MERIT RESEARCH JOURNALS
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Merit Research Journal of Agricultural Science and Soil Sciences (ISSN: 2350-2274) Vol. 3(10) pp. 149-158, November, 2015
Available online http://meritresearchjournals.org/asss/index.htm

Original Research Article

Construction of Permanent Fence around an Agricultural Demonstration Farm Using Locally Procured Materials

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Abstract

The overall purpose of the exercise was to construct a fence around an agricultural demonstration farm in the School of Agriculture of the Delta State Polytechnic, Ozoro using locally procured materials. The area was surveyed and mapped out and materials such as diagonal shaped wire mesh, fencing poles, staples, mesh wire and other materials needed for the fencing were procured. A permanent fence was constructed and the fence took a rectangular shape covering an area of 200 m^2. The fence was constructed over a period of two weeks with a total cost of eight hundred and fifty eighty thousand, five hundred naira. Although the cost of the fence using the locally procured materials was high, it is assessed that durability is of utmost importance considering the fact that it is a permanent fence. The study recommends that locally sourced materials should be used to fence a farm to protect it from external invaders, loans and grants be given to farmers, tertiary institutions and research institutes by government to construct solid and quality fences to protect farms and a proper consideration of hills and valleys be made in fencing to avoid effects on the fencing structure amongst others.

Key words: Agricultural, Construction, Demonstration farm, Fence, Locally, Materials, Procured

INTRODUCTION

The need for demonstration farms was first recognized over a century ago by Seaman A. Knapp, an extension pioneer. Knapp's theory was that farmers would not change their method as a result of observing farms operated by public expense, but by demonstrations conducted by public farmers themselves on their own farms under ordinary farm conditions. Knapp showed the small demonstration farm in Texas where corn was planted in half and cotton on the other half to illustrate the effects of using different seed varieties, fertilizers, method of planting and cultivation. (Hancock, 2000).

The importance of demonstration farms cannot be overemphasized as it helps to stimulate audience interest on problems in which people are already aware of, and provide a platform for actually conducting a study. It also provides an opportunity for economic evaluation of

results in order to advice farmers on the best way to embark on the cultivation of the crop or breeding of the animal or other associated activities. (Andrew and Peter, 2002).

In contemporary time, demonstration farms have been owned and operated in Nigeria by educational institutions or government Ministries. In the case of educational institution such as Universities, Polytechnics and Colleges of Education, these are referred to as Teaching and Research Farms, where students are made to conduct researches and are also shown the underlying causes and effects of the identified problems and methods of combating it. On the other hand, government ministries such as the Ministry of Agriculture and Natural Resources have areas such as commercial farms that are used for the purpose. But where they are not available, land is rented from the local farmers to perform the demonstrations while the land owner is paid for the land usage or given the resulting crops (FAO, 2012).

In the establishment and management of demonstration farms, the design, delineation of boundaries and record keeping are vital activities. The design involves compilation of several treatments and replication of the treatments where possible as well as complete to all practical demonstrations including all recommended practices to establish a benchmark or goal for achievement. Record keeping involves keeping a record of demonstration design, plot layout, and distance to land marks amongst others. Of particular note which is paramount in this study is the delineation of boundaries which involves placing permanent stakes in fence rows or off turning rows. This is a very important exercise for any successful demonstration farm.

Meaning of Fencing/Fences

Fencing is the process of using a wide variety of materials depending on terrain, location and animals to delineate boundaries and keep animals in and out of an area (Wikipedia, the Free Encyclopedia, 2011). On the other hand, BreDahi (2000) defined fencing as the procedures of constructing a barrier to mark boundaries and restrict movement of livestock. He noted that these barriers may be physical, psychological or a combination of the two. Physical barriers contain enough materials of sufficient strength to prevent or discourage animals from going over, under or through the barrier. Examples of physical barriers are wooden, woven wire, cable fences and welded panels. Psychological barriers are those that depend on inflicting pain to discourage animals from challenging an inferior physical barrier which by itself could not be counted on to contain them. Examples are electrified and barbed wires. Conversely, high tensile electric fences are a combination of physical and psychological barriers.

WoodGay and Heidel (2011) observed that fences are barriers that consist of seven types based on the materials used. They include;

(i) Woven Wire Fences
(ii) Barbed Wire Fences
(iii) Cable Wire Fences
(iv) Mesh Wire Fences
(v) Board Fences
(vii) Electric Fences

Depending on the quality of materials used and the durability of fences, two categories of fences /fencing are distinguished (Gay et al, 2003). These are;

(i) Fixed/Permanent/Portable Fencing System
(ii) Flexible/Temporary Fencing System

The fixed /permanent/portable fencing system is that which is made up of sturdy materials and has long durability of up to forty years. Some examples of materials used in constructing this fence are aluminum, stainless steel and high tensile wire. Some of the advantages and disadvantages of this fencing system are as follows;

Advantages

1. Minimum daily labour
2. Low cost per acre in large installations
3. Limited management flexibility

Disadvantages

1. Low maintenance
2. Low cost per acre in small installations

On the other hand, the flexible or temporary fencing are constructed using less sturdy materials such as fine aluminum or stainless steel wires. They are constructed to last only for short periods after which they may be removed or replaced. Some of the advantages and disadvantage of this type of fencing system are;

Advantages

1. High management flexibility
2. Low cost per acre on small installations\

Disadvantage

1. More labour

Considerations in Fencing of Demonstration Farms

Anon (2012) noted that the first step in planning a fencing program is to determine the purpose and goals of the fencing program. This is because proper fencing constitutes a powerful management tool in the efficient management of farms. Pasture fencing enhances livestock protection and confinement and enhances effective rotational managed grazing system to provide forage to grazing livestock and reduce herd nutrition cost year round. Anon (2011) observed that in preparing to construct a fence there should be proper planning which would involve an aerial map, a topographic map and a soil map of the area. Another consideration elucidated by Gayetal (2003) is that the operational size of the demonstration farm, number of animals and or crops type of forage systems and number of paddocks needed should be ascertained before investing in fencing materials and supplies. In relation to this, Gay et al (2003) also noted that the farm resources available should be considered. These farm resources were classified into;

(i) Permanent resources such as soil type, slope and aspect affecting fencing layout plans. Soil types therefore need to be understood and fenced separately. Fences should follow the contour of the land such that those that run down the slope should be kept to a minimum to avoid erosion. Thus, permanent resources cannot be modified but the fencing layout should fit into it

(ii) Semi-permanent resources such as water and shade may be modified to accommodate the fencing layout. A fencing layout needs to be planned to allow livestock access to adequate water supplies. This is because water is a critical nutrient required for a wide variety of body functions. Water constitutes a key part of rotational grazing systems and water quality and accessibility are important to maintaining adequate water intake. In the absence of a water source in a fencing system, it may be necessary to incorporate into it a central water source accessible to and within 900 feet of each paddock. Pipes and portable containers may be used to provide mobile water systems and avoid mud.

Shade is a major factor to consider when building fences as it create animals' exposure to the sun's radiant energy, reduce respiration rate and body temperature during the hottest times of the day. It also alters the grazing habits of animals. Three types of shades need to be observed in any fencing layout;

(a) Natural shade which are made up of trees that grow naturally. However, high concentration of livestock congregating near trees over extended periods can kill them, leaving pastures with limited shade

(b) Permanent shades which are provided in the form of sheds or barns. These sheds can be costly but not flexible. A major problem is that the permanent sheds can become muddy during wet periods and harbor diseases causing agents that can affect livestock.

(c) Portable shades which are structures made from galvanized pipe frames. These sheds are flexible and sturdy enough to withstand livestock activity. In this regard, they can help to avoid mud and manure build up around a particular shade.

(iii) Variable resources such as a combination of cool and warm season grasses and compatible legumes that provides a good forage supply throughout the grazing season.

Bushermohle et al. (1996) also observed that the effectiveness of lane systems and gate placement should also be considered as it helps to make livestock movement to animal handling facilities and rotation to other pastures much easier. In this regard, they suggested that gates and passageways for livestock and other equipment should be placed at the corner of each field closest to the central water source. Anon (2013) noted that there can never be enough gates considering the fact that it could be very frustrating to move through very long distances before reaching one. In this regard, it is advised that investment in good gates that are wide enough to allow for passage of farm equipment should be made, Ten feet wide gate is generally the smallest recommended.

Conclusively, fencing layout should consider the legal rights and responsibilities to avoid potential disputes with adjacent landowners.

As a result of the need to demonstrate and protect on-going teaching and research activities based on the experience encountered in the illegal and unwarranted entry of animals and humans which have eventually resulted in unnecessary interference and destruction, it has become imperative to fence demonstration farms to avoid disrupting on-going researches. Hence, the objective of the exercise is to fence a demonstration farm in the School of Agriculture of the Delta State Polytechnic Ozoro.

MATERIALS AND METHODS

The fence was constructed in the Teaching and Research Farm of the School of Agriculture of the Delta State Polytechnic Ozoro. The demonstration farm is located in campus two, specifically on the left fringes, adjacent to the piggery on one side and the school commercial farm on the other side. The area is characterized by the presence of sandy-loam soil and previously exposed to mixed cropping system. The area encompasses a turkey house, grasscutter house, fish culture pond, nursery and sprinkler irrigation points

amongst others.

The area was mapped out to identify the size of the area, the gate location, the lanes and other features such as length and plan for corner post, gate post and in-line bracing pole post.

A permanent fence was designed and constructed. This required using strong materials that is long lasting and provides long services with minimal maintenance.

The following materials were used in fencing the area;

1. Fencing Post (Shell make), 2inch, 5mm thickness and 8ft length.
2. Staples (binding wires)
3. Chain link (Mesh wire)- (12 ½ half gauge and diamond shape)
4. Pliers
5. Cement (4 and half bags)
6. Gravel (45 head pans of gravel)
7. Sand (45 head pans of sand)
8. Water (one drum of water, 200 litres)
9. Shovel (2 piece)
10. Cutlass (4 pieces)
11. Theodolite
12. Tape and line (Rope)

The materials used were categorized into three forms. These are;

Wire Materials

This comprise of diagonal shaped mesh wire. They are preferred because they work in helping to restrain small and large livestock and can be adapted better than other forms of wire materials.

Post Materials

The post material that were used is steel (Shell make) of 2inch and 5mm thickness. This is strictly because of ease of installation, longevity and availability.

Ancillary Materials

They include staples, pliers, cement, sand, gravel, shovel and headpan amongst others.

The following fifteen (15) steps were adopted in the construction of the fence as recommended by Sugarcoat, Milindo, Flickety, and Cliffar (2012) as follows:-

Step1: Determination of the type of fence to build – permanent fence. This was determined by the type of animals around the area and amount of money to be spent.

Step 2: Determination of the area where the fence covers. This is depended upon the following;-

(i) the area of land
(ii) the number of sections of the land
(iii) the lanes/pathways for smooth flow of traffic
(iv) The area where the gates were located.

Step 3: Determination of how the fence was built in line with the type of animal. For example, if cattle is a threat, the fence is made strong to hold them from walking out/in. But where animals that are fence jumpers, crawlers and diggers are the threat, the fence were built taking this into consideration.

Step 4: Determination the corner braces (anchor point from which the fence takes its force from). For example H-brace with a steel post at the top and wire stretching from it.

Step 5: Informing the Department and School for onward transmission to the Estate authority of the polytechnic for approval to construct the fence. This involved strictly providing them the opportunity to mark out the areas for inclusion in the polytechnic improvement plan before constructing the fence.

Step 6: Surveying the land to determine the size (Perimeter of the land), boundaries and position of other structures.

Step 7: Purchasing the fencing supplies from the market such as fencing wire, post materials amongst others.

Step 8: Digging the hole using a post-hole digger or auger. The depth of the hole depended on the type of soil. A 2 feet hole was dug in all cases.

Step 9: Installing the corner post. This required ensuring that they are straight and level.

Step 10: Putting up the fencing wire materials and ensuring that they are straight

Step 11: Putting up line posts at regular intervals. These were as close as possible to ensure that the fence is strong and studier. A 5 m distance between poles was adopted.

Step 12: Putting up the rest of the fencing wire

Step 13: Hammering in the staples to hold the fencing wires to the line post.

Step 14: Cross checking the various areas to find that the fencing and post materials are well placed.

RESULTS AND DISCUSSION

The total area fenced was 200 m^2. Within this area, a fencing post was placed every 5 m to hold firmly the wire materials. On the whole, there were forty one fencing posts and one gate. (Figure 1)

Activity Scenes

The layout in the pasture fencing activity shows the following scenes that students were involved in. (Figure 2 - 6) (Table 1)

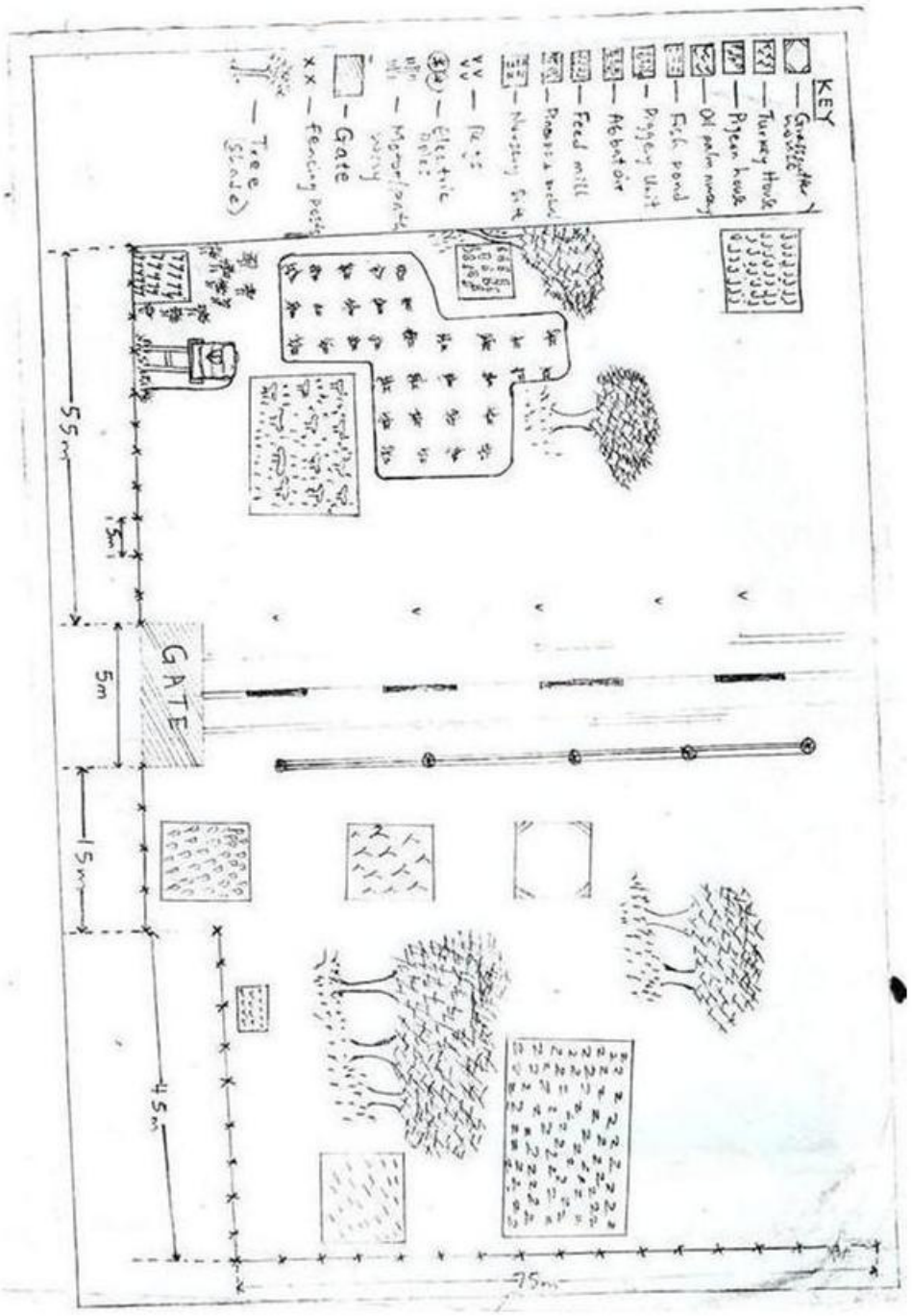

Figure 1. Survey Map Showing Shape and Dimensions of Constructed Fence around area in Demonstration Farms.

Figure 2. Using theodolite in the survey of the area

Figure 3. Outlining/ stretching out the wire mesh

Figure 4. Mixing gravel, sand and cement for casting the fencing posts.

Figure 5. The Gate

Figure 6. One Side view of constructed fence

Table 1. Cost Analysis

S/No.	Description of Materials	Quality	Unit Cost (N)	Total Cost (N)
1.	Fencing post/pole	41	15,000	205,000
2.	Chain link	12bundles	12,000	144,000
3.	Cement	4 ½ bags	2,000	9,000
4.	Sand	1 trip	12,000	12,000
5.	Gravel	½ trip	54,000	27,000
6.	Binding wire(staples)	10 bundles	1,5000	15,000
7.	Water	1 drum	500	500
8.	Pliers	**8**	600	4,800
9.	Paint	**3**	2000	6,000
10.	Caliper	**1**	200	200
11.	Miscellaneous (Transportation, Labour cost etc.)		25, 000	25,000
		Total		**858.500**

DISCUSSION

The fencing activity in the establishment of an agricultural demonstration farm in the School of Agriculture of the Delta State Polytechnic Ozoro has resulted in the specification of the boundaries of the farm and improved the aesthetic view of the landscape. In addition, it has also provided adequate protection and conservation of on-farm ongoing research and prevented unauthorized entry and pilfers of the farm. It has also attracted the attention of members of the Polytechnic community on the rationale and the happenings within the location. BreDahi (2000) supported this view when he noted that the construction of a fence creates physical and physiological barriers that protects a farm, beautify the landscape and improves the outcome of ongoing research.

The fence constructed utilized strong materials such as steel posts that are long lasting with limited management flexibility. It is therefore expected that the fence will serve for a long period of time in supporting the activities of the demonstration farm. Gay et al (2003) in support of this assertion noted that a permanent fence last for a period of between 25-40 years. This will help to ensure that the activities of the agricultural demonstration farm are not disrupted unexpectedly thereby promoting effective teaching and research for the acquisition of knowledge for enhanced agricultural productivity.

However, in the construction of the fence some challenges were encountered particularly with respect to the fact that the fencing post on a particular side (right wing) of the fence were not of the same level in the area. This created a scene where the fence constructed was undulating. Alaina (2009) stipulated this when he noted that the depth of the fencing post should depend on the nature of the landscape and that the highest and lowest points of the area should be taken in setting the post to avoid an undulating fence that will not provide good aesthetic view.

CONCLUSION

Based on the findings of the exercise it can be concluded that the construction of a fence using locally procured materials will serve to delineate boundaries and protect the agricultural demonstration farm from any form of unwarranted interference in order for the overall objectives of the agricultural demonstration farm to be achieved.

RECOMMENDATIONS

The findings of the study lead to the following recommendations;

1. Agricultural demonstration farms should be fenced using high quality cost effective locally procured materials to enhance affordability and durability in the long run. This will assist local farmers to construct fences around their demonstration farms without the excuse of exorbitant cost and non-availability of materials in the local environment.
2. Local farmers, tertiary institutions and research institutes should be assisted with loans, grants, subsidies to construct fences around their farms in the quest to adequately protect agricultural activities for enhanced food production and food security.
3. The setting of fencing posts in the construction of fences in agricultural demonstration farms must be preceded by an examination of the slope of the area to ascertain its status in order to be able to avoid the placement of post and fence wires that provides poor aesthetic view of the landscape. This should involve setting posts, connecting the post with an appropriate line before fixing the wire mesh

ACKNOWLEDGEMENTS

We wish to acknowledge the Rector of the Delta state Polytechnic, Ozoro for the approval given to construct the fence. The students of the Department of Agricultural Technology are also acknowledged for their untiring effort and support in ensuring the completion of the exercise in due time. May your efforts be rewarded by the Almighty God.

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