academicJournals

Vol.8(6), pp. 89-98, June 2016
DOI: 10.5897/JAERD2016.0774
Articles Number: E685BD658747
ISSN 2141-2170

http://www.academicjournals.org/JAERD

Journal of Agricultural Extension and Rural Development

Full Length Research Paper

Effect of extension and training on farmers' husbandry and management practices and field performance when using draught horses in ploughing

Elsamawal Khalil Makki*, Fatima Elbasheer Eltayeb and Osman Abdelkarim Badri

School of Rural Extension, Education and Development Ahfad University for Women P.O. Box 167 Omdurman, Sudan.

Received 13 February, 2016; Accepted 26 April, 2016

For draught animal technology to contribute to its full potential to farming, it needs to be backed up with suitable and relevant extension and training packages. This study investigated the effect of extension on farmers' husbandry and management practices and field performance of draught horses in EN-Nhoud locality, West Kordofan State, Sudan. The study followed the cross-sectional survey design on a sample of 80 farmers, selected following the systematic random sampling technique 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. Additional data was collected through interviews with the director of the Administration of Agriculture in the locality and the senior staff as well as group discussions with the prominent farmers. The results showed that extension faces many constraints and problems; the most important of which are: Lack of funds, lack of experienced staff and lack of clear curricula and training content. This reflected on a weak role and impact on the farmers' side and their husbandry and management practices were less than optimal and consequently field performance was on the poor side. Animal feeding, harnessing and plough operation and care were poorly applied.

Key words: Draught animal technology, agricultural extension, draught horses, animal husbandry, animal management, field capacity and efficiency, harness, farming in Sudan.

INTRODUCTION

The role of draught animal technology (DAT) in agriculture and transport is well understood and documented in different parts of the world. The improved use of the technology is seen as the most appropriate and relevant form of strategy for small holder agriculture due to economical, technical and agro-ecological problems associated with mechanized agriculture. The technology has been qualified as an ecologically sustainable means of increasing agricultural production, reducing human drudgery and improving the quality of the rural life (Chanie et al., 2012).

The realization of the technology benefits in some parts

*Corresponding author. sammakki@hotmail.com

of Asia and Latin America lead the technology to be widely advocated in the Savannah areas of Africa. Nevertheless, the technology did not perform to its potential capacity due to many reasons; amongst which poor extension remains the most important. This is typical to the situation in Sudan where the technology was introduced few decades ago to many parts of the traditional rainfed farming system in an attempt to assist rural farmers achieving food security and reducing the drudgery of work. The objective was to reduce the drudgery of work and assist the farmers to expand horizontally in a traditional subsistence oriented farming system.

Oladeji et al. (2012) recommended 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. They continued suggesting design of animal traction oriented program and use of appropriate extension organ to disseminate well packaged animal traction related information to propagate the use of the technology in Northern Nigeria.

Pearson et al. (1999) pointed that small scale farmers are not receiving the information they need, much of which is available; to improve the farming practice. Further, Chanie et al. (2012) emphasized that the absence of work to improve traits for work performance indicates least emphasis is given to promote draught animal power. Pearson (1998) added “research and extension activities have to be undertaken in an environment in which population is increasing, grazing land is diminishing and labour expectations are changing”.

In rural Sudan poor field performance a major concern for the success of draught animal technology programs. Few are reported on the effect of extension on DAT in the country; Therefore, this study was carried out to:

1. Identify the situation of extension and training on DAT En-Nhoud locality, West Kordofan State, Sudan.
2. Identify farmers’ perceptions on extension and training in DAT in the area.
3. Explore the effect of extension on farmers’ husbandry and management practices of draught horses in the area.
4. Explore the effect of extension on field performance.

MATERIALS AND METHODS

Study area

Field data was collected in EN-Nhoud locality to investigate the effect of extension on farmers’ husbandry and management practices of draught horses and field performance when ploughing. EN-Nhoud locality is located in the semi-arid savannah zone. The locality 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 (ENCCP, 1997).

The dominant system of agriculture in EN-Nhoud area is the traditional rainfed farming system which is known as a small holding farming system that is mainly characterized by being subsistence oriented. No systematic agricultural rotation is followed, and farmers always tend to the horizontal expansion to increase crop production (Dahab and Hamad, 2003). 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, while 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 (ENCCP, 1997). 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. All the farmers use the same size of animal drawn mouldboard plough (15 kg in weight, 25 cm wide and 20 cm maximum depth).

Sampling

This study was based on the cross-sectional survey design targeting farmers who operate on plots more than 1 ha. A sample of 80 farmers was selected from 10 villages (clusters) following the systematic random sampling technique based on geographical location. The first of every five farmers was chosen along a survey line drawn across the farming area in each cluster starting at the upper end until 8 farmers had been selected. Farmers are mostly illiterate or with low educational level attained at informal educational institutions and their age ranges between 30 and 65 years (76%).

Data collection and analysis

The main management parameters considered in this study were:

1. Animal health (veterinary care, vaccination and wounds management)
2. Animal feeding.
3. Animal harnessing (care for harness, padding and sores and wounds related to harness).
4. Plough condition (care measures and plough condition).

All these were tested against the checklists of the ideal practices presented by Makki and Pearson (2011) and Pearson et al. (2003). Further, field capacity and efficiency were determined as direct assessments of the management practices.

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. Some information was recorded as observations to avoid farmers’ bias on issues they can consider “sensitive”. Direct field measurements were concerned with determining field capacity and field efficiency in accordance with Gbadamosi and Magaji (2004) and Abubakar et al. (2009). Two stop watches and a tape measure were used to record the total and net times of operation and the land dimensions, respectively.

Other parameters computed from the field performance data were; working speed (km/h), effective field capacity (ha/h) and field efficiency (%), expressed as:

Working speed = distance of run (km) / overall time taken (h)

Then the effective field capacity (ha/h) was taken as the product of dividing the area worked (ha) by the total time (h) as follows:

Effective field capacity (F.C) = Area (ha)/Total time (h)

And the field efficiency = Net productive time/Total time of operation Survey data were entered into an SPSS computer programme (SPSS 14.0) and analysed to produce frequency tables and the different parameters were assessed using the *chi* square test.

Additional information on extension service providers was collected through interviews with the director-general of the Administration of Agriculture and the departments' directors along with participation in the daily activities over a period of one month. Prominent farmers were also included in group discussions.

RESULTS AND DISCUSSION

Background and situation of extension service

The administration of Agriculture, EN-Nhoud locality is the official body responsible for all the agricultural strategies, policies, decisions and programs. It is formed of different departments and is headed by a director-general. The administration follows the Ministry of Agriculture at the State level and implements its policies with some freedom at the local decisions level. The Administration is characterized by:

1. Lack of clear well designed policies and plans for extension and training programs in the field of DAT.
2. Training is delivered by junior unexperienced staff with little knowledge on DAT.
3. Extension and training programs are less frequent and occasional; they do not target the right beneficiaries (some farmers attended the same packages repeatedly looking to collect the daily allowance paid for attending these programs).
4. In the mandate of the Administration DAT is not a priority and receives less attention; priorities are decided at the State level.
5. The Administration is understaffed and lacks experienced staff with good or even acceptable knowledge in DAT.
6. Most of the junior staff is fresh graduates with low or no experience in DAT. This leads to lack of trust and accountability from the farmers' side.
7. Lack of funds and resources to finance the training and extension programs. The administration turned to rely on donations and endorsement of NGOs and other donors to finance DAT activities.
8. Lack of coordination between the different departments relating to DAT (that is, veterinary service, animal production and agricultural mechanization).
9. All the training and extension packages in DAT focused on labour reduction, timeliness, harness and implements use which are of less concern to the farmers compared with animal husbandry and management practices, production and productivity which farmers consider of utmost importance.
10. It is difficult if not impossible to cover all the spatially scattered villages in the locality with the available staff and budgets.

These characteristics clearly show that extension and training in DAT lags way behind being optimal and is constrained by many difficulties that hinder it from delivering usable formulated messages. Training is provided to farmers in demonstration sessions at the Department of Agriculture buildings. There are no clear criteria for farmers selection nor there is enough training material or illustration material given to the farmers as hand-outs. Further, extension is considered as part of this training. Field extension is very scanty if not completely absent.

Chanie et al. (2012) pointed that the absence of works to improve traits for work performance indicates that least emphasis is given to promote draught animal power. Further, Abubakar and Ahmad (2010) suggested that utilization of animal traction would be increased significantly if more funds are injected in animal traction technology by the State and local government. The only available DAT service, training and extension center which is stationed in the locality capital city fails to serve the users in remote villages; instead of establishing new training centers the Administration of Agriculture opted to train farmers as trainers to other farmers and were considered as 'model' farmers who are basically seen as extension aids. This policy might not achieve good impact if farmers lack confidence in the 'model' ones and will necessarily depend on the capacity and experience of the latter. In a similar farming system Abubakar and Ahmad (2010) presented the problems of inadequate funding, poor infrastructure, undefined curricula and poor staffing as the main limiting factors to farmers training, while Oladeji et al. (2012) recommended that animal traction training centers should be established at suitable or strategic location to demonstrate the use and benefits of animal in the zone.

Staff capacity and skills are very important in designing/tailoring and identifying the local needs for training and extension. All the junior staff who practically shoulder the field work and participate in policymaking are not trained in DAT. It is necessary that workers and extension agents in the field of DAT receive in-service training in animal traction and related technology to enable them to adequately meet the needs of the farmers they serve. It is envisaged that for training programs to be fully effective they need to be backed by animal traction resource centers. The situation in the study area is way far from Abubakar and Ahmad (2010) who pointed that in order to meet the huge needs of the small scale farmers for animal traction training, extension and on farm research, it is believed that the use of mobile animal traction and research units would be an effective way to rapidly address such needs.

A major concern in the extension and training programs is the lack/absence of emphasis on participatory research

needs as highlighted by Starkey (2000) who mentioned that 'top-down' approaches to extension and development of improved technologies have greatly failed. This situation shows one of the reasons for extension/training inefficiency which is in accordance with Pearson et al. (1999) who reported that small scale farmers are not receiving the information they need, much of which is available; to improve the farming practice.

Farmers perceptions on extension service and training

The group discussions with the farmers revealed the following:

1. Farmers are not satisfied with the quality of extension and training provided to them.
2. They believe they know more/better than the staff of the Administration of Agriculture.
3. The content of extension and training packages is not what they anticipate; they demanded more information about the proper husbandry practices and work strategies, while the staff of the Administration of Agriculture insists on harnessing and implement side.
4. Farmers mostly learn about DAT from their peers and experienced farmers.
5. They prefer training their animals by themselves because they suspect the *'employees'* experience in proper animal training or selection.
6. Extension agents seldom reach the remote villages and farmers have to come to the locality center to get the service.
7. The selection of the 'model' farmers and trainers is highly biased and model farmers are not necessarily the more experienced ones.
8. Some farmers cannot afford the transportation cost or are not willing to spend money on transportation. Therefore, unless the training providers/organizers have enough funds to pay farmers, they will not participate or attend.

This situation is far from being convenient/satisfactory and resulted in less capacity and skills on the farmers' side as will be presented in the survey results. Abubakar and Ahmad (2010) presented comparable trends among farmers in Nigeria. Pearson (1998) pointed that farmers learn more from family members on draught animals than from institutions or organizations; and Madama et al. (2008) added that farmers learn about animals handling from family members. Further, Abubakar and Ahmad (2010) reported that farmers in Nigeria –an almost similar to the study area- mentioned poor extension as one of the constraints to the successful use of DAT. Mulanda et al. (2000) added that more than 80% of DA training has been educated by the farmers themselves using their own resources.

Field survey

Animal health care

Table 1 shows the distribution of work horses by animal health care parameters and extension service. Most (85%) of the farmers claimed that they vaccinate their animals, while the rest of them do not. Within this group, the majority (69%) received extension service in different aspects of DAT. On the other hand, farmers who do not vaccinate their animals distributed equally between those who received extension and those who did not (6 farmers in each group). No significant differences were indicated between the two groups (P = 0.96 using chi square) and this shows that extension service did not improve farmers' practice in this regard. Farmers in the study area even confuse vaccination and any other injection given to their animals as reported by Makki and Musa (2011). Furthermore, the majority of the farmers (52.2%) take their animals regularly to the veterinary center which is stationed in the locality center. Most of whom received extension service (76.2%); but the determinant factor here is not the awareness of the importance of regular veterinary care inspection of the animal, it is rather the vicinity of farmers' villages to the locality center. Transportation is a major constraint here in an area where it is unavailable and/or unaffordable. This compels the majority (53.8%) of the farmers to opt/resort to local remedies or buying medicines directly from the veterinary pharmacy in the locality center rather than shouldering the cost of transportation. The use of local remedies is common especially in the far villages where the service is geographically inaccessible.

The poor effect of extension service on animal health care parameters is evident in farmers' response to the appropriate measures that they take to keep their animals in a good health condition. Most of them (87.5%) focused on feeding concentrates and food additives, while few (12.5%) of them mentioned veterinary care in their response. Differences between both groups were statistically similar (P = 0.83 using chi square test).

Almost all the farmers (98.75%) claimed inspection of their animals' hoofs regularly. The majority of them (65.8%) received extension service. This suggests that farmers do this by tradition rather than as a result of awareness raising through extension. Few farmers get advice on decisions regarding wounds management from health officers or veterinarians. The same concerns and situation was reported by Krecek (1999) in North-west Province, South Africa. However, differences between both groups were statistically similar. The same trend is observed with grooming as 95% of the farmers groomed their horses, of whom 67% received extension. All these results suggest that health measures are practiced by tradition rather than awareness raising through extension.

As suggested by Makki ad Pearson (2011) animals' teeth and tongue should be checked/examined regularly

Table 1. Frequency distribution and (percentage) of the farmers by animal health care measures and extension service.

Categories	Extension service		Total
	Extension received	Extension not received	
Animal Vaccination			
Yes	47 (69.1)	21 (30.9)	68
No	6 (50)	6 (50.0)	12
Regular veterinary care of animals			
Yes	32 (76.2)	10 (23.8)	42
No	21 (55.3)	17 (44.7)	38
Procedure followed when the animal is sick			
Take it to the veterinary care	27 (73.0)	10 (27.0)	37
Buy medication from pharmacy	17 (56.7)	13 (43.3)	30
traditional treatment	9 69.2)	4 (30.8)	13
The appropriate measures to keep animals in a good health condition			
Giving it concentrates and food additives	44 (65.7)	23 (34.3)	67
Take to veterinary care regularly	4 (100.0)	0 (0.0)	4
Veterinary care and food additives	2 (33.3)	4 (66.7)	6
Wounds care	3 (100)	0 (0.0)	3
Inspection of animal hoofs			
Yes	52 (65.8)	27 (34.2)	79
No	1 (100)	0 (0.0)	1
Animals grooming			
Yes	51 (67.1)	25 (32.9)	76
No	2 (50)	2 (50.0)	4
Regular examination of animals teeth and tongue			
Yes	47 (68.1)	22 (31.9)	69
No	6 (54.5)	5 (45.5)	11

as they affect the feeding ability of the animals and consequently its live weight and body condition which both decide animals' power output. Most of the farmers in both groups (86.3%) claimed regular inspection of animals' teeth and tongue. Differences between the two groups were statistically similar. Although farmers who received extension were more than those who did not receive the service.

Animal feeding

Extension is not expected to influence the types of feed offered to the work animals as feed types are dictated by the availability of diversified feed types in the area and the prevalent environmental conditions. Extension is more likely to affect feeding practices and programs followed by the farmers since their knowledge is the key factor here. In a semi-arid farming system dry feed remains the only option available to the farmers especially after the end of the short rainy season. Open grazing is not a choice for the farmers in the study area. It is more observed with bovines rather than equids. Table 2 shows animal feeding parameters. In both groups almost all the farmers (97.5%) fed their animals on dry feed and cereals referred to as concentrated feed. Farmers who mentioned green fodder do not mean fresh one. Further, the same percentage of the farmers (97.5%) offered feed to their animals in a container rather than on the ground. Interestingly all farmers with no access to extension fed their animals in containers instead of on the ground which shows that the same animals' feeding and husbandry practices are performed by tradition and not a result of receiving proper instructions.

Pearson (1998) suggested that work animals should be fed differently before the beginning of the season so that the animals will be in a good shape with enough fat reserves to work efficiently, there is little conclusive evidence to show that animals in good body condition

Table 2. Frequency distribution and (percentage) of the farmers by animal feeding practices and extension service.

Services	Extension Service		Total
	Extension received	Extension not received	
Basic type of feed during the year			
Concentrated feed and dry feed	52 (66.7)	26 (33.3)	78
Concentrated feed and green fodder	1 (50.0)	1 (50.0)	2
Animals feeding place			
On the ground	2 (100.0)	0 (0.0)	2
In a container	51 (65.4)	27 (34.6)	78
Time before work when animals are fed			
Less than 2 h	37 (66.0)	18 (34.0)	55
2 h and more	16 (64.0)	9 (36.0)	25
Number of concentrated feed types offered to the animals			
One type	53 (67.0)	26 (33.0)	79
2 types	0 (0.0)	1 (100.0)	1
Offering water to the animal during the work			
Yes	3 (75.0)	1 (25.0)	4
No	50 (65.8)	26 (34.2)	76
Animals watering			
Before and after eating	26 (65.0)	14 (35.0)	40
After eating	21 (77.8)	6 (22.2)	27
Before eating	4 (40.0)	6 (60.0)	10
All day	2 (75.0)	1 (25.0)	3

work faster and/or longer than those in poor condition at the start of the working season when they are required to do most of the work. This was not followed by the surveyed farmers and all of them fed their animals differently at the beginning of the season. In this case animals are not expected to benefit from this practice to generate the required energy.

A close look to the time before work when animals are fed shows that the majority of the farmers (68.7%) fed their animals less than 2 h before work starts, while the rest (31.3%) fed their animals 2 or more hours before work. The latter is the optimal practice according to Pearson (1998). Between the two groups the feeding time of those who received extension is less optimal; which questions the effectiveness and/or usefulness of extension programs.

The less optimal feeding practices included the number of concentrated feeds offered to the animal. All the farmers except for one (98.8%) relied on one type of cereals/oil seed cake offered to the animal. Evidently extension played no role here as all those who received extension offered only one type of cereals, while the optimal practice is to offer a mix of two or three types cereals (Makki and Pearson, 2011). Further, farmers did not mostly (95%) offer water to the horses during work and only a marginal percentage of both groups did that. The group discussion with the farmers revealed their misconception that water during work causes gases and hernia to the animal and results in slow work. Contrary to this offering water to the animals helps in reducing the heat stress animals undergo in a semi-arid environment. This suggests that the practice is by intuition and tradition and not on recommendation or any scientific grounds.

Animal watering is not an exception and one half of the farmers claimed watering their horses before and after eating, while the recommendation is to offer water to the horse before eating. One third of the farmers (33.8%) offered water to their horses after eating, while only 12.5% followed the optimal practice by offering water to the horses before eating. All these less acceptable practices are a direct result of the lack of organization and coordination between the different departments of the Administration of Agriculture since each department organizes its own packages without appreciating or acknowledging the multi-disciplinary nature of draught animal technology.

Animal harnessing

All the farmers in both groups harnessed their horses with collars which is common in the study area (Table 3).

Table 3. Frequency distribution and (percentage) of the farmers by harnessing and extension service.

Categories	Extension Service		Total
	Extension received	Extension not received	
Harness padding			
Yes	20 (77.0)	6 (23.0)	26
No	33 (61.0)	21 (39.0)	54
Does the harness fit the animal			
Suitable	52 (66.7)	26 (33.3)	78
Large	1 (50.0)	1 (50.0)	2
Rate of harness cleaning			
Not at all	51 (67.0)	25 (33.0)	76
every now and then	0 (0.0)	1 (100.0)	1
During the season	1 (50.0)	1 (50.0)	2
Everyday	1 (100.0)	0 (0.0)	1
State of harness cleanliness			
Dirty and dusty	6 (43.0)	8 (57.0)	14
Clean	47 (71.2)	19 (28.8)	66

Farmers did not care much for harness padding (67.5%) although padding is imperative for a comfortable work of the horse and reduces susceptibility to any bruises and/or injuries resulting from the harness rubbing on the horse skin. Extension role in this aspect is on the weak side keeping in mind that extension packages in the area mainly focus on harnessing and implement work. The majority of the farmers who received extension did not pad the collar of their horses; this certainly questions the effectiveness of extension packages and messages and the trust and reliability/accountability from the farmers' side on the service providers.

Most of the farmers (98.5%) believe that the collars they use are suitable to their horses; of whom 67% received extension while the rest did not. Knowledge on harness cleaning is alarming as most of the farmers (82.5%) never clean the collars of their horses, 67.5% of them claimed receiving extension. This practice does not comply with the harness care checklist (Pearson et al., 2003). The rest of the farmers cleaned the harness less frequently. Lack of harness cleaning subjects the horses to cuts and bruises resulting from collar rubbing on its' skin. This resulted in poor (dusty and dirty) collars for most of the studied farmers (98.5%); most of whom (71.2%) received extension. Differences between the two groups were statistically similar (P = 0.76). Despite the no or less frequent cleaning, most of the collars (92.5%) were in a good condition without torn parts. Further all the farmers in both groups toss the harness on the ground by the animal keeping/tethering place exposing it to different hazards to both the harness and the animal (Pearson et al., 2003).

Plough operation and care

Although plough operation and care is one of the main components of extension and training packages, farmers' practices in this regard are mostly less optimal (Table 4). All the farmers use the same type of mouldboard plough (15 kg in weight 25 com wide and 20 cm maximum depth). They mostly (62.5%) did not follow the proper procedure for plough checking/inspection before work starts. It is evident from this that either the packages did not provide information on plough care measures, or the farmers do not trust the information provided to them. This extended to include procedure of plough care after work as only 30% of the total sample followed the proper procedure. Among the farmers who received extension only 26.4% followed the proper procedure, while the rest did not.

The situation is even acute when plough care procedure at the end of the season is considered. Only 22.5% followed the proper procedure; and among the farmers who received extension only 24.5% followed the proper procedure.

Consideration of work continuation in the field is the only optimal practice regarding plough operation and care. Most (85%) of the farmers kept nuts, bolts and nut-drivers to tighten or replace any broken nuts. This is because farming site is distant from any service area and any breakdown can lead to delays in operation and potential yield losses.

Almost one third of the tested ploughs (31.3%) were rusty; most of them (80%) were operated by farmers who received extension. Further, among the farmers who

Table 4. Frequency distribution and (percentage) of the farmers by plough condition and care parameters and extension service.

Categories	Extension service		Total
	Extension received	Extension not received	
Procedure followed to check the plough before work			
Proper	21 (70.0)	9 (30.0)	30
Improper	32 (64.0)	18 (36.0)	50
Procedure followed to check the plough after work			
Proper	14 (58.3)	10 (41.7)	24
Improper	39 (69.6)	12 (30.4)	56
Procedure followed to check the plough at the end of the season			
Proper	13 (72.2)	5 (27.8)	18
Improper	40 (64.5)	22 (35.5)	62
Signs of rust on the tool			
Yes	20 (80.0)	5 (20.0)	25
No	33 (60.0)	22 (40.0)	55
Keeping any type of nuts drivers or wrenches			
Yes	44 (64.7)	9 (30)	68
No	9 (75.0)	3 (25.0)	12

received extension nearly two fifths (37.7%) received extension. The same question on the usefulness of extension and training packages holds valid again.

Field performance

Field performance is affected by a list of factors that vary from soil, animal weight and body condition, harness to farmers experience in work and plough/implement condition. Nevertheless, it was considered as an indicator to the effectiveness of extension programs since extension relates from its side to the aforementioned factors. Table 5 shows farmers distribution by forward speed, field capacity and efficiency and extension service. Forward speed was mostly (72.5%) on the moderate to high range (2.6-4.0 and 4.1-5.0 km/h, respectively). Most of the farmers who received extension worked in these ranges, but the difference between the two groups is statistically similar.

Work speed ranges reflected on field capacity and collectively the highest percentage of the farmers (46.3%) worked at low field capacity (less than 0.14 ha/h), while slightly more than one third (35%) worked at moderate field capacity (015-0.17 ha/h). Those who worked at high field capacity were only 18.7% of the total sample. Among farmers who received extension the highest percentage worked at low field capacity followed by those who worked at moderate capacity. The same trend was observed with those who did not receive extension. The result confirms that extension did not reflect on farmers' field performance (P = 0.69).

Field efficiency is more indicative of farmers' experience and knowledge as it is determined from the net productive time to the total time of field operations. The highest percentage of the total sample (40%) worked at high efficiency (>80%), these were followed by 32.5% who worked at low efficiency (<70%). Nearly one half of the farmers who received extension (47.2%) worked at high efficiencies. Differences between the two groups were statistically similar. The ranges of field performance reported in this study are comparable to those reported by Geza (1999) in the neighbouring Ethiopia. Nengomasha (1999) reported similar low capacities for heavy male donkeys harnessed to the same type of plough used in the study area.

Conclusion

Extension activities in the study area are constrained by lack of funds, lack of experienced staff, mistrust from the farmers and lack of clear curricula and training content. This reflected on a weak role and impact on the farmers' husbandry and management practices of draught horses which were less than optimal and consequently field performance was on the poor side. Farmers' knowledge on animal harnessing, plough operation and care and

Table 5. Frequency distribution and (percentage) of the farmers by field performance and extension service.

Categories	Extension service		Total
	Extension received	Extension not received	
	Frequency	Frequency	
Forward speed categories (km/h)			
101 to 105	4 (100.0)	0 (0.0)	4
1.6 tp 2.5	10 (55.6)	8 (44.4)	18
2.6 to 4.0	28 (66.7)	14 (33.3)	42
More than 4	11 (68.7)	5 (31.3)	11
Field efficiency categories (%)			
≤50	2 (66.7)	1 (33.3)	3
51 to 60	6 (66.7)	3 (33.3)	9
61 to 70	6 (43.0)	8 (57.0)	14
71 to 80	14 (63.6)	8 (36.4)	22
81 to 90	16 (76.2)	5 (23.8)	21
≥91%	9 (81.8)	2 (18.2)	11
Field capacity (ha/h)			
≤0.11	13 (72.2)	5 (27.8)	18
0.12 - 0.14	10 (52.6)	9 (47.4)	19
0.15 - 0.17	19 (68.0)	9 (32.1)	28
0.18 - 0.23	7 (63.6)	4 (36.4)	11
≥0.24	4 (100)	0 (0.0)	4

feeding is poor. The results suggest that extension programs will not be efficient unless tailored upon needs assessment based on the priorities set by the farmers themselves. Further, training on site in a multidisciplinary form involving all the actors in DAT is imperative. The study recommends baseline surveys for needs assessment for the development of DAT projects, extension and training programs.

Conflict of Interests

The authors have not declared any conflict of interests.

REFERENCES

Abubakar MS, Ahmad D (2010). Utilization and Constraints on Animal Traction in Jigawa State, Nigeria. Aust. J. Basic Appl. Sci. 4(6):1152-1156.

Abubakar MS, Tekwa IJ, Ahmed MM (2009). Effects of Soil Physico-mechanical properties on field performance efficiency of ox-drawn mouldboard plough in Yola, Adamawa State. Agricultural Engineering International: CIGR Ejournal. XI, 1369-2137-1.

Chanie M, Fentahun T, Mitiku T, Behran M (2012). Strategies for Improvement of Draft Animal Power Supply for Cultivation in Ethiopia: A Review. Eur. J. Biol. Sci. 4(3):96-104.

Dahab MH, Hamad SF (2003). Comparative of weeding by animal-drawn cultivator and manual hoe in En-nohoud area, Sudan. Agric. Mechan. Asia Afr. Latin Am. 34(3):27-30.

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

Gbadamosi L, Magaji AS (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.

Geza M (1999). Harnessing techniques and work performance of draft horse in Ethiopia. In: Meeting the Challenges of Animal Traction. A Resource Book of the Animal Traction Network for Eastern Africa (ATNESA), Harrare, Zimbabwe, Intermediate Technology Publications, London 326 p.

Krecek RC (1999). Management and welfare of working animals: experiences with communities in North-West Province, South Africa. In: Pearson RA, Wythe S, Joubert B, O'Neill D, Simalenga T (Eds.). 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.

Madama EA, Naazie A, Adogla-Bessa T, Adjorlolo LK (2008). Use of donkeys and cattle as draught animals in the Northern and Upper East and Volta Regions of Ghana. Draught Anim. News 46(1):10-13.

Makki EK, Musa EOM (2011). A survey on draught animal technology (DAT) in EN-Nhoud area, North Kordofan State, Sudan. Trop. Anim. Health Prod. 43(5):923-928.

Makki EK, Pearson RA (2011). Training Manual for Extension Workers and Farmers using Draught Animal Technology. School of Rural Extension Education and Development, Ahfad University for Women, Omdurman, Sudan. 79 p. Published by Ahfad University for Women.

Mulanda J, Mwenya E, Namalambo E (2000). Draught animal power: experiences of farmer training in the Northern communal areas of Namibia. In: Kaumbutho PG, Pearson RA, Simalenga TE (Eds.). Empowering Farmers with Animal Traction. Proceedings of the workshop of the Animal Traction Network for Eastern and Southern Africa (ATNESA) held 20-24 September 1999, Mpumalanga, South Africa. 344 p.

Nengomasha E (1999). Feeding and managing donkeys for work in Zimbabwe. In: Pearson RA, Wythe S, Joubert B, O'Neill D, Simalenga T (Eds). 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.
Oladeji JO, Ogunleye KY, Aderinto A (2012). Attitude of farmers towards the use of animal traction technology in Savannah zone of Oyo State, Nigeria. Glob. J. Sci. Front. Res. Agric. Vet. Sci. 12(2):17-23.
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.
Pearson RA (1998). Draught animals and their management: The future in rain-fed agriculture. Ann. Arid Zone 37(3):233-251.
Pearson RA, Simalinga TE, Kercek RC (2003). Harnessing and hitching donkeys, horses and mules for work. Centre for Tropical Veterinary Medicine, University of Edinburgh, 34 p.
Starkey P (2000). Empowering Farmers with Animal traction: Worldwide reands, Issues and Challenges. In: Kaumbutho PG, Pearson RA, Simalenga TE (Eds.). Empowering Farmers with Animal Traction. Proceedings of the workshop of the Animal Traction Network for Eastern and Southern Africa (ATNESA) held 20-24 September 1999, Mpumalanga, South Africa. 344 p.