International Journal of Agriculture Innovations and Research
Volume 5, Issue 5, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received: 15/02/2017 | Accepted on : 22/02/2017 | Published : 04/03/2017

Factors Affecting Draught Animal Technology Adoption in Rural Kordofan

Elsamawal Khalil Makki
School of Rural Extension, Education and Development
Ahfad University for Women,
Omdurman, Sudan.

Fatima Elbasheer Eltayeb
School of Rural Extension, Education and Development
Ahfad University for Women,
Omdurman, Sudan.

Osman Abdelkarim Badri*
School of Rural Extension, Education and Development
Ahfad University for Women,
Omdurman, Sudan.

*Corresponding author email id: osmanalam48@gmail.com

***Abstract* – Despite its potential benefits to the small-scale traditional farmers, draught animal technology adoption is seriously low in EN-Nhoud locality, West Kordofan State, Sudan. Factors underlying, undermining and affecting the adoption of the technology in the state were identified through a study following the cross-sectional survey design on a sample of 100 farmers divided equally between two strata (users and non-users of DAT). Within each stratum farmers were selected following the systematic random sampling technique based on geographical location. Data was collected using a formal questionnaire with the farmers in face to face interview and was analysed descriptively to produce frequency and percentage tables. Dependency between the selected variables was tested using chi square test. The results showed that both DAT user- and user-farmers lack confidence and trust in the technical know-how of the staff responsible for technology transfer and training and extension; they both learn more about the technology from their peer farmers than from formal bodies responsible for training. Factors underlying adoption of DAT are: production purpose, farm size, farmers' age and land ownership. On the other hand, undermining factors are lack of financial resources, inaccessibility to service, poor technical know-how of the staff of training and extension authorities. Adoption rate of the technology can be improved by providing credit service and providing high quality training for optimal application of the technology.**

***Keywords* – DAT Adoption, Intermediate Technology in Sudan, Traditional Farming.**

I. INTRODUCTION

For sub-Saharan Africa and many developing countries, draught power technology has been qualified as an ecologically sustainable means of increasing agricultural production, reducing human drudgery and improving quality of rural life. The power offers a feasible alternative power source to manual power in the cultivation of food and cash crops [1].

[2] suggested that in order to raise power inputs in developing countries to achieve agricultural growth, greater reliance on working animals will be necessary. The author continued "draught animals are likely to assume much greater importance in farming systems in developing countries in the future". This is optimal and will only be possible and realistic if farmers potentially have the capacity to successfully adopt the technology; and only if supportive programs are well designed and implemented.

Adoption of animal traction in Africa has been patchy [3] and is used on less than 15% of the arable land in Ghana despite the long history of the technology in the country. The author attributed this to the poor training and performance of the technology and mentioned that farmers are mostly trained by their family members and peers.

Lack of extension amongst other factors affecting draught animal technology (DAT) was mentioned by [4]. The authors further presented that the constraints reported by farmers were lack of funds, inadequate formal education, limited feed resources, few implements are used, disease treatment, lack of shelter for the animals and poor extension services. They suggested that utilization of animal traction would be increased significantly if more funds are injected in animal traction technology by the State and local governments.

The rare and poor extension of the technical details of animal traction lead to the low and slow adoption of animal traction in Nigeria [5]. Further, the author mentioned low capacity and inadequate funding, poor infrastructure, undefined curricula and poor strategies as some limiting factors to farmers training and adoption of animal traction.

[6] reported that farmer's age, family size and farming experience of farmers were significantly related to their attitudes towards the use of animal traction technology, while farm size and cropping pattern were observed not to be significantly related to their attitudes. The author suggested that a well-designed extension-based animal traction program should be put in place to arouse the interest of farmers in the technology to combat shortage of labour in the agricultural sector.

Adoption process is greatly influenced by the level and quality of extension service offered to users and their field performance. The quality and efficiency of users' field performance is another concern as they are under continuous observation and evaluation by their non-user peers. This goes in accordance with [7] who argued that small scale farmers are not receiving the information that they need, much of which is available to improve their farming practice.

Draught animal technology can potentially play a major role in improving farming practices in the traditional rainfed farming system in Sudan. Some of these roles are well understood and documented [8, 9]. The technology suits small farmers and fits best where motorized alternatives are inaccessible or unaffordable; and where the manual alternatives are impractical and/or jeopardize farmers' productivity and consequently food security. Adoption of DAT by small scale farmers is a major

concern for agriculture policymakers in West Kordofan State, Sudan. In order to understand the dynamics of DAT adoption in the state, they need to closely look into the factors influencing the adoption process. Therefore, this study was carried out to identify the factors underlying, undermining and affecting the adoption of draught animal technology in the state through looking into the characteristics of DAT users and non-users separately in relation to their situation and the adoption process; then through examination and comparison of DAT adoption-related parameters between users and non-user farmers.

II. Materials and Methods

Study Area

Field data was collected in EN-Nhoud locality West Kordofan State to investigate the factors affecting DAT adoption by traditional farmers. EN-Nhoud locality is located in the semi-arid savanna zone in North Kordofan state. The area consists of five rural councils. Different tribes live in the area with the *hamar* being dominant. Most of the population depends on crop production beside other activities like animal breeding and poultry production. The average land holding of the family is about 4.5 feddans (1 feddan = 0.42 ha), but only 60% of that area is annually cultivated [10].

The dominant system of agriculture in EN-Nhoud area is the traditional rainfed farming which is known as a small holding farming system that is mainly characterized by being subsistence oriented with considerable numbers of farmers producing cash crops also. No systematic agricultural rotation is followed, and farmers always tend to the horizontal expansion to increase crop production [11]. The land is flat to undulating and there are only a few seasonal water streams (*khors*). However, the soil is mostly sandy to sandy loam but clay soil (*gardood*) covers the southern parts of the area. Groundnuts, hibiscus *"karkade"*, sorghum, sesame and water melon are the main crops in the area. The area is famous for production of groundnuts as the main cash crop [10]. The agricultural production of both food and cash crops depends mainly on family labour mostly in an agricultural sharing system. The area is well known for livestock production for milk and meat.

Sampling

This study was based on the cross-sectional survey design on a sample of 100 farmers divided equally between two strata (users and non-users of DAT). Within each stratum farmers were selected from 10 villages (5 from each village) following the systematic random sampling technique based on geographical location. The first of every ten farmers was chosen along a survey line drawn across the farming area in each village starting at the upper end until five farmers had been selected.

Data Collection and Analysis

Data were collected using a formal survey questionnaire in a face to face interview for literacy reasons and by direct field measurements during land preparation. Direct field measurements were concerned with determining field capacity in accordance with [12, 13].

Survey data were entered into an SPSS computer programme (SPSS 16.0) and analysed to produce frequency tables and the different parameters were assessed using the *chi* square test (SPSS.16).

III. Results and Discussion

Table 1 shows some of the characteristics of DAT users. The majority of farmers (54%) learned about the technology from peer farmers, while 26% and 20% of them were trained by the International fund for Agricultural Development (IFAD) and the Administration of Agriculture in the locality. DAT was introduced to the area as one of the activities of EN-Nhoud Cooperative Credit Project (ENCCP) in collaboration with the Ministry of Agriculture. Then upon cease of activities the project assets and management were handed to the Ministry of Agriculture which was supposed to carry on with its activities as planned. During the project time and in the first years of management by the Ministry of Agriculture training activities used to run well then they slowed dramatically. Training by peer farmers appears to be common in Subsaharan Africa as mentioned by [3] who reported that *'farmers learn more from family members on draught animals than from institutions or organizations. This cycle must be complemented by more attention from government through Ministry of Agriculture to help transfer modern technology to farmers who are still using manual farming practices'*. This is probably because formal training and extension institutions lack the appropriate resources to shoulder their activities. When farmers are trained by their peers they will probably lack the suitable knowledge essential for the proper and optimal application and employment of the technology. This will potentially reflect on their field performance and constitutes a barrier of entry to other farmers who still use manual alternatives.

Farmers who use DAT acknowledge its potential benefits. The highest percentage of them (38%) mentioned increased area and production, while 30% focused on drudgery reduction as the major benefit of DAT. Further, slightly more than one fourth of the surveyed farmers (26%) mentioned improvement of timeliness. All these potential benefits can be realized only if farmers are well trained on the technology application and are supported by the suitable extension packages to help them achieving their full capacity and consequently food security. The fact that all the farmers ignored the potential benefit of increased yield shows lack of information and proper tools or both.

Most of DAT users (72%) mentioned suitability to the farming area and the comparatively low cot as their motive to adopt the technology. A considerable portion of the users (16%) were motivated by the ease of use of the technology, while for 12% of them ownership of animals was the main motive. Of course farmers who produce on comparatively larger lands are market oriented and consider hired labour cost in their production budget hence they tend to use DAT as a suitable alternative. In a study on DAT adoption in north Cameroon, [13] reported that

"adoption depended more on agronomic requirements of particular crops and the need to expand cropped areas to take advantage of market availability".

Main problems and constraints that face DAT users are potential barriers to non-users. Most of the users (78%) pointed lack of training and technical know-how as the main problem they face. This is comparable to the percentage of farmers who were trained by their peers and the Administration of Agriculture (74% in total). Lack of access to service was mentioned by 14% of them, while only 8% mentioned lack of implements as their main problem. Most of the farmers in the study area use the plough only with a marginal portion of them use the seed drill along with the plough [8]. All the constraints mentioned are in accordance with those in Nigeria reported by [4] who suggested *'that utilization of animal traction would be increased significantly if more funds are injected in animal traction technology by the State and local governments'*.

DAT users in the study area lack confidence in the Administration of Agriculture (being the only formal body responsible for technology support, extension, training and improvement) as reported by [8]. Nearly one half of the farmers (48%) pointed that DAT field is not on top of the priorities list of the Administration of Agriculture hence it receives less attention. Further, nearly one third of them (30%) mentioned inaccessibility of the service geographically and financially as most of the farmers live in remote villages while the 'rare' activities are organized in the locality center and they do not get enough support to participate in the activities which made them lack interest in these workshops and activities. Interestingly slightly more than one fifth of the farmers (22%) questioned the capacity and knowledge of the staff of the Administration of Agriculture in DAT. The last point was reported by [8] in the same study area.

Collectively the majority of the farmers (64%) worked at low field capacity (less than 0.15 ha/h), while slightly more than one fourth (26%) worked at moderate field capacity (016-0.19 ha/h). Those who worked at high field capacity were only 10% of the total sample. [8] reported that extension and training did not reflect on farmers' performance. Poor field performance is alarming as non-users could perceive this as inefficiency of the technology than quality of application and will consequently decide not to adopt DAT keeping in mind that rural people are resistant to any change especially those involving financial risk or investment.

Characteristics of DAT Non-users

Possibility of horizontal expansion and ownership of animals are important factors in DAT adoption. Table 2. shows some selected characteristics of none-user farmers. While slightly more than one fifth of the farmers (22%) do not have room for horizontal expansion, the highest percentage of them (44%) can possibly expand on 2-5 ha. These are followed by 20% with 6-10 ha extra area. Farmers with larger area are 14% of the total sample. This distribution suggests that other more important factors are involved in the adoption process. Apparently farmers with possibility of horizontal expansion should go for DAT as a viable alternative and great assistance. Nevertheless they did not; which makes the latter argument valid. This is better viewed with farmers' reasons for not adopting as will be presented later in this section.

Ownership of animals as a second motivation for DAT adoption showed very interesting results. Although most of the farmers (68%) owned animals that are suitable for work, they were not motivated to adopt DAT. Equal portions of the farmers (30% each) owned horses or donkeys which are the common draught animals in the area, followed by 8% of them owning both types of animals. Further, one third of the farmers had no animals.
One half of the farmers (50%) had information on DAT for a long time (6-15 years), while one third of them (32%) did not know about the technology. According to [1] the long history of animal traction in Ghana did not reflect on increased adoption rate and many farmers still use manual inputs in agricultural production.

Source of knowledge on DAT did not differ than that of technology users. While 32% of the farmers did not know about the technology, the highest percentage of them (40%) learned about it from peer farmers. Interestingly 28% were trained by IFAD or the Administration of agriculture. It is evident that the role of training and extension is very trivial in technology diffusion and advocacy.

Similar to DAT users, most of the non-user farmers (86%) focused on horizontal expansion (increased area and production) as the potential benefit of DAT, while improvement of timeliness and drudgery reduction received less attention (8% and 6%, respectively). Nevertheless, farmers in this group did not adopt the technology as other factors influenced their decision. This is common in Sub-Saharan Africa despite the fact that *'animal traction had been widely acknowledged as the most appropriate, affordable and sustainable technology for subsistence small-scale farmers in the world'* as reported by [15].

Lack of financial resources is the major reason (68%) that constrained farmers from adopting DAT, while lack of training was the reason for 16% of them. Availability of family labour which is a typical characteristic of the farming system was mentioned by 10% of the farmers as a reason for not adopting DAT. Further, nearly all the farmers complained about the role of Administration of Agriculture in technology support. Their opinions on the reasons of this situation are comparable to those of their peer DAT users. The highest percentage of them (44%) pointed that for the Administration of Agriculture DAT is not a priority, while 28% of them claimed that the staff lacks technical know-how and experience in the technology. Further, 20% of the farmers could not identify any reason for the poor performance in DAT field, while a marginal portion of the farmers (8%) mentioned lack of financial resources as the main cause of poor roles in DAT field. This result is comparable to what [5] reported as reasons for the slow adoption of animal traction in Nigeria.

Comparison Between DAT Users and Non-user Farmers

Farmers' age, level of education, farm size, land ownership and production purpose were selected as factors of comparison for their potential effect on DAT adoption process (Table 3). Chi square test was used to evaluate the significance of these factors. Farmers' age and level of education were not significantly related to the decision of DAT adoption. Although more DAT users were in the age groups 40 years and less compared to their non-user peers. The comparative involvement of younger farmers in DAT was attributed by [6] to the fact that they are *"expected to be very active, adventurous, and desirous of innovations that are capable of improving their life and farm work"*. On the other hand, distribution of DAT users and non-user farmers across the educational levels is also comparable. Adoption of DAT is highly dependent on farm size (chi=49.9 and P=0.01). Larger size motivated farmers to adopt DAT and more user-farmers are found in the medium to large farm sizes (3-5 and 6-9 ha). Comparatively more non-user farmers are found in the small farm size group (2 ha). This clearly shows that DAT adoption in the area is driven by farm size in an attempt to reduce manual labour cost or to have the capacity in catching the rainy season in a short time. This result is different than that of [6] who reported that *"farmers' age, family size, and farming experience were significantly related to their attitudes towards the use of animal traction technology, while farm size and cropping pattern were observed not to be significantly related to their attitudes"*.

Land ownership significantly influenced DAT adoption (chi=7.53 and P=0.02). More users hired or shared the plots they cultivate compared to their non-user peers. Distribution of farmers who own their farms is comparable. Hiring land and share cropping puts farmers in front of the challenge of maximizing their returns through increased production or reduced cost or both. All these can potentially be achieved through DAT adoption; hence the significant effect is logical. This extends to cover production purpose as market oriented farmers similarly need to maximize their production or reduce their cost. More farmers in the market group adopted DAT. The results indicated significant differences between user- and user-groups in production purpose (chi=27.7 and P=0.01). Production on comparatively smaller plots for subsistence with marginal marketable surplus is a basic feature of the farming system. The decision of DAT adoption is more powered by the full orientation to market than partial orientation. This situation is in accordance with that reported by [16] who suggested that adoption of animal traction is driven by intensification and expansion opportunities where good markets exist than merely by constraints.

IV. Conclusion

Factors underlying adoption of DAT are: production purpose, farm size, farmers' age and land ownership. On the other hand, undermining factors of DAT adoption are lack of financial resources, inaccessibility to service, poor technical know-how of the staff of training and extension authorities and poor technology advocacy. Formal bodies play very poor and marginal role in technology adoption hence farmers lack trust in their capacity and learn from their peer about the technology. Adoption rate of the technology can be improved by providing credit service, capacity building of the staff responsible for extension and training at the formal bodies dealing with the technology transfer and providing high quality of training sessions for optimal application of the technology.

References

[1] Chanie, M., Fentahun, T., Mitiku, T., Behran, M. (2012). Strategies for Improvement of Draft Animal Power Supply for Cultivation in Ethiopia: A Review. European Journal of Biological Sciences 4(3):96-104.

[2] Devendra, C. (1989). Ruminant production systems in developing countries: resource utilization. In *Feeding Strategies for Improving Productivity of Ruminant Livestock in Developing Countries,* IAEA, Vienna.

[3] Madama, E. A. Naazie, A., Adogla-Bessa, T. Adjorlolo, L. K. (2008). Use of donkeys and cattle as draught animals in the Northern and Upper East and Volta Regions of Ghana. *Draught Animal News* 46(1):10-13.

[4] Abubakar, M.S., Ahmad, D. (2010). Utilization and Constraints on Animal Traction in Jigawa State, Nigeria. *Australian Journal of Basic and Applied Sciences.* 4(6):1152-1156.

[5] Ajav (1989). Mechanization programme for rural farmers in Nigeria. Seminar paper, Department of Agricultural Engineering, University of Ibadan. Nigeria. Pp 28-30.

[6] Oladeji, J.O., Ogunleye, K.Y., Aderinto, A. (2012). Attitude of farmers towards the use of animal traction technology in Savannah zone of Oyo State, Nigeria. Global Journal of Science Frontier Research, Agriculture and Veterinary Sciences 12(2):17-23.

[7] Pearson A, Wythe S, Joubert B, O"Neill D, Simalenga T (Eds.). (1999). Management and Feeding of Animals for Work. Proceedings of a Workshop at Fort Hare University, Alice, Eastern Cape. Centre for Tropical Veterinary Medicine, Draught Animal Power Technical Report 4.

[8] Makki, E., Eltayeb, F. E., Badri, O. A. (2016). Effect of extension and training on farmers' husbandry and management practices and field performance when using draught horses in ploughing. *Journal of Agricultural Extension and Rural Development*. Vol. 8(6), pp. 89-98.

[9] Makki EK, Jamaa LS (2012). Animal traction in Sudanese agriculture: a comparative study. *Agric. Mech. in Asia, Africa and Latin America* 43(3):9-14.

[10] ENCCP (1997). EN-Nhoud Cooperative Credit Project. Annual report.

[11] Dahab M H and Hamad S F (2003). Comparative of weeding by animal-drawn cultivator and manual hoe in En-nohoud area, Sudan. Agricultural Mechanization in Asia, Africa and Latin America 34(3), 27-30.

[12] Gbadamosi L and Magaji A S (2004) Field study on animal draught power for farmers in Zuguma village of Niger State; Proceedings of 5th International conference and 26th Annual General meeting of Nigeria Institution of Agricultural Engineers (NIAE). 26: 84-85.

[13] Abubakar M S, Tekwa I J and Ahmed M (2009). Effects of soil physical and mechanical properties on field efficiency of ox-drawn mouldboard plough in Yola, Adamawa State. Agricultural Engineering International: the CIGR Ejournal. XI, 1369-2137-1.

[14] Langha, K. (1999). Evolution of farming systems and the adoption and profitability of animal traction: a case study from the savanna highlands of north-west Cameroon. In: Starkey P and Kaumbutho P (eds), 1999. *Meeting the challenges of animal traction.* A resource book of the Animal Traction Network for Eastern and Southern Africa (ATNESA), Harare, Zimbabwe.

Intermediate Technology Publications, London. 326p. pages 239-246.

[15] Starkey, P. (1994). A worldwide view, with a small farmer's perspective. In Starkey, P., Mwenya, E. and Stares, J. (eds). *Improving Animal Traction Technology*. Proceedings of 1st workshop of the Animal Traction Network for Eastern and Southern Africa (ATNESA). Pp 61-81. Technical Centre for Agricultural and Research Cooperation (CTA) Wageningen, The Netherlands.

[16] Birch-Thomsen, T. (1999).Animal traction and market conditions: a case study from south-western Tanzania and northern Zambia. In: Starkey P and Kaumbutho P (eds), 1999. *Meeting the challenges of animal traction.* A resource book of the Animal Traction Network for Eastern and Southern Africa (ATNESA), Harare, Zimbabwe. Intermediate Technology Publications, London. 326p. pages 33-39.

AUTHORS' PROFILES

Prof. Elsamawal Khalil Makki
Professor of agricultural engineering and former Dean of School of REED, Ahfad University for Women, Omdurman-Sudan. He graduated in 1990 from the Faculty of Agriculture, Cairo university-Egypt majoring in Agricultural Mechanization. He then qualified for M.Sc. in soil and water engineering from the Department of Agricultural Engineering, Faculty of Agriculture, University of Khartoum in 1996. He got the Ph. D. in 2002 in soil and water engineering from the Department of Agricultural Engineering, Faculty of Agriculture, University of Khartoum. He was awarded the professorship in Agricultural Engineering in 2013 and still holds the post of a professor at the school of REED, Ahfad University for Women, Omdurman, Sudan.

Mrs. Fatima Elbashir Eltayeb
Lecturer at the School of REED, Ahfad University for Women, Omdurman- Sudan. She graduated from the School of REED, Ahfad University for Women in 1996. She got her M. Sc. Rural Social Development in 1999 from the Department of Agricultural Extension and Rural Development, The University of Reading, UK. She works now as a lecturer at the School of REED, Ahfad University for Women, Omdurman-Sudan.

Dr. Osman Abdelkarim Badri
Associate professor and former Dean of School of REED, Ahfad University for Women, Omdurman-Sudan. He graduated from the Department of Agricultural Economics, Agricultural University of Prague, Chezc Republic in 1972. In 1973 he qualified for the M. Sc. Degree in Agric. Econ. From the same university. He got his Ph. D. in Extension and Rural Development in 1996 from the Department of Agricultural Extension and Rural Development, The University of Reading, UK. He now holds the position of Associate Professor at the school of REED, Ahfad University for Women, Omdurman, Sudan.

Table 1. Frequency Distribution and (Percentage) of DAT using Farmers by Selected Characteristics

Categories	Source of information on DAT
Peer farmers	27 (54)
IFAD	13 (26)
Administration of Agriculture	10 (20)
	Opinion on the advantages of DAT employment
Increased production	19 (38)
Reduced drudgery	15 (30)
Low manual labour required	3 (6)
Improved timeliness	13 (26)
	Motives to use DAT
Suits farming area and cheap	36 (72)
Easy to learn	8 (16)
Animal ownership	6 (18)
	Main Problems and Constraints of DAT
Lack of training and technical know-how	39 (78)
lack of access to service	7 (14)
lack of implements	4 (8)
	Reasons of insufficiency of training by the formal authorities
The technology is not a priority for Min. of Agric.	24 (48)
Inaccessibility to services	15 (30)
Lack of capacity on the training and extension side	11 (22)
	Field capacity
0.11 ha/h and less	18 (36)
0.12-0.15 ha/h	14 (28)
0.16-0.19 ha/h	13 (26)
0.20-0.24 ha/h	5 (10)

Table 2. Frequency Distribution and (Percentage) of DAT Non-user Farmers by Selected Characteristics

Categories	The area that can potentially be added to the cultivated area (ha)
No extra space	11 (22)
2 to 5	22 (44)
6 to 10	10 (20)
11 to 15	2 (4)
> 20	5 (10)
	Types of animals owned
Horse	15 (30)
Donkey	15 (30)
Horse + donkey	4 (8)
none	16 (32)
Duration of knowledge about the role of DAT in agriculture	
> 5 years	9 (18)
6 to 10 years	21 (42)
11 to 15 years	4 (8)
Do not know about it	16 (32)
	Source of Knowledge on DAT
Peer farmers	20 (40)
IFAD/Admin. Of Agric.	14 (28)
None	16 (32)
The most important benefit(s) of employing DAT in agriculture	
Increased production and area	43 (86)
Drudgery reduction	3 (6)
Improved timeliness	4 (8)
	Reasons for not using DAT in agriculture
Implements' cost	34 (68)
Lack of training	8 (16)
Availability of family labour	5 (10)
Small farm size	3 (6)
	Reasons for lack of technical support to

	DAT users
Not a priority	22 (44)
Lack of technical know-how	14 (28)
Do not know	10 (20)
Lack of financial resources	4 (8)

Table 3. Frequency Distribution and (Percentage) of Farmers by DAT Adoption and Selected Parameters

Categories	users	non-users
	Farmers' Age	
<20 years	1 (50.0)	1 (50.0)
21 to 30 years	22 (73.3)	8 (26.3)
31 to 40 years	10 (35.0)	17 (65.0)
41 to 50 years	10 (38.7)	13 (61.3)
51 to 60 years	5 (28.9)	9 (71.1)
< 60 years	2 (50)	2 (50.0)
	Level of Education	
Illiterate	12 (50)	12 (50.0)
Informal education	7 (53.8)	6 (46.2)
Primary	19 (46.3)	22 (53.7)
Secondary	12 (54.5)	10 (45.5)
	Farm Size (ha)	
< 2	4 (8.9)	35 (91.1)
3 to 5	21(66.1)	10 (33.9)
6 to 9	14 (85.4)	4 (14.6)
10 to 12	8 (100.0)	0 (0.0)
> 12	3 (83.3)	1 (16.7)
	Land Ownership	
owned	19 (46.3)	22 (53.7)
hired	24 (46.2)	28 (53.8)
shared	7 (100.0)	0 (0.0)
	Production Purpose	
market	19 (70.4)	8 (29.6)
subsistence	15 (93.8)	1 (6.3)
both	16 (28.1)	41 (71.9)