
Farm inputs		
Children's education		
Reproduction		
Loans (in-credit and or cash) taking		
9. Women empowerment		
Women's time used in household and farm activities		
Leadership position at community		
Women's legal positions in inheriting and acquiring land		
Women's access to credits and collaterals		

10. Employment opportunities		
Types of jobs created		
Benefits of employment opportunities		
Major sex employed by HIS		
11. Social capital Information		
OP and POG Group formation		
Organizations working in the community		
Community based groups		
Heifer in-trust schemes groups		
Participation of poor households		
Participation of beneficiaries in heifer in-trust schemes groups		
Groups capacity building		
Group working committees		
Participation of women		
Participation of youth		
Cultural and social trends		
Most vulnerable groups and individuals		
Changes in women's status		
Borrowing money in time of need		
Patron or money lender loan terms		
Access to schools		
Non-formal education		
Skills in the community		
Literacy levels and drop-outs		
Education in people's lives		
12. Other information		
a. Participation in NGO or other Gov. Programs		
Participation in Government programs		
Participation in NGO programs		
Recommended changes		
Effect of external services support on community sharing		
b. Human health		
Major diseases for adults and children		
Health services facilities		
Health services affordability		
Seasonal variations and effect on labor		
Where do you go when you are sick		
Access to health clinics		
Access to sanitation & hygiene facilities		
Recommendations for improving health conditions		

c. Shocks and Coping Strategies		
Historical information on shocks and risks		
Coping strategies		
Reliance on other households		
HH and community adaptations		
Role of community in managing shocks		
Role of external organizations		
HIS and shock as compared to none beneficiaries		
d. Attitudes and Aspiration		
Have things improved or gotten worse in the last 5 years		
What would be done differently if more resources were available		

Appendix 3: Checklist for the core observational items at household

Region: .....District: ..... Ward: ..... Village: ..... Household #.....

Items to observe
1. Livestock
Pastures plots
Shed construction materials
Feeding style
Grazing systems
Types of livestock owned
2. Food and agriculture
Land tenure systems
Types of crops grown
Integration farming (livestock & agriculture)
Adoption and practice
3. Housing
Construction materials
Walling materials
Flooring materials
4. Environment
Farm trees/woodlots
Organic and inorganic waste management systems
Manure for farm usage
Water points
5. Employment opportunities
Major jobs engagement

Appendix 4: The inferential analyses used in this study:

1. Ordinal logistic regression:

Since the dependent variable (well-being) will be measured at the ordinal level while covariates will include variables measured at the nominal, ordinal, interval and ratio levels, the study will apply ordinal logistic regression because it is the model of choice in such a situation (Agresti and Finlay, 2009). The formula for the model is model is:

$$P(y) = \frac{e^{\alpha + \beta 1x1 + \ldots \beta kxk}}{1 + e^{\alpha + \beta 1x1 + \ldots \beta kxk}}$$ (Agresti and Finlay, 2009), where:

P (y) = the probability of the success alternative occurring

e = the natural log

α = the intercept of the equation

$\beta 1$ to βk = coefficients of the predictor variables

x1 to xk = predictor variables entered in the regression model

In this research:

P(y) = 1) = the probability of being well-off according to the indicators of well-being to be used

x1 = number of dairy cattle owned

x2 = total costs incurred on dairy production

x3 = net revenue from milk and dairy cattle by-products (e.g. manure)

x4 = net revenue from crop production

x5 = net revenue from non-farm activities

x6 = state of grazing (e.g. in-door or out-door)

x7 = total number of meals taken per day

x8 = level of education (e.g Primary, secondary etc)

x9 = level adoption (e.g the application of manure as fertilizer etc)

x10 = biological identification (e.g. state of being male or female)

The results interpreted with respect to β-weights, Wald statistics, p-values, and EXP (β). β-weights indicated the impact of covariates on the probability of being well-off; Wald statistics indicated the magnitudes of the impacts; p-values indicate the significance of the impacts, in which case $p < 0.05$ indicated significance and $p > 0.05$ indicated not significant; and EXP (β) which is the exponent of β-weights and measures the chances of the desirable outcome happened, in this case well-being.

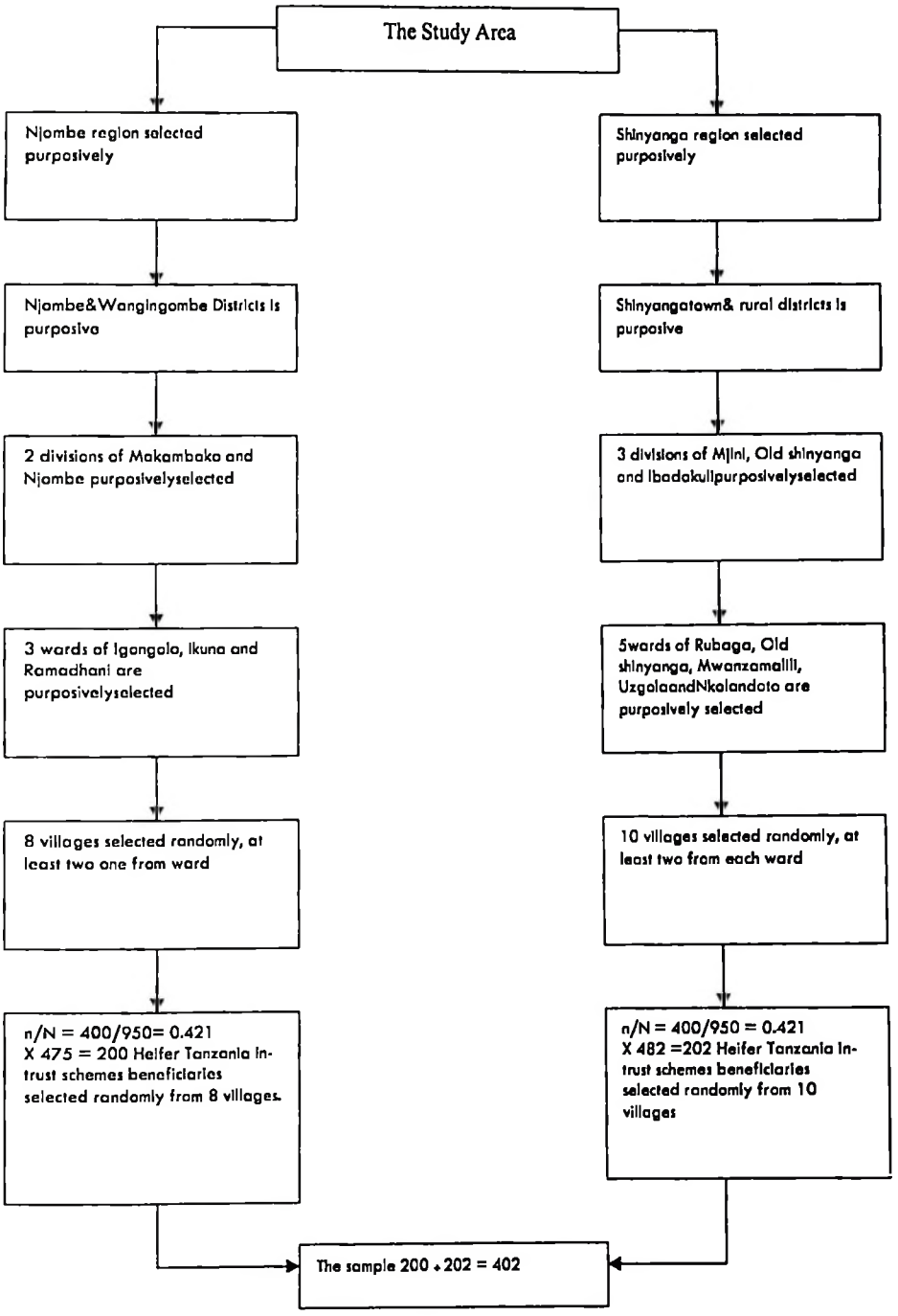
2. T-test

The T-test used to assess whether the mean of two groups are statistically different from each other. This analysis was appropriate to compare or measure the means of two groups as well as their variability. The formula for the T-test was a ratio. The top part of the ratio measured the difference between two means, while the bottom part measured the variability of the scores or the standard error of the difference. The difference between the means was the signal of the treatment or interest introduced into the data. The T-test used to test the means and variability of two studied groups of Njombe and Shinyanga regions

3. Wilcoxon Signed Ranks Test

The Wilcoxon Signed Ranking test used to assess the household's meals and composition before & after HIS. This analysis was appropriate to measure the frequency of meals taken per day and to measure their diversity in terms of nutrients' composition at the household level.

Appendix 5: Illustration of Sampling Procedure



Appendix 6: Operational definition of variables and their measurement levels.

Variables	Operation definition	Level of measurement	Unit of measurement
Background variables			
Age	Absolute years since one was born	Ratio	Numbers
Sex	Being male or female biologically	Nominal	1= Male 2= Female
Marital status	A state of being in marriage or otherwise	Ordinal	1= Single; 2= Married 3= Separated, 4=Divorce 5=Widow/widower
Household composition/size	Number of household members	Ratio	Number
Occupation	A state of employment (being idle or having job) to generate earning for at least more than 6 months year	Ratio	1= Farmer (self-employment) 2= Government employment 3= Business
Heifer in-trust (Independent) variables			
House	A place or home that belong to farmers, not a rented/ permitted by relative or friend to reside	Ration	Number
Heifer	A foundation female cow place in a family level	Ratio	Number
Manure	A state of animal dug fertilizer application (adaptation of its use)	Ordinal	1= High 2= Low
Milk	Level of production and demand per day/month/season	Ratio	Liters
Calf	Number of new born	Ratio	Number
Income level	Monetary/cash value of earnings of the respondent per month/season/annual	Ratio	TZS
Food availability	Accessibility of three meals a day by respondents per year	Ratio	1= Grams 2= Kilogram 3= Tones
Food consumption-1	Number and frequency of meals consumed a day/week	Ratio	1= High 2= Low
Food consumption-2	Diversity/composition of food consumed a day/week and beliefs related to food	Ratio	1= High 2= Low
Recycling of crop residues	A state of crops residues used to feed animal after their first use	Ordinal	1= High 2=Low
Pasture	A plot or area of land with established grass or fodders for animal feed	Ration	1=Acre 2= Hector
Agro-ecological factors			
Rainfall	Supportive rainfall patterns for growing animal feeds/fodders and provision of water throughout the year	Dummy	1=Adequately available 2=Not adequately available
Seasonality	Wet and dry season and amount of rain receive in the study zone	Ordinal	1= High 2=Low

Pasture	Availability of quality pasture and fodders by season for animal feeds throughout the year	Dummy	1=Adequately available 2=Not adequately available
Cultural practices			
Awareness	Respondent's knowledge on the existence and importance of heifer in-trust scheme services	Dummy	1=Aware 0= Not aware
Traditional ties	The state of traditions to support or hinders the heifer in-trust scheme	Ordinal	1= Strong 2= Fair 3= Not strong
Grazing culture	The state of beneficiaries are used to graze their livestock whether zero or free range grazing systems this also coped with all modern animal husbandry of sheds construction, shed cleanliness, animal washing and treatment, removing of cow's dug.	Ordinal	1= Strong 2= Fair 3= Not strong
Traditional animal treatment	The state of using herbs instead of modern drugs and or vaccines for animal treatment	Ordinal	1= Strong 2= Fair 3= Not strong
Traditional beliefs on animal protection	The state of beliefs on rituals applied for protecting animal from people with bad intention	Ordinal	1= Strong 2= Fair
Cow's dung manure usage	The belief and practice on daily animal shed's cleaning and the cow's dung manure usage in farms	Ordinal	1=High 2= Low
Gender structures	Traditions opportunities and constrains to youth, women and men as regards to access to and control over resources, employment opportunities, decision making and inheritance procedures	Ordinal	1= High 2=Low
Discrimination	Respondents being treated unfair in the process of heifer in-trust scheme beneficiaries' selection	Dummy	1=Discriminated 0= Not discriminated
Religiosity	Level at which respondents have affiliation with their religions that hinder their access to heifer in-trust credits	Ordinal	1=High 2= Low
Traditional ties	The state of traditions to support or hinders the heifer in-trust scheme	Ordinal	1= Strong 2= Fair 3= Not strong
Grazing culture	The state of beneficiaries are used to graze their livestock whether zero or free range grazing systems this also cooped with all modern animal husbandry of sheds construction, shed cleanliness, animal washing and treatment, removing of cow's dug.	Ordinal	1= Strong 2= Fair 3= Not strong

Traditional animal treatment	The state of using herbs instead of modern drugs and or vaccines for animal treatment	Ordinal	1= Strong 2= Fair 3= Not strong
Traditional beliefs on animal protection	The state of beliefs on rituals applied for protecting animal from people with bad intention	Ordinal	1= Strong 2= Fair
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