UTILIZATION OF DRAUGHT ANIMALS FOR IMPROVING AGRICULTURE PRODUCTION IN DODOMA REGION. A CASE OF MSISI WARD

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Abstract

This study was conducted to assess the utilization of draught animal for improving agriculture production in Dodoma Region. It was conducted at Msisi ward in Bahi District. It included Msisi and Mchito village.

Findings indicated that 55% of respondents who own cattle use them in agriculture activities. Where by 11.7% of respondents own cattle but they do not use them for agricultural activities. About 65% of respondents own cattle while 35% of respondents do not own cattle. It was 98.3% of respondents who were aware of the use of work animals in agriculture. Only 1.7% of respondents was not aware and has never heard about animal traction technology. Adaptation of that technology had enabled 39.8% of farmers to increased production, while 11.8% of respondents had expanded their farms and other many benefits. About 36.7% of respondents associated poverty with the adaptation of the technology. Another 25% of respondents pointed low income as one of the hindrances toward adoption of animal traction technology. Also 28.0% of respondents claimed that drought discourages people from adopting the technology.

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It was concluded that, many households fail to adopt animal traction technology, since they lack money for purchasing cattle, equipments or both. Seminars and tour system was suggested by farmers to be conducted because it enable them to share ideas and experience on animal traction technology. Markets and price for agricultural products should be improved by the government (Ministry of Agriculture, Food Security and Cooperation). This will enable farmers to improve their income and in turn alleviate poverty which hinders them from adaptation of animal traction technology.

Introduction

Work animals are being used all over the world to reduce drudgery and to intensify agriculture production (Starkey, 1997). In Europe and South- East Asia draught animals were used in tillage, harrowing, transporting and threshing rice (Henriksson and Lindholm, 2000).

The Adoption of animal traction technology in Tanzania started in the Sukuma land, Southern highland and the central zone. Recently the technology has spread in many regions. Diagnostic survey in Mwanza and Shinyanga regions confirmed that weeding was a major limiting factor in crop production in ox-cultivated areas. In Mbeya region though there are high cattle numbers and surplus land but only between 10 and 20 per cent of farming households own oxen (Wella *etal*, 2000).

The animals for work which are commonly used in Dodoma region are oxen and donkeys. These animals help farmers in tilling the land, planting, weeding, and harvesting and transportation activities. Most districts in Dodoma Region have adopted the use of animal traction technology, though they differ in terms of number of animals used for farming activities (Bahi-DALDO, 2010).

Dodoma region is one of regions with big herds of cattle. By the year 2002 the region had a total of 1,174,449 cattle and by 2007 the total number of cattle in the region was 1,879,320. But by

2008 the herds were reduced because of the occurrence of Rift Valley Fever (R V F). Although the region has big herds of cattle, nevertheless animal traction technology for tilling and weeding is still low, though it was introduced as far back as 1936. By 2009 the region registered almost 45,738 pairs of oxen used for ploughing and tilling land. This accounts for about 15% of the potential animals that could be used as animal traction in the region (Socio-economic profile Dodoma region, 2010).

Besides, hand hoe technology and drought are claimed to be the causes of low crop production in the region, it has been noted that cattle diseases which could limit the promotion of animal traction technology are no longer a threat in the Dodoma region. The region has Livestock Institute Training (LIT) in Mpwapwa which has served in the provision of treatment and extension services. By 2008 Bahi district was estimated to have 189,841. Msisi ward had 9,532 cattle while Msisi and Mchito villages had a total number of 5,886 cattle. It is anticipated that factors limiting the expansion of animal traction in Dodoma region lies on socio-cultural factors other than technological factors. This study aimed at assessing the utilization of draught animal for improving agriculture production in Dodoma region (Bahi- DALDO, 2010).

Materials and Methods

Geographical Location of the Study Area

The study was conducted at Bahi district, Dodoma region. This is due to the fact that people at district are involved in livestock keeping their economic activity. According to the 2006 livestock census the district had 189,841 cattle. The district has an area of 542,844 hectares of which 378,207 hectares are suitable for crop cultivation. But out of 378,207 hectares of arable land, only 164,637 hectares are used for crop production. The district extends between latitude 4^0 and 8^0 to the South and between 35^0 and 37^0 to the East. Bahi district has a dry Savannah type of climate, the average rainfall is 500 to 800mm annually and about 85% of the rainfall occurs between December and March. According to the National Census of 2002, Bahi district had a population of 179,724, where male were 85,430 and female 94,294 (URT, 2002).

Research Design

The study was conducted in one ward; where two villages were involved. These include Msisi village and Mchito village. These villages were purposively selected among the four villages of Msisi ward of Bahi district because they had large numbers of cattle and could be easily accessed in terms of transport. In each village 30 households were selected using the snow ball as the sampling technique. The sample size for the study was 60 households. A cross-sectional research design was employed in this study. According to (Bernard, 1994) a cross-sectional research design allows data to be collected at one point in time and it makes possible to determine relationships between different variables that are in focus at the time of the survey.

Data Collection Methods

The main tool for data collection was a structured questionnaire containing both closed and open-ended questions. The questionnaire was administered through individual interview of household heads. Other members of the household were allowed to attend the interview in order to supplement the information. The questionnaire was used to collect information on demographic parameters such as (age of household head, Sex of household head and household size), socio-economic characteristics (education level, marital status, occupation livestock production to household income and food), Socio- cultural factors that affects adoption of animal traction technology, strategies that has been taken to promote animal traction technology or ox-cart in small scale agriculture, and the achievements so far reached from promotion of animal traction technology in the study area. Some information was collected through group discussions guided by a checklist. Group discussion involved key informants such as the Village leaders, Village Extension Officers and elders who had experience of keeping cattle. Information collected through this method willingness of people on the use of animal traction technology, strategies taken to increase agriculture production, and factor hindering people from adopting animal traction technology.

Data Processing and Analysis

Data were processed by using computer software program known as Statistical Package for Social Science (SPSS) version eleven point five, where by data were coded, analyzed, interpreted and summarized in order to check and edit them. Quantitative data were analyzed by using the Statistical Package for Social Science (SPSS) version eleven point five. Those data collected were analyzed in terms of mean, ratio, average and standard deviation. While qualitative data were analyzed by using themes and content when the researcher conducted group discussion with respondents, since qualitative data involved attitude and perception of respondents. Generally the analysis was done into constituent parts in order to obtain answers to research questions (Rwegoshora, 2006).

Results and Discussion

Sample characteristics of respondents by sex

The study involved the sample of sixty respondents, where sixty of them were household heads, in which primary data were obtained. Among the sixty household respondents, male were 45% of the total household respondents. While female were 55% of respondents as shown in Table 2.

Table 1: Distribution of Sample household by sex **N=60**

Respondents	Frequency	Percent
Male	27	45
Female	33	55
Total	60	100

Role of household respondents

Most of the respondents were parents, meaning that they were either father or mother of the family. Taking all respondents you find that there 41.7% of household respondents were male,

where 55% were female, and only 3% of the responds were children but of the majority age as shown in Table 3. A woman respondent at Mchito village claimed that;

> *"You know men are the one to work for the family. They have more free time for engaging in other economic activities. I am taking care of the children and my husband too. Men can not do the activities of women, it is shame when other people find a man cooking or taking care of children."*

Table 2: Distribution of respondents by roles **N=60**

Role of respondent	Frequency	percent
Father	25	41.7
Mother	33	55.0
Children	2	3.3
Total	60	100.0

Cattle ownership

Research findings indicated that 65% of respondents own cattle while 35% of respondents do not own cattle as shown in Table 4. A respondent at Msisi village said that;

> *"Majority of us have succeeded to own cattle because we are enthusiastic of getting off from poverty which we had experienced for a number of years. By owning cattle one is in the position of using them for tilling the land which in turn can increase agriculture production."*

Table 3: Distribution of cattle ownership among households **N=60**

Cattle ownership	Frequency	Percent

Owning	39	65
Not owning	21	35
Total	60	100

Number of cattle per households

Although the number of cattle differ from one household to another but one can find that majority of households own more than four cattle. Ownership of cattle ranges from one cattle to forty cattle depending on the level of income per households. Findings indicate that1.7% of households with one cattle, 10% of households with two cattle, 21.7% of households with four cattle, 5% of households with six cattle, 26.7% of households with more than six cattle and 35% of households have no cattle. Generally the number of households who own cattle were 65% as compared to 35% of those who does not own cattle as it is indicated in Table 5.

It implies that efforts have been taken to ensure that people own cattle so that they use them for agriculture activities. Though majority of households in the study area own cattle, yet few of them households have not yet managed to own cattle. A respondent at Mchito village claimed that;

> *"I do not own pairs of oxen because I do not have money for buying them. If I had money I could have purchased oxen so that I use it for tilling land."*

Table 4: Distribution of number of cattle per households **N=60**

Number of cattle	Frequency	Percent

One	1	1.7
Two	6	10.0
Four	13	21.7
Six	3	5.0
Above six	16	26.7
Not owning	21	35.0
Total	60	100.0

Information about animal traction technology among farmers

Findings show that 98.3% of the respondents are aware of the use of work animals in agriculture, where1.7% of respondents are not aware and have never heard about animal traction technology as shown in Table 6.

It implies that majority of the people were getting information about animal traction technology. But few of them could not get such information. One of respondents claimed that "*I have ever had about animal traction technology, may be if the rich people are given that information and we poor, we are neglected.*"

Table 5: Spread of information on animal traction technology among farmers N=60

Awareness	Frequency	Percent
Aware	59	98.3
Unaware	1	1.7
Total	60	100.0

The use of work animals in agriculture

There is increase in the use of cattle in agriculture among people who own work animals. The information from the field shows that 55%t of the respondents who own cattle use them in

agriculture activities. Also 33.3% of farmers do not have cattle but they use them in agriculture through hiring from other people. Where 11.7% own cattle but they do not use it for agriculture activities as shown in Table 7. This implies that there some people who can own cattle but for other reasons they can use them in agriculture activities.

The reasons for not using cattle for agriculture activities were pointed out by one of respondents in Msisi village that;

> *"I do not use cattle because they are cows. I am planning to sell these so that I buy Oxen"* Another peasant said that. *"I have purchased oxen this year, now I am planning to train them so that I start using them."*

Table 6: Distribution of using work animals in agriculture as per household N=60

Work animal for agriculture	Frequency	Percent
Own and use	33	55.0
Own but don't use	7	11.7
Don't own but use	20	33.3
Total	60	100.0

Social- cultural factors that affect the adoption of animal traction technology at Msisi ward.

Research findings indicate that 36.7% of respondents associated poverty to the adoption of the technology. About 17.7% of respondents remarked that drought contributes a lot to the failure of many house holds to adopt animal traction technology. 11.4% of respondents argued that, lack of loans among small farmers and high price of equipments contributes to the failure of farmers toward adoption of animal traction technology. Farmers have not yet created the tendency of taking loans from financial institutions. While10% of farmers who have supported selfishness as one among the contributions of many household fails to adopt animal traction technology. Where Only 8.2% of responded that low education among farmers contribute to the failure of households

from adopting animal traction technology. Very few 4.4 % of respondents argued that, they fail to adopt animal traction technology because they fear of theft.

The research findings supported by the World Bank (1994a p38-39) that low income discouraged farmers from using animal traction technology and tractors. Henriksson and Lindholm (2000) argue that instable government, lack of clear and effective policies concerning animal traction technology, as well as little modification due to lack of education have retarded the adoption of the technology among farmers. Lack of weeding is also among factors that affect animal traction technology (Starkey and Simalenga, 2000 p70-73). Exposure to education has increased farmers ability to obtain process and use information relevant to the adoption of improved maize technology, also lack of credit – it is expected that access to credit will increase the probability of adoption of animal traction technology. The increase in price of fertilizers, agro chemicals and seeds has lead many farmers fail to manage to use such agriculture inputs. The yields were low and the living condition of small farmers was and it is still lagging behind in terms of education, housing, food, clothes, health service and water (Wella *etal*, 2000).

Also Starkey and Kaumbutho (1999) contend that some of the major constraints which have been identified as limiting the widespread use of animal traction in the country are: low farm incomes which make the technology unaffordable to the majority unavailability of implements poor infrastructure and support services an ineffective extension system and social, cultural and gender issues. Moreover, it should be noted that successful dissemination of any innovation requires that the price must be right, potential users must be knowledgeable in the use of the innovation and the necessary inputs must be available. Although farmers are a rational people, they are not aware of all the possibilities of animal power.

Table 7: Factors affecting the adoption of animal traction technology

Factor	Percent

Low income (poverty)	36.7
Lack of loans	11.4
High price of equipments	11.4
Fear of theft	4.4
Draught	17.7
Low education	8.2
Selfishness	10.1
Total	100.0

Non-government organizations involved in trainings

Findings show that 75% of respondents said that trainings and seminars about animal traction technology in the study area were provided by ADP, while 15% respondents of the trainings and seminars were provided by LVIA and 5% of the trainings and seminars were provided by other organizations which were not mentioned and 5% of respondents argued that there are no trainings which are conducted in their village as shown in Table 9.

This implies that non governmental organizations are involved much in training farmers on the new methods for agriculture. To a large extent ADP and LVIA are much more involved in training farmers on the use of animal traction technology.

Table 8: NGOs involved in training and service provision

Name of the organization	Percent
ADP	75
LVIA	15

Others	5
None of them	5
Total	100

Farmers achievement from adopting animal traction technology

The research findings in Table10 indicate that 39.8 % of farmers have increased production through the use of animal traction technology. About 14% of farmers have got more free time for involving in other economic activities like trade since they started using work animals. 11.8 per cent of farmers have expanded the farms, where 10.8% of farmers use short time in cultivation when using animal traction technology. And 10% of farmers have built houses, and 5.4 % of respondents have managed to send children to school because they are able to pay school fees and other costs. Only 4.3% of respondents have increased the number of cattle and very few respondents (3.2%) had not yet benefited from adopting animal traction technology because the cattle are not grown up. One of the farmers in Msisi village narrated that;

> *"I have not yet benefited from work animal because I have purchased the oxen in 2007/2008 and trained them ready for using them in 2009/2010. But unfortunately the rainfall was too low, the crops did not perform well, we have harvested less as compared to when we were using hand hoe. May be in the next year we can get higher yields if the rainfall will be high."*

ATNESA (2007) supports the researcher findings that animal traction technology increases production. According to them, on average ox-weeded maize yielded 4782 kg/ha and hand weeded plots only 2649 kg/ha. Where cotton yielded 575 kg seed cotton/ha compared to 475 kg seed cotton /ha for hand weeded plots. While Kwiligwa *et al* (1994) remarked that Animal traction technology enables farmers to spend short time in cultivation. For example on farm trials in Mbeya, Southern Tanzania have recorded an average time for hand- hoe weeding as 230 working hours/ha as against 50 working hours/ha when weeding with oxen. Also according to Starkey and Simalenga (2000) animal traction technology is beneficial to people since it increases

production and reduce working time per hector. Animal traction technologies improve agricultural produce and alleviate the labor shortages experienced during weeding (Makwanda *et al*, 2000).

Simalenga and Joubert (1997) argue that animal traction provides smallholder farmers with vital power for cultivation and transport. Empowering rural communities and providing an alternative but complementary power option. Providing employment and transport, and promoting food production and security, thereby leading to a higher standard of living. Making marketing and trading easier. Relieving women of the burden of transporting water by hand, head or wheelbarrow. Animals are easy to use and donkeys, specifically, can be handled by children and women. Making transportation of the harvest and shopping easier. Improving fertility by ploughing manure from draught animals back into the soil. It is an affordable and sustainable technology. In comparison with mechanical systems, animal power has the advantage to rural families of being available, timely and affordable.

Table 91: Benefits from adoption of animal traction technology

Achievements	Percent
High production	39.8
Farm expansion	11.8
Built a house	10.8
Send children to school	5.4
Involve in other activities	14.0
Short time for cultivation	10.8
Increase cattle	4.3
Not yet	3.2
Total	100.0

Apart from the farmers who have benefited from the adoption of animal traction technology, there those farmers who have heard about the technology but not yet adopted due to low income. However these farmers had various plans which were implemented individually.

"One of them said that "I *have been saving some money for a long time, but I think in this year I will buy my own oxen. Because hiring oxen involves a lot of costs. And some times you find a number of orders which may lead to delaying in cultivating the farm."*

Strategies used to promote animal traction technology

To attend seminars and trainings which are conducted by non government organizations like LVIA and ADP. In case of ADP they normally conduct seminars three times per annum. They conduct a general seminar for agriculture in January, June and December, it takes about one week and the participants are farmers from different villages. Another seminar is about animal traction technology which is conducted once per annum and it takes one month (Msisi-WEO, 2010).

Majority of farmers have been selected by the village governments to attend seminars which are normally conducted at Mundemu ADP. But many farmers condemned about this strategy that, it is biased because the village governments' leaders do select their relatives and friends as well as the rich people, neglecting the poor. Borrowing and possessing cattle on behalf of the owner. That you borrow small cattle from the one who have many, you graze until they reach the age of being trained; it is when you train and use them. Grazing cattle on behalf of the owner during dry season and when it rains the owner of cattle cultivate even the farms of the one who was grazing (Msisi-WEO, 2010). In order to ensure that each village participate in work animal training, in 2008 the DALDO for Bahi district organized seminar where the training were done at Bihawana (Bahi DALDO, 2010).

Farmers implementation farmers toward adoption of animal traction technology

The recent research findings show that 70% of respondents had adopted the use of animal traction technology. That means they possess pairs of oxen and plough, where 13.3% of respondents were in need of loans because they had low income. About 5% of respondents were planning to buy their own cattle or oxen. Another 5% had purchased the oxen only. Also 5% of farmers had no any plan. Very few respondents (1.7%) had purchased the plough.

It implies that although some of farmers at Msisi ward do not own cattle but every individual have got a plan that ensure they are adopting animal traction technology at the household level. there some strategies which have been implemented by villagers themselves. These include borrowing pairs of cattle from people who possess many of cattle.

According to Msisi VEO (2010), the village governments also conduct seminars which aim at providing education about animal traction technology among farmers. Moreover the village government enforces each livestock keeper to have at least one pair of oxen, and buy the plough.

Previous research results have shown that the depth of tillage is the most important factor controlling or affecting soil moisture characteristics. Deep tillage helps to increase porosity, reduce surface sealing of the soil and permits roots proliferation to exploit soil water and nutrients at deep horizons. Significant reduction of surface runoff and increase in crop yields have been shown to occur with increased depth of tillage in Hombolo, Central Dodoma. Lack of power and equipment to till and ridge the land, and poor implementation of ridging which leads to low crop population density (Kaumbusho *etal*, 1999).

Table20: Farmers implementation toward adoption of animal traction technology N=60

Plan	Frequency	Percent
Planning to buy our own cattle	3	5.0

Need of loan due to low income	8	13.3
Purchased the plough	1	1.7
Have purchased the oxen	3	5.0
I don't know	3	5.0
Already adopted	42	70.0
Total	60	100.0

Conclusions and Recommendations

Conclusions

Lack of by-laws which prohibited farmers from misusing agriculture produce; Due to that majority of farmers use agricultural products for brewing and buying local beer. This was observed by the researcher during data collection, where the researcher found a good number of bar for local beer. This has made majority of rural people suffer from food shortage and hunger in turn few of them fail to adopt animal traction technology which might have improved the livelihood.

Illiteracy has led many people fail to adopt animal traction technology because their affraiding of taking loans which can help them to buy oxen and plough. Many respondents argued that they dislike taking loans because they do not have money to repay back when the oxen are stolen or fall sick and die.

Selfishness is among the socio-cultural factors which have contributed to the failure of many households from adopting animal traction technology. The household which own cattle or plough sometimes refuses to borrow their cattle to those who do not own.

It was expected by the researcher that small farmers could have developed some strategies which could have helped them in the adoption of animal traction technology. This has been proved true that farmers themselves have developed strategies which are helpful to them. Among the strategies are like attending seminars which are mostly conducted by non- government organizations like ADP, LVIA and others. Also farmers had developed a very simple and implementable strategy where those with no cattle borrow to those who own cattle. The strategies has encouraged many farmers to adopt the technology since those who copied it earlier have increased production, expanded their farms, they had managed to send their children to school and building modern houses.

The village governments also had started conducting seminars aiming at encouraging the farmers to adopt animal traction technology, though to a large extent seminars are conducted by non – government organizations.

Most of the farmers have recognized the advantages (achievements) toward adoption of animal traction technology. As mentioned in the previous topic, generally the technology has increased production, it has enabled some farmers to expand the farms, others have built modern houses, they have managed to send children to school and some of the respondents have increased the number of oxen. Also some farmers have go more time for engaging in other socio-economic activities because they use short time in cultivation.

Recommendations

- The researcher has discovered that many households fail to adopt animal traction technology, since they lack money for purchasing cattle, equipments or both. There is a need for the government and non-government organization to put more emphasis on the provision of loans, especially loans for plough (equipments) particularly to farmers who are not able to purchase the equipments. Such loans should not be provided to those who

attends the seminar or to reach people and friends or relatives of the village governments leaders. Rather it should be provided to all farmers who are willing.

- More efforts must be on the provision of education in rural farmers, especially at Msisi ward. Such education should be provided in terms of seminars and tour system where by farmers from one village visits another village for the aim of sharing ideas and experience about animal traction technology. The village governments should be the main facilitator in the whole process.
- Each village or ward should have a center for animal traction training and seminars. Training centers should be built through people's power and support from the government as well as non-government organizations. This will encourage many farmers to attend seminars and trainings in turn many farmers will be attracted to adopt the technology. This will reduce biasness which has been prevailing for a long time especially on the selection of people to attend seminars and trainings at Mundemu ADP.
- There is a need for village governments to introduce by-laws which will force each farmers or household to own a pair of oxen, as compared to the previous time where the decisions to own or not were upon the farmers. The village governments were not participating fully in introducing the technology to be well known and adopted by many farmers
- There is a need for the government to put more efforts on ensuring that education on this technology is adopted by many people. For the case of seminars which are conducted outside the ward, there must be a fair representation. The researcher has discovered that there is no fair and equal representation in seminars.

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