

The need for standardized procedures to test ox-drawn implements: experience from Zambia

by

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Abstract

To predict the performance of animal-drawn implements and to protect farmers against unsuitable and/or unreliable equipment, any new implement should be thoroughly tested under controlled conditions before it is introduced to farmers. Compulsory tests should be widely accepted as being reliable and thorough, and should have the approval of the appropriate national authorities. To be widely acceptable, results of standard tests should be presented in standardized formats. Standardized testing conducted by authoritative institutions can lead to increased profitability of the use of animal traction in three ways. First, it will help farmers to obtain implements suited to their particular situations and stimulate acceptance of improved technologies. Second, the information manufacturers obtain through test results will assist them in the development of further appropriate equipment. Finally, standardization will improve international exchange of test results.

Introduction

The introduction of animal draft power in various countries of the African continent came hand-in-hand with the introduction of a vast number of agricultural implements originating from countries with diverse agricultural practices. It is no wonder that many of the new implements proved to be unfit for use in the new environment. Often unsuitable implements were promoted as improvements in themselves, despite the fact that benefits from the implements could only come if there was major investment in other aspects of the

farming system. Without high investment, farmers could obtain only minor benefits. Profits relative to costs were often less than those obtained using traditional methods. This did not improve the farmers' opinion of the promoted implements in particular, or of animal draft power (ADP) in general. This resulted in new psychological constraints to the acceptance of "improved" ADP technologies.

One means to overcome this problem, would be for new implements to be thoroughly tested under controlled conditions, before being introduced to farmers. This would prevent exposing farmers to unknown risks. While this idea has been accepted by many organizations involved in agricultural development, it has not been popular with local producers of implements, or with the donor agencies that have been responsible for the importation of large quantities of animal-drawn implements.

For those interested in testing, few detailed guidelines on what and how to test are available. The selection of procedures and criteria depends largely on the discretion of the tester. The lack of standardization strongly limits widespread acceptance of any one test result, and so causes much unnecessary repetition at different locations. Even more serious, if neither farmers nor manufacturers have faith in the tests, the results have little acceptability or impact. If testing is well organized, fair and objective, it will generally be accepted by manufacturers since it will assist their development programmes. If testing is poor, it will not be accepted and will be difficult to maintain in the long run.

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Objectives of testing

Testing involves observing how well an implement performs the task for which it was designed, and at what rate of work. Comprehensive testing procedures, conforming to internationally accepted codes (such as BSI, SAE and ISO) exist for many types of farm machinery. Most testing stations in developing countries do not have the instruments or facilities to test to all the international standards, so they have to obtain some test information from outside. However there is a great difference in agricultural environment between "western world" testing stations and farm conditions in African countries. This necessitates the testing of field performance assessment under actual farm conditions. To ensure that implements are suited to local farming systems, their use should be compared with existing traditional practices. Because of the large differences in agricultural environments and traditional practices, tests have to be carried out in each region.

For equipment testing in developing countries, Stevens (1982) considers the following aspects to be of prime importance:

- soundness of construction;
- rate of work;
- quality of work and its relevance to the requirement;
- ease of operation.

The aims of testing animal-drawn implements at stations throughout Africa should be:

- to predict the performance of implements under the specific circumstances that can be expected at farm level;
- to assess the implements' compatibility with existing equipment and farming systems.

The overall objective would be to ensure that only implements that pass the tests are made available to farmers. In this way farmers would be protected against unsuitable and/or unreliable equipment, either locally made or imported. In Zambia, the main problem has

been with imported implements; frequently large quantities of plows have been "dumped" on the market at low prices due to export rebates or donor assistance. Little consideration has been given to their suitability or the damage caused to local manufacturers.

The tests would also provide feedback to the manufacturers of agricultural implements on necessary improvements in design and construction. This is important, as many manufacturers in Zambia (and other African countries) have only recently started producing agricultural implements and have limited agricultural engineering expertise available.

Need for standard procedures

If obligatory tests are to play a decisive role in determining which implements should and/or should not be available, they should be widely accepted as reliable and thorough. They also need to have the approval of the authorities that can implement the conclusions of the test reports. To obtain such acceptance, the results should be presented in detail according to a standard format. This will assist the authorities, manufacturers and prospective buyers to ascertain whether tests have been conducted satisfactorily. There should be separate, defined test procedures and report format for each category of implements. Such standard procedures will make testing at stations in different regions comparable. This could facilitate the international exchange of test results and so save considerable resources. At present much time is spent testing implements that have already failed tests elsewhere.

Organizational structures

If implements fail the tests, they should be refused an import licence if they originate from abroad. In the case of locally manufactured implements, sales should be prohibited. This implies that the testing organization must have a close relationship with the authorities that would enforce these measures. Therefore testing of animal-drawn agricultural implements should be the responsibility of the Min-

istry of Agriculture. Should implements prove unsuitable, this ministry could contact other government authorities to take appropriate action to discourage or prevent the distribution of failed implements.

Recent developments in Zambia

Policy and co-ordination

At present Zambia's official testing centre is based at Magoye Regional Research Station. The centre is part of the Research Branch of the Ministry of Agriculture and Water Development but is technically responsible to the Agricultural Engineering Section of the Extension Branch of this Ministry. The Agricultural Engineering Technical Committee (AETC) deals with all topics concerning agricultural engineering. The Committee is made up of the research and extension branches of the Ministry, the University of Zambia, Zambian manufacturers of animal-drawn implements, the Zambian Bureau of Standards, the Farm Machinery Research Unit and the Animal Draft Power Research and Development Project. This Committee is developing a procedure for granting certificates and seals of approval for farm equipment found to be suitable for use in Zambia.

Equipment testing authorities

The Farm Machinery Research Unit (FMRU) presently conducts tests of tractors and their implements, hand tools and hand-powered equipment. This Unit has been testing agricultural machinery since 1971 and until recently was also responsible for animal-drawn equipment. Manufacturers and importers of agricultural equipment have not been obliged to send their products for testing. Furthermore, the FMRU has not had the authority nor the contacts to prohibit sales or importation of machinery that failed the tests. Nevertheless, although testing facilities were limited, manufacturers generally accepted the results and suggestions for possible alterations. Most equipment that failed tests was not put on the market.

Since the Animal Draft Power Research and Development Project (ADPRDP) was established in Magoye at the end of 1987, it has been responsible for testing animal-drawn implements and ox carts. A wide range of testing and measuring equipment has been installed for this purpose. Recently, draft standard test procedures for ox-drawn tillage implements and carts have been formulated by FMRU and ADPRDP and accepted by AETC's Standards Subcommittee. The proposed standard test procedures and recording formats are being written in detail and will be sent for comments to Bureaux of Standards in eastern, central and southern Africa. Contacts are presently being established with the Ministry of Finance and the Ministry of Commerce and Industry in order to make the official Zambian Standard tests obligatory, and the test conclusions binding, once they are approved.

Test procedures

The proposed Zambian Standard test procedures for animal-drawn tillage implements and carts were based on two main sources: the recommendations of the Second Regional Workshop on Farm Machinery Testing Procedures held in Malawi in 1982 (Commonwealth Secretariat, 1982) and the Test Code and Procedure for Plows of the Regional Network for Agricultural Machinery (RNAM, 1983). The proposed Zambian Standard procedures consist of three successive parts:

- an initial trial period, covering laboratory and workshop testing of construction-quality and field trials for a total of one hectare for field implements or five hours on a test track in case of ox carts;
- on-station durability trial, involving the use of the implement for a total of 10 hectares or 60 hours fully loaded on test track for carts;
- on-farm acceptability and durability trials; over 10 hectares (or for 6 months use for carts) on various farms in the three agro-climatic zones of the country.

Interim reports are to be produced after every part; if an implement fails one part, the remainder of the test is abandoned and the implement is rejected. The first two trials will mainly serve to test the implement's performance and suitability under local and simulated farmers' conditions. Strength of construction (e.g. bending and impact test) and resistance to wear (hardness test, abrasion test) of various parts will be determined in a laboratory and workshop. Performance (depth and width of work, draft requirements, work rates, ease of operation, mechanical behaviour, wear) and quality of work (penetration, inversion, crumbling, weed control, scouring) will be determined during field tests. Some of these data can be accurately and objectively measured (hardness, draft requirement) with the help of instruments and need certain criteria to which the results should comply. Information on the ease of operation and scouring can only be observed subjectively and so will depend to a large extent on the knowledge and experience of the testers.

The aim of the final stage will be the evaluation of the implement and its operations in relation to existing farming systems (which can vary from zone to zone). It will include factors like alleviation of labour peak demands, timeliness of operation, effects on soil and water conservation and suitability for rural maintenance and repair. As this information will mainly be gathered through questionnaires, assessment of the results will again require extensive experience.

Conclusions

If conducted well by an influential and recognized organization, standard-procedure testing of animal-drawn implements can serve the following objectives:

- it will provide information to the farmers to help them acquire implements suited to their situations. It should increase their trust in "improved technologies";
- the feedback of test results to manufacturers will assist them in the development

of appropriate and reliable equipment that can contribute to a more effective and efficient use of animal traction;

- standardization will give test results value to other countries within and outside the region. As international exchange of test results improves, funds and time will be saved by preventing unnecessary repetition of tests. Local tests can concentrate on implements proven successful elsewhere.

In this way standardized testing will lead to an increase in the profitability of the use of animal draft power in African agriculture.

Résumé

Pour prévoir les performances des équipements de culture attelée et ainsi éviter que les fermiers reçoivent des équipements inadaptés ou d'une fiabilité incertaine, les matériels nouveaux devraient être rigoureusement testés dans des conditions contrôlées avant leur introduction dans les fermes. Pour que des tests obligatoires jouent un rôle déterminant lors de la sélection des équipements, ils devraient être approuvés par les autorités chargées de leurs applications, une fois leur fiabilité et leur intégrité établies. Pour cela, les procédures des tests et leurs résultats doivent être normalisés avec précision.

Les tests normalisés conduits par des institutions officielles contribueront à augmenter la rentabilité de la traction animale. Les fermiers pourront obtenir des équipements adaptés à leurs besoins, stimulant ainsi la diffusion de technologies plus avancées. Les fabricants pourront tenir compte des recommandations des utilisateurs. La normalisation facilitera les échanges internationaux des résultats des tests.

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