

## NECESSITY OF AGRICULTURAL MACHINERY TESTING CENTERS TO PROMOTE FARM MECHANIZATION IN PAKISTAN

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Need of Farm Mechanization for Agricultural Production in Pakistan cannot be over emphasized. The critical features of agricultural equipment that help to perform different field operations precisely in different regions of Pakistan also pertinent to understand. Standards for testing and evaluation of farm machinery are needed to be adapted and adopted for better understanding about machine life and performance. The main focus of the study was to regulate local agricultural industry in Pakistan. Furthermore, it will also assist in improving quality of locally developed agricultural machinery and to assist the farmers in selection and purchase of locally developed agricultural machinery. Results generated from standard testing are needed. The agricultural productivity in Pakistan can be enhanced significantly with promotion of farm mechanization specifically developed to work in local agro ecological environment of Pakistan. Therefore, modern testing evaluation and certification centers with a well-organized structure and research based data to ensure efficiency and impact in improvement of farm mechanization in country would be required to test and evaluate locally developed agricultural machinery.

**Keywords:** Farm Machinery, Standard Testing, Mechanization, Farm Income

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### INTRODUCTION

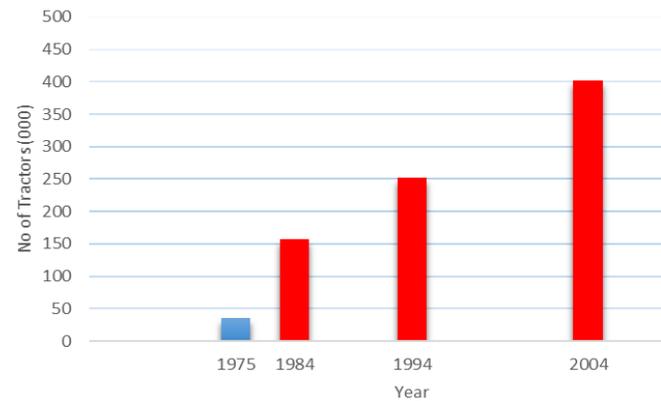
Food demand of world population is increasing day by day, to deal with demand of food different approaches are being adopted for agricultural production one of them is the farm mechanization. Different technologies like hydrological technologies which may include tubewell, high efficiency irrigation system etc. chemical technologies which include plant protection measures, mechanical technologies which may include tractors and tractor driven agricultural implements, electrical and anatomical seed measuring system threshers, bulldozers etc. are included in farm mechanization (Naresh *et al.*, 2012). In different situations different terms have been suggested for this substitution of mechanical power. These terms include Tractorization, appropriate technology, selective mechanization or mechanization (FAO 1980). Tillage is a major operation which is carried out by mechanical power in field (Ahaneku *et al.*, 2011). Agricultural tillage involves cutting, inversion and pulverization of soil and these operations demand high energy. This high demand of energy is not only due to movement of large amount of soil mass but also due to inappropriate methods of transferring energy to the soil. Pulling of tillage tool through soil is most popular method in the world for transferring of energy into soil. Tractor is a major source of energy in field to carry out different field operations. Main purpose of tractor is to provide drawbar power, therefore frequently used power outlet of tractor is drawbar (Ahaneku

*et al.*, 2011). Primary measure for the effectiveness of tractor is its ability to provide draft for pulling of different types of implements (Kathirvel *et al.*, 2011). Draw bar is the product of pull and speed of travel and drawbar work is achieved by drive wheel to transport tractor or agricultural implement through soil. So, ideal tractor transfers fuel energy into valuable work at drawbar. In actual practices there is a loss potential energy during conversion of chemical energy to mechanical energy, alongwith losses from engine of tractor through drive train and lastly through tractive device (Zoz and Grisso, 2003). Large amount of available tractor energy is wasted at soil-tractive device interface. this wasted energy wears out the tires and increases soil compaction that may damage crop production (Burr *et al.*, 1982; Baloch *et al.*, 1991). Similarly, selection of size of tractor and appropriate implement is also an important factor. Wrong selection of size of tractor can be expensive, because very small size tractor can take more time to complete the task, can cause excessive delays and pre-mature replacement, on other hand very large tractor requires excessive operating and over-head cost (Summer and Williams. 2007). A tractor can perform its work timely, efficiently and at lowest possible rates with best matching equipment. Selection of appropriate equipment and size of tractor to carryout different farming operations depends upon size of farm, labor availability, cropping pattern and type of operation (Ahaneku *et al.*, 2011). Size of tractor increases with increase in the size of farm, excessive labor requirement may permit one tractor holder to hire a number

of operators to ensure the working of tractor for extended period during peak season. It means tractor should undergo different tests in-order to avoid from breakdowns during peak season. For selection of best match of tractor and implement, information about type and size of tractor and implement and nature of operation to perform is needed (Ahaneku *et al.*, 2011). Draft requirement changes with speed and depth of operation and type of soil. So for a perfect matching of tractor and implement, there is need of actual field data along with other factors. Determination of tractor performance in field requires complex apparatus therefore few methods were developed for testing of tractors in order to forecast performance of tractor (Ozarlsan and Erdogan, 1996). Rate of adaptation of latest 4-Wheel Drive tractors is also low and only farmers decided to purchase new tractor by keeping in view the field performance of already existing tractors. In agricultural mechanization different field machines like tractors constitute a major part of crop production and proper operation of these machines is necessary to make agriculture profitable. Due to this performance test data of tractors and other agricultural equipment under different conditions is important for manufacturers and farmers (Al-Suhaibani *et al.*, 2010). Agricultural production in Pakistan is low as compared to other advanced countries this is due to non-availability of agricultural machinery and equipment at right time, mismatching of agricultural machinery and implement in field, lack of appropriate operation and maintenance, economic condition of farmer to purchase appropriate machinery, poor quality of locally manufactured machinery and implements due to poor layout of local workshops (Devendra and Ganesh, 2008). In Pakistan most of agricultural machinery is imported and the imported machinery is not designed to operate in the agro-ecological conditions of Pakistan, in simple words these machines are imported with-out any specific standardized testing and evaluation. In addition to that locally manufactured agricultural machinery in Pakistan is also of substandard quality and unsafe to operate in field and also leads the farmer to bear financial and time losses. Government of Pakistan has established National Agriculture Research Center (NARC) at Federal Level in Islamabad and Government of Punjab has established Agricultural Mechanization Research Institute (AMRI), Multan at province level to enhance mechanization level through research and trainings. NARC and AMRI both are in existence for a number of years and doing their efforts to increase mechanization level in Pakistan but still have limited impact on mechanization development due to several issues including lack standardization of agricultural machinery, limited infrastructure, poor quality of locally manufactured agricultural implements, lack sound agricultural mechanization strategies, limited facilities etc. This papers discuss the requirement of local Testing Evaluation and Certification Centers for Agricultural Machinery in Pakistan to increase farm mechanization level

in the country and to protect the farmer from economic and time losses. These centers should be established to create institutional and market environment in which farmers and other end users have choice of farm power and equipment suited to their need with a sustainable delivery and support system. Results generated from standard testing and evaluation of equipment in these centers will be used to guide local agricultural machinery manufacturers to improve the quality of implements and guide the farmers in selection and proper use of agricultural implements.

**Testing Evaluation and Certification of Agricultural Machinery in Pakistan:** In Pakistan farm mechanization is an important ingredient of strategy to enhance growth rate of agriculture sector and it is limited to tractorization with cultivators only fig. 1 shows the population of tractors in Pakistan (GOP 2004).



**Figure 1. Number of Tractors in Pakistan**

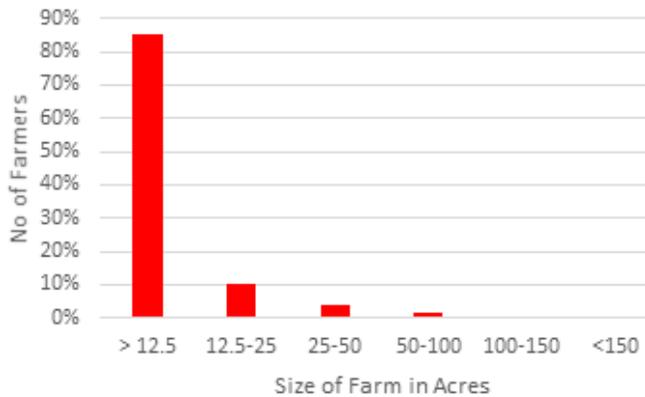
Due to poor use of technology in agriculture sector, Pakistan is facing the problem of crop-yield gap and average yield production in Pakistan is 50-83 % lower than average yield of other countries that use latest technologies in their agriculture (Khan *et al.*, 2011; Tewari *et al.*, 2012). Main constraints in enhancing agricultural production are non-availability of agricultural machinery the farmers at right time and at affordable price. Available horse power (hp) in Pakistan is around 0.9 against required horse power of 1.4 per hectare as per FAO recommendations (FAO 2004). In Pakistan locally manufactured agricultural machinery and equipment lack of standardization and quality due to poor layout of workshops, lack of managerial and technical skills, poor design and improper manufacturing techniques and non-availability of standards and their enforcement. Pakistan is also a member country of Asia Pacific Network for Testing of Agricultural Machinery (ANTAM). ANTAM is working to ensure sustainability and quality of agricultural machinery in Asia Pacific region through harmonization of standards and testing codes of agricultural machinery. China, India, Sri Lanka, Philippine etc. are also member countries of ANTAM and all

these countries are equipped with latest agricultural machinery testing and evaluation countries to test farm machinery under their local conditions table 1 shows the number of testing facilities in member countries of ANTAM. In Pakistan AMRI Multan and NARC Islamabad are established to conduct testing and evaluation of agricultural machinery but due to lack of proper testing labs, testing and evaluation is limited to field testing only.

**Table 1. Agricultural Machinery Testing Centers in Members Countries of ANTAM.**

Sr. No.	Country	Number of Centers (Nos.)
1	China	35
2	India	34
3	Sri Lanka	01
4	Philippine	01

**Major Challenges of Agricultural Mechanization in Pakistan:** In Pakistan mostly farmers are small landholders scale having land less than 12 acres with low crop production due their dependence on conventional and substandard agricultural machinery developed locally because local manufacturing sector is not equipped with latest machinery testing and evaluation facilities, lack of technical knowledge and entrepreneurial skills and have poor after sales network, figure 2 shows the land ownership pattern in Pakistan (GOP 2013).



**Figure 2. Land Ownership Pattern**

In Pakistan, government is trying to enhance agricultural mechanization by introducing different development programs including provision of agricultural equipment and tractors to the farmers on cost sharing basis, establishment of hi-tech mechanization service centers to provides hi-tech machinery to the farmers on rental basis, but still government had not developed any testing, evaluation and certification facility for local manufacturers and do not force the manufacturers to adopt standards of agricultural machinery. Therefore, there is a need of improvement in the area of manufacturing of agricultural machinery, capacity building

and infrastructure strengthening in Pakistan. Selection of appropriate machinery for different field operations is also a big challenge in Pakistan, selection of farm machinery should be appropriate and based on agro-ecological conditions of Pakistan. Another major issue for agricultural mechanization in Pakistan is poor machinery management techniques, expensive repair and maintenance and inadequate enabling environment.

**Role of National Agriculture Research Center (NARC):** Government of Pakistan has established National Agricultural Research Center (NARC) in Islamabad in 1984. NARC is working at federal level and conducted several researches to enhance crop production in Pakistan. In this study testing and evaluation for farm machinery referred to organized determination of performance of agricultural machinery. For this purpose, NARC has established a separate institute named “Agricultural Engineering Institute”. This institute working on prototype development and fabrication of agricultural machinery, testing and instrumentation of agricultural machinery and designing of agricultural machinery.

**Role of Agricultural Mechanization Research Institute (AMRI):** By keeping in view the need of farm mechanization Government of Punjab, Pakistan has established Agricultural Mechanization Research Institute (AMRI) in Multan. AMRI has three sections in Multan, named “Fabrication and Workshop”, “Test and Trial” and “Design and Development” and also have its sub-station in Faisalabad. In past AMRI has launched several programs to promote farm mechanization in Punjab, Pakistan. Currently AMRI is also working on development of Standards of Agricultural Machinery and same will be got approved Pakistan Standards and Quality Control Authority (PSQCA). AMRI Multan has a mandate to design, develop, test, evaluate and report on existing farm machinery, and to provide assistance to manufacturers in the development of new farm machinery. Reliability in testing depends on instrumentation, sensors and data-acquisition system adopted for measuring the performance of equipment. Currently, AMRI has limited infrastructure as well as capacity for testing and evaluation of agricultural machinery as per international standards.

**Important Tests Needed for Agricultural Machinery:** Testing and evaluation of agricultural machinery requires the understanding of environmental conditions of the area to understand the required specifications of agricultural equipment, critical components of equipment for efficient operation under local conditions and type of testing to measures reliability, performance and suitability of critical components of equipment. For these understanding different types of tests are needed including soil tests and material tests like compaction test of soil, tensile, hardness, brittleness etc. tests of material to be used for agricultural equipment. There are a lot of reasons to perform these tests on agricultural machinery which are summarized below.

1. Evaluation of equipment for improvement and capability assessment.
2. To generate a consistent data on efficient performance of agricultural machinery manufactured locally.
3. For Decision makers in rural credit banks that extend credit lines to small scale producers
4. To create user awareness for selection of machinery.
5. For institutions working on promotion of farm mechanization.

**Need for Establishment of Testing Labs:** Agriculture of Pakistan requires standardized agricultural machinery to enhance agricultural production. No doubt Government of Pakistan trying its best to promote farm mechanization by introducing different programs but problem of sub-standard machinery also required attention of government. There is a need for establishment of new testing, evaluation and certification centers for agricultural machinery and strengthening of NARC and AMRI to overcome this problem of sub-standard machinery in the country.

**Conclusion and Recommendations:** Currently agricultural mechanization is not very successful in Pakistan, but there is a potential for government to promote farm mechanization to enhance agricultural productivity by making sound policies. Without sound strategies there is risk of repetition of earlier mistakes. Establishment of testing and evaluation facilities with proper funding can help to over-come the previous mistakes and also promote research and development to help the manufacturers and farmers of Pakistan. Collaborations with testing labs in other countries for staff training and acquisition of equipment will also help in long run for improvement of testing in research and development. Result generated from these testing centers can be used for further improvement of locally developed agricultural machinery and equipment which will not only strong the farmers financially but also contribute to the economics of Pakistan.

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