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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 pre-tested 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.

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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].

Literature on smallholder farmers' improved livelihood in Tanzania and elsewhere has ignored the agro-ecological factors affecting access to materials and assets of smallholders. In fact, livelihood of a household is shaped by various dynamic contextual factors including agro-ecological influences such as rainfall patterns, 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.

This study was guided by a null hypothesis: Heifer In-trust Schemes have no significant role in smallholder self-employment opportunities in highland and semi-arid regions of Tanzania and 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 km² [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 Hehe 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 km² [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. Data collection was done in December 2012 through January 2013. Primary data were collected from 402 randomly selected HIS beneficiaries households using a structured questionnaire. 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 SPSS 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. Binary regression was also used to determine level of confidence in income earned before and after HIS. Qualitative data from the FGDs were analysed using content analysis which enabled categorization of the information into meaningful verbal strings and their organisation 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 limited 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. The 606 and 302 dairy cattle were owned by female and male headed households respectively. According to the [26] the livestock sector provides employment to nearly 70 per cent of 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 to HIS beneficiaries in the study area (n =402)

Education Parameters	Completed education	
	Frequency	Percent
No formal education	76	18.9
Primary school education (Std 1 - 7)	306	76.1
Secondary school education (Form 1 - 4)	20	5.0
Total	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 (\$ 15 and \$ 21). They reported that the sales of pastures can give an annual net income of between TZS 600,000 and 1,000,000 (\$ 364 and \$ 606). According to the [31] the establishment of pasture plots is very challenging in semi-arid areas.

Table 2: Types of pastures produced by HIS beneficiaries

Region	Sex of household	Type of pastures produced	Frequency	Percent
Njombe	Male (n=94)	Pastures, hay and fodders	86	91.4
	Female (n=106)	Pastures and fodders	94	88.6
Shinyanga	Male (n=44)	Pastures and fodders	4	9.0
	Female (n=158)	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. It was also reported that HIS beneficiaries pay far less amount of money than that paid by none-beneficiaries. 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 (\$ 2 to \$ 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 (\$ 1,818 and \$ 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 (\$ 1,939 and \$ 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: Milk vending by HIS beneficiaries (n=402)

Region	Raw milk selling points	Response to raw milk selling	
		Frequency	Percentage
Njombe	Milk Collection centres	129	64.5
	In-village small restaurants	40	20.0
	Individuals Consumers	21	10.5
	Other Milk walkers	10	5.0
Shinyanga	Hotels in town	85	42.1
	In-village small restaurants	41	20.3
	Individuals Consumers	27	13.4
	Other Milk walkers	49	24.3

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. The region has no milk processing plant like CEFA. CEFA, is an Italian acronym for “Comitato Europeo per la Formazione l’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 farmers’ communities provides reliable milk market among smallholder farmers. Milk collection centre built the trust among members and provided employment opportunities in rural settings.

Box 1. LubagaSafinaNjema 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).

Box 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.

Box 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 to diverse agro-ecological factors. According to the [33] the 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 states: 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			Binary Logistic-test		
			n	Mean TZS	t-value	p-value'000	value	Percentage
Njombe	Male	Households' net income (2012)	94	4,032,600		0.000	1	100
		Annual household's net income before the scheme (1998) as expressed in year 2012 prices	94	532,980	-58.588		0	0
	Female	Households' net income (2012)	106	4,025,500		0.000	1	100

		Annual household's net income before the scheme (1998) as expressed in year 2012 prices	106	532,640	- 61.042		0	0
Shinyanga	Male	Households' net income (2012)	44	2,884,000		0.000	1	100
		Annual household's net income before the scheme (1998) as expressed in year 2012 prices	44	499,770	-20.155		0	0
	Female	Households' net income (2012)	158	2,836,700	- 46.733	0.000	1	100
		Annual household's net income before the scheme (1998) as expressed in year 2012 prices	158	506,710	- 46.733		0	0

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 (Box 3 and Box 4). Respondents reported that prices of inputs varied from one shop to another one and according to the types of vaccine and drug needed.

Box 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.

Boxes 3 and 4, 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.

Box 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

Box 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).

Box 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 ... 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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