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Current status and adoption of mechanized agriculture in Pakistan- A review

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Abstract

Presently about 0.94 million of tractors are working in Pakistan, offering a farm power of about 0.84hp/acre. Domestic tractor unit manufacturing in Pakistan risen nearly 14.6 percent during the 2017-18 fiscal year. Production increased to 63,054 tractor units by 19.6 percent compared to last year's 54,992 units, with additional 901 thousand of chisel ploughs and 108 thousand mould board plough while tillage operation for soil bed planning is the only procedure that is nearly 100 percent mechanized in the country for almost all crops. The planting and spraying equipment industry has risen from 70 and 21 thousand in 2004 to 295 and 1438 thousand in 2014 respectively. Thresher market in Pakistan is estimated at 20,000-30,000 units per annum through sales resulting in nearly 100 percent mechanized cereal crop threshing operation. The average crop yield can be improved by raising the available horse power per hectare and adequate managing of agricultural machinery. It is concluded from the review of different survey and research conducted on farm mechanization that optimum level of mechanized agriculture is attained as per FAO optimum farm power requirement per unit area for crop production. However, it is still less than many developed and developing countries that's why yield is also two to four times less than Japan, Europe, Canada, USA, etc. In Pakistan Tractors are commonly used in industry, building and road construction not contributing agriculture. To increase yield per unit area proper used of tractor with farm equipment should made compulsory.

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Introduction

Pakistan is a country with per capita low income. Because of its primary dedication to supplying healthy food to the fast-growing population, agriculture is its most significant industry. Appropriate mechanization strategy should be developed and adapted to boost land productivity by keeping in mind previous farm mechanization trends in the state. This article will summarize the country's mechanization level information and aim to highlight the weak areas in the field. Farm management is a key component of modern farm mechanization. Although the tractor is one of the major power sources available on the farm level, the draft animals, farm workers, small-scale diesel engines and electric motors are used as a source of power in agriculture in the country (Iqbal *et al.*, 2015).

Pakistan's economic growth is strongly linked to agriculture. Agriculture accounts for 21% of gross counteryal product (GDP) and 80% of total export income for all other agro-based goods (Majeed and Saifullah, 2014). Mechanical, biological, hydrological and chemical inputs affect agricultural productivity. In terms of farm mechanization, the contribution of mechanical inputs in agriculture is regarded (Yamin *et al.*, 2010). Farm mechanization plays a crucial role in optimizing the use of biological, hydrological and chemical inputs. Farm mechanization in Pakistan began in the early fifties in the form of private tube wells to use mechanical power to pump ground water for irrigation purposes (Chaudhary & Hussain, 1986). Initially, however, owing to their analphabetism and rigidity for using standard techniques, a big proportion of farmers were reluctant to adopt the farm equipment (Yamin *et al.*, 2011). But over time, farm mechanization has been shown to be useful in enhancing agricultural productivity by saving time, water, and other farm resources.

Unviability or shortage of agricultural machinery at the right time result in delaying farming operations, particularly with regard to plant seeding and harvesting (Tahir *et al.*, 2003a). Inefficient choice of agricultural machinery due to the low purchasing power of the farming community, the non-availability of standardized goods and their seasonal use are also responsible for the reduced productivity of the farmland of the county (Ahmad *et al.*, 2004). In addition, a limited number of repair and maintenance facilities across the country resulted in reduced life and low agricultural equipment quality (Tahir and Azeden, 2015).

Increase in productivity of the majority crop depend on intensification, adoption of new technology, a strong demand for land and access to land environmental challenges (Dethier and Effenberger, 2012). Labor and machinery can be replaced, but farm equipment is relatively accurate, has more power to complete farm operation on time, and is therefore preferred to replace labor. Mechanization has a significant impact on productivity, and its share of total productivity growth is about 11.7 percent (Liu and Wang, 2005). Efficiency in water use and management of irrigation needs to be improved for future agricultural development as well as further developments in farm mechanization, and the use of technology is essential to improving farm production in semi-arid regions with limited water supplies (Deng *et al.*, 2005).

Present status of farm mechanization

Pakistan is a country that generates low revenue. Because of its main dedication to offering good food to a rapidly increasing population, agriculture is the most significant industry. Appropriate mechanization approach should be created and tailored to enhance soil productivity by maintaining in mind past farm mechanization trends in the countery. This paper summarized the country's mechanization level data and attempted to highlight the field's weak regions (Iqbal *et al.*, 2015).

Tractor manufacturing industry

M/s Tractors Millat Ltd. Lahore and M/s tractors Al-Ghazi Ltd. Dera Ghazi Khan manufactures 8 tractor models ranging from 50 to 85 hp. Both businesses have well-established fabrication/assembly plants and distribution network as well as after-sales service across Punjab and Pakistan. M/s Millat Tractors Ltd. produces 45,000 units per year, while M/s Al-Ghazi Tractors Ltd. has installed a single shift capacity of

more than 30,000 tractors. In addition to these two main producers of tractors, few other companies also produce and market on a restricted scale locally assembled and imported tractors. According to the Punjab Development Statistics (2011-12), there are approximately 3.88 million acres of cultivable waste land that does not include rain-fed Thal and Potohar areas. Tractor mounted front blade and bulldozers are frequently used to develop cultivable waste land. Tractor mounted front blades are accessible through the private sector, while the public sector offers bulldozers for land development. Only by using crawler tractors/bulldozers can this cultivable waste land be created economically for agriculture. With the Punjab Agriculture Department, the current fleet of 338 bulldozers is inadequate to transform 3.88 million acres of crop-capable soil. It is estimated that it will take about 100 years to create the entire cultivable waste land with the current power of bulldozers Anonymous (2015).

Pakistan - Agricultural Machinery and Equipment

Year	2016	2017	2018	2019* (Estimated)
Total Local Production	229.70	248.07	1,190.73	1,200.85
Total Exports	38.30	40.00	42.50	41.00
Total Imports	153.20	165.45	177.03	168.17
Imports from the US	5.70	5.98	6.25	7.30
Total Market Size	344.80	373.52	1,325.26	1,328.02
Exchange Rates	102.77	104.77	124.50	152.34

Agriculture in Pakistan is the economy's main pillar and a primary source of income. The agricultural industry contributed 18.9% of the country's GDP during FY 2018-19 and employs 42.3% of the total workers. During the fiscal year 20118-19, the industry grew by 0.85% compared to last year's development of 3.8%. This decreasing trend in development is primarily ascribed to the macroeconomic position of the country as a whole and to inward pressure on the fiscal and commercial fronts. The total land area under cultivation is 79.6 million acres, which has risen 5.8 percent over the past year, according to the Pakistan Agriculture Machinery Census. The complete size of the agricultural machinery sector is around $1.3 billion, composed of a mixture of tractors, harvesters, and other small-scale agricultural machinery, according to industry sources.

According to the Pakistan Vision 2025 Economic Survey, food security is one of seven key fields for action. "Create a contemporary, effective and diverse agricultural industry that can guarantee a stable and sufficient supply of fundamental food supplies to the population of the country and provide quality products for export are among the top five goals for attaining food security. Providing contemporary agricultural machinery and equipment is critical to the plan of the government. There are five counterys providing more than 70% of the total imported agricultural machinery and equipment in terms of market share. These include the U.S., China, Japan, Italy, and Germany with around 30 percent market share in the U.S.

Machinery and Equipment

Pakistan's tractor unit countery manufacturing risen by almost 14.6 percent during the 2017-18 fiscal year. Production increased to 63,054 tractor units by 19.6 percent compared to last year's 54,992 units. Locally manufactured tractors are licensed with U.S., Belarus, Turkey, and China overseas businesses. The U.S. and EU exports used agricultural machinery to Pakistan, including harvesters, in addition to tractors. Domestic sector has the ability of native people to generate agricultural machinery and equipment to satisfy only 15% of the complete demands of the country. Over the next 4 to 5 years, production is anticipated to rise by 8 to 10 percent annually as local companies, driven by rising demand, gear their production and diversify their product lines. Most of the equipment manufactured locally is based on obsolete technology and low effectiveness. A broad range of more advanced machinery is imported, but farmers prefer locally produced replacement and spare components owing to the comparatively low price of home-made equipment. The Government of Pakistan has introduced several programs and incentives to modernize and expand current ability to better develop the agriculture sector at both the federal and provincial levels. These projects include farmers '

education programs and subsidized inputs for simple and long-term loan equipment. Moreover, the state provides low taxation programs on agricultural machinery through budget support programs to increase agricultural modernization.

For FY 2020, the most promising agricultural machinery export opportunities are tractors, combine harvesters, growers, cultivators, harrowers, subsoilers, rotators, broadcasters, seed drillers, fertilizer spreaders, transplants, drip irrigation systems, weight sorters, round balers, sprayers, irrigation pumps, diggers, etc. With 79.6 million acres of arable land, there is great potential with better equipment and machinery to improve efficiencies and productivity in the agricultural sector. Pakistan's government is committed to supporting this industry, hoping that Pakistan will be able to boost the returns and exports of fruit and vegetables, poultry and milk main crops and thus become a major provider to the region. To accomplish this goal, by providing low-interest funding, the government encourages investment. By setting up small to large-scale projects, both the government and private industries have or are in the process of taking advantage of these motivations. Local markets will continue to offer significant company possibilities for local and integral country businesses over the next several years, according to industry specialists. Pakistan Economic Survey, (2017-18).

Production sale of tractors may drop by 35 percent in FY18-19

Tractor production and sales are likely to decline by about 35 percent during FY 2018-19 owing to economic recession and sugarcane industry crisis, which has caused the hunger for money in the agricultural sector. As a result, industry insiders have disclosed two tractor assembly plants and 200 + tier 1 sales base shifting towards closure. Some 100,000 qualified employees are employed in this sector primarily in Lahore. Mumshad Ali, former chairman of the Pakistan Automotive Parts & Accessories Manufacturers Association (PAAPAM), told Business Recorder that this fall came after a powerful development in the last 2 years when the sector manufactured between 60 and 70,000 trucks annually Pakistan Economic Survey, (2017-18)..

He said this development came on the back of assistance for the agri industry and CPEC from the PML-N government. As CPEC projects are placed on hold and Rupee devalues leading to price increases, there has been an eminent fall in revenues. Sales of tractors are a useful measure of the health of the economy of the country in general and especially the agri-economy. Industry insiders think this financial year will end with revenues of less than 50,000 units compared to last financial year's 70,000 + revenues as investors take their cash out of this business to invest elsewhere. Tractor sales have 2 seasons per year and investors are required to buy tractors throughout the year to satisfy the demand surge following the harvesting of rabi and kharif crops and the income cycle of agri-economy. He said that in the previous tractor sector also faced a fall in demand for various reasons, such as GST imposition, withdrawal of tractor subsidy systems, news of fresh and old used tractor imports, commodity price crashes, floods, and crop failures. This boom and bust cycle is a major impediment to the volume and quality development of this industry. Due to the Pakistani tractor's cost, design and durability, the sector retains excellent potential for exports to Africa, Pakistan Economic Survey, (2017-18).

Kew role of tractor industry in the growth of agriculture sector

In promoting the agricultural sector and enhancing the domestic economy, the local tractor industry plays a strategic role. Over 250,000 individuals are involved in the manufacturing of tractors. Pakistan has been able to export tractors produced locally to Eastern European countries during the current year, including South Africa. After a critical five-year era, which saw sales fall by nearly 80%, the tractor sector shows signs of resurgence.

The share of the lion went to two major manufacturers, i.e. Massey Ferguson and Fiat, respectively selling 23,263 tractors and 14,776 tractors. The resurgence of the crop industry over the

past three years and the massive development of highway infrastructure under the China-Pakistan Economic Corridor (CPEC) are two main factors behind increasing revenues. The recovery of crops contributed 70 percent to the resurgence of revenues, the rest of which definitely came from the growth of infrastructure. Rice and sugar cane have assisted the tractor industry in particular in the crop sector.

In September 2015, a package of Rs340 billion had to be developed by the federal government after rice prices dropped to Rs700 per maund (40kg). The Punjab government also joined in a Rs200 billion package in April 2016. As a consequence, the rice crop recovered from 3.39 million tonnes to 3.5 million tonnes in Punjab alone, while prices rose by more than 100%. For sugar cane, over the past three years, the acreage has risen by nearly 25 percent to over 2 million acres. Yields also rose to 635 maunds from 550 maunds per acre. The recovery of saccharose increased by up to 10 percent compared to the previous 7 percent.

In addition to the current year when farmers have observed variable price crash rates, the past two years have been comparatively good for farmers financially. In the four-month crushing season, farmers purchase tractors whenever they can as they are the only way to transport cane to factories. When sales and manufacturing in the industry dropped 80% in 2016, the federal government reduced overall sales tax by 5%. Depending on the model and horsepower, this produced tractors cheaper by Rs32, 000 to Rs50, 000. For the effect of CPEC on the tractor sector, it is thought that the more than 1,800 kilometers long network of new main roads and the development of old ones at a price of more than $8 billion has helped the sector as never before. In Pakistan, due to the underuse of tractors, the sector has always experienced intrinsic issues due to the lack of tools for various agricultural operations. The sector now expects manufacturing in the coming years to reach 80,000 units. The tractor sector is striving to revive from the negative tax effect, as the current manufacturing numbers of 53,975 units are still behind the pre-tax numbers of 70,770 units attained years earlier. Stakeholders in the sector said taxation not only overturned the momentum but also lost the development that had already been attained.

In the past, Sindh's government was severely criticized for implementing tractor systems that lacked transparency. It was then PAMA's complaint about irregularities in Sindh Tractor Scheme; only 6200 units were assigned by the Sindh government to be split equally among all local manufacturers just to silence the protesting firms.

GDP development does not currently equalize with the rapidly increasing population. Poverty levels are growing day by day, and Pakistan is ranked 146th over per capita income in the globe. To generate employment and guarantee food security, the enhanced development of both the agricultural and industrial sectors needs the hour. In this aspect, all stakeholders, especially the government, need to review the position of the local tractor sector and further enhance its efficiency China-Pakistan Economic Corridor (CPEC), (2018).

No doubt the industry's performance has been quite satisfactory

Over a period of five decades, self-reliance in the manufacturing of indigenous tractors was accomplished through a very lengthy process. Tractor industry has a distinctive position in the automotive sector as it has played a fundamental part in transferring technology and transforming the fledging local light engineering industry into a solid, quality-conscious automotive sales industry comprising over 250 units. Besides being useful to the local tractor industry, these suppliers are also essential for the automotive industry as a whole and even for Pakistan's defense industry.

Tractors manufactured in Pakistan are the world's cheapest. The present cost of Pakistan's competitive tractor designs is $130/hp, compared to the $200/hp Indian, China's 150/hp, and Japan's $900/hp. The sector has also diversified its company for other products, including Prime Movers, Diesel Generating Sets, Forklift Trucks and Agri-Implements, based on its key strengths.

New initiatives are also underway to tackle evolving requirements such as Combine Harvesters, Fodder Harvesters, Bio-mass handling balers, Green motors for global markets and future compliance with local emission norms, creation of fresh 100 hp and above tractor designs, etc.

In the agricultural sector, there are some new business avenues that have tremendous economic potential and can be grasped by mechanization. After the implementation of Fodder Silage technology, the dairy industry becomes more feasible.

Exports of grasses and fodders to the Gulf countries are rising, and bio-mass waste (straw, cotton sticks, etc.) generates income for farmers as a fuel for generating electricity. These fresh avenues are still in their early stages and need both private and public sector assistance. To offer economical alternatives and materials, the local tractor sector has the technical and economic muscles for R & D in these fields.

It will not be feasible to guarantee a favorable investment climate without public policy assistance. Non-friendly public policies have adversely affected the industry's pace of advancement towards higher diversification and technical improvement, e.g. the importation of CBU tractors at zero duty until recently, while the importation of second-hand combine harvesters is still permitted, hampering the industry's investment opportunities in this sector China-Pakistan Economic Corridor (CPEC), (2018).

Mechanization of plant protection

Weeds are the major produce limiting factor that absorbs plant nutrients, competes with crops, port illnesses, insects, and delays harvesting (Kinsman, 1993). Efficacy of applied agrochemicals depends largely on the structure of the spray, droplet size, fluid velocity and characteristics of the trained air (Miller and Ellis 2000). It was recorded that the chemical implementation effectiveness in Pakistan was only 50% and was ascribed to the use of bad quality spray equipment (Ejaz *et al.*, 2004). Weeds are currently being controlled mechanically and chemically throughout the country. Intercultural instruments such as bar harrows and rigid tine growers are most frequently used for seed plants on flat beds (Safdar *et al.*, 2011).

Generally, pressure control system (control flow valve) is not mounted in locally manufactured sprayers because the pressure at the tip of the nozzle does not stay uniform, resulting in non-uniform implementation again (Tahir *et al.*, 2003b).

Mechanization for harvesting and threshing

Cereal harvesting in Pakistan is a significant issue as long as this procedure remains largely by hand (Tahir *et al.*, 2003a). Also used to a higher extent are tractor mounted reaper windrowers and combine harvesters. It has been estimated that crop losses due to delayed harvesting as well as the use of improper harvesting machines for corn, rice and other oilseed plants are around 10%-15% (Ali and Khalid, 2015). Rice harvesting made from wheat combines excessive loss of grain and decreased recovery of rice. This also leads to enhanced breakage of grain during milling (Sheik *et al.*, 2003).

Wheat threshing is now almost completely mechanized in Pakistan (Tahir *et al.*, 2003a). Wheat threshing is mostly performed using stationary threshers powered by tractor PTO, motor or electric engines. While high throughput capability, the commercially manufactured wheat threshers are heavy in weight and therefore expensive, energy inefficient, ergonomically unsafe (Ahmad *et al.*, 2013). In the country, chickpea is generally threshed with little modification in the wheat thresher and with adequate sieves. This threshing mechanism, however, decreases general product marketability (Peksen *et al.*, 2013).

The stationary threshold installed by the tractor rises from 137 thousand in 2004 to 353 thousand in 2014 (GOP, 2015). Combine harvester development is quite slow and has grown over the past ten years from 3 thousand to 29 thousand. This slow development is due to the elevated machine price and comparatively small farm size making it inexpensive for tiny local landowners (Tahir *et al.*, 2003a).

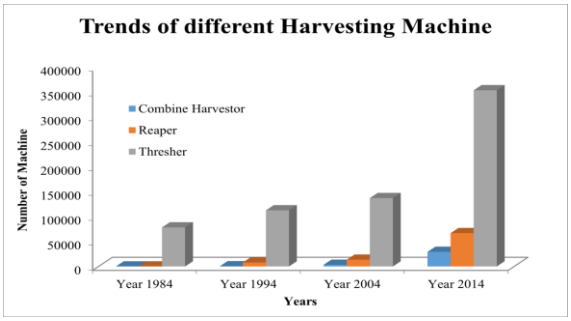

Fig. 1. Growth of harvesters (GOP, 2015).

Fertilizer application machinery

According to field studies undertaken by the Adaptive Research Farms and AARI, the effectiveness of fertilizer use is about 50% due to improper application (broadcast) machinery and facilities. In Punjab, base fertilizers are usually implemented by manually transmitted broadcasting or by a tractor-mounted fertilizer transmitter. During sowing, fertilizers are mostly applied through exercises and plants, while subsequent dose in wheat is applied through manual broadcasting and in plants cultivated in rows is implemented using the fertilizer attachment supplied by the intercultural instrument. Some drills and planters provide for DAP fertilizer band positioning. Fertilization (application of fertilizers by irrigation water) is also used in drip irrigated plants. Some of the progressive farmers apply foliar fertilizers Census of Agriculture Machinery of Pakistan (2015).

Irrigation machinery

According to information supplied by the Water Management Wing, water consumption efficiency (WUE) in Pakistan is the lowest in the world (10% of China in wheat and 5% of Philippines in rice). Tube wells are used for irrigation purposes where irrigation of the canal is either not accessible or where it is inadequate, tube wells are used to supplement supplies of the canal. In riverine areas where water table is within 30ft, centrifugal pumps are used to lift water, water lifting from depths of 30 to 100ft is used, turbine pumps are used and submersible pumps are frequently used to lift water from depths of 100 to 200ft. Some farmers use jack pumps in hilly regions that have the ability to lift water above 500ft. The centrifugal pumps have the smallest effectiveness while the highest is the same for jack pumps Agricultural Statics of Pakistan (2015).

Harvesting and post harvesting machinery for fruits and vegetables

Due to insufficient harvesting, handling and post-harvesting equipment, harvesting losses of fruit and vegetables were estimated at 40-45 percent. In order to minimize harvest losses, retain quality and boost shelf life, timely preparation for pre-harvesting should be made, which involves lining up enough workers, supplies (containers and packaging products) and ensuring that all instruments and harvesting machinery are accessible and in service. Fruit and vegetables harvesting is mostly performed manually using some kind of harvesting assistance such as clippers, ladders, scissors, knives, snipers and dryers.

On-farm processing is restricted to the extent to which fruits and vegetables are washed, cleaned and bagged and graded. In the processing plants, post-harvest grain processing is mostly performed while in the pack houses it is done in the event of fruits and vegetables. Post-harvest losses for grains have been estimated to be 10-15 percent, while the same for fruits and vegetables is 20-25 percent due to improper on-farm handling, transportation and use of insufficient post-harvest activities such as pre-cooling washing and drying, sorting, grading, disease / insect therapy, protective coating, packaging and storage Agricultural Statics of Pakistan (2015).

Proposed agricultural mechanization strategies

An agricultural mechanization plan (AMS) should generate a policy, according to the FAO (1997), in which farmers and other stakeholders can choose the right farm energy and facilities for their requirements. The suggested approach may also promote the import and domestic production of instruments, equipment and machinery, their repair and maintenance, appropriate training and extension programs, and the advancement of funding mechanisms for the acquisition of farm energy and associated machinery and equipment Census of Agriculture Machinery (2015).

Zone wise agricultural machines/implements for crop production

Much of the food cultivated on farms is never past the farm door, contributing to food insecurity. Estimates of post-harvest fruit and vegetable losses in Pakistan as a result of mishandling, spoilage and infestation with pests are nearly 35 percent, suggesting that one third of what is produced never reaches the consumer for whom it was cultivated, and that the effort and money needed to generate it is lost forever. Fruit, vegetables, and root plants are rapidly perishable, and unless care is taken in post-harvest operations such as handling, grading, processing, packaging, and transportation, they will soon decline and become unsuitable for human use. Mangoes, dates, tomatoes, bananas, chilies and onion manufacturing losses are sometimes estimated to be as big as 50%. Post-harvest losses in cereals were similarly reported at 15-20 percent as large as 20 percent. More than 6.5 million families are engaged in livestock farming, composed of 30-35 million individuals. It complements farm income in rural regions by turning crop residues, by-products of agriculture and waste into milk, meat, wool, hair, etc. In Pakistan and Punjab there are 72 million and 39 million livestock respectively. In poultry farms across the country there are about 785 million birds. Meat availability per capita is 12kg, mostly from buffalo and bovine animals. Pakistan's meat sector works informally from animal husbandry to meat selling. Animal traders are buying livestock from rural regions and selling them to urban animal markets. Butchers buy and kill these cattle in the slaughterhouses from the animal markets. Butchers operate as meat traders in rural and urban regions and dominate the meat market. In general, the animals sold in these markets are animals that are sick and culled. Butchers/traders prefer these inexpensive animals to be purchased. Appropriate use of post-harvest techniques, including dairy processing and animal slaughtering, will minimize post-harvest losses, boost farm products ' market value, quality and food value, and thus assist to solve food safety problems. Modern post-harvest technologies that are widely used in developed countries cannot be rapidly implemented in Pakistan as they are advanced, costly and too big for Pakistan's small-scale farming systems. In addition, some small-scale machinery companies are too costly for a developing country like Pakistan in countery like Europe and Japan Census of Agriculture Machinery (2015).

Wheat Straw Chopper

Wheat is Pakistan's people's staple food. During 2013, wheat was grown on 8.7m ha. Wheat crops add 10.1 percent to the value added in agriculture and 2.2 percent to the Gross Domestic Product (GoP a, 2013). Wheat is grown in various crop schemes such as cotton wheat, rice wheat, sugarcane wheat, maize wheat and fallow wheat cotton wheat and rice wheat systems contribute approximately 60 percent of the country's total wheat region (Farooq *et al.*, 2007). In Pakistan, wheat harvesting begins in the south from early March and continues in the northern areas of the countery until the end of July. Wheat crop harvesting takes place when the crop reaches maturity and the grain has a moisture content of 14-20 percent (Pioneer, 2013).

Because of early monsoon rains, not only can a substantial quantity of grains and chaff be wasted, resulting in general low yield, but it also delays the seeding of the next crop. Combine harvesters are now gaining considerable recognition in Pakistan for timely wheat harvesting and replacing standard techniques of wheat harvesting and threshing (Zafar *et al.*, 2002).

Now, in the Punjab rice-wheat and cotton wheat cropping schemes a big amount of locally developed wheat straw choppers are in service. In a single action, the machine conducts activities of cutting, picking, threshing and blowing. During field operation, a number of issues were encountered in the early versions of this machine connected with its gear box, cutter bar, crank shaft and safety mechanism. In order to enhance its efficiency, various changes were integrated in the machine. Wheat straw chopper's enhanced variants are now more reliable and have better field efficiency. While the wheat straw chopper has been adopted for many years in Pakistan, this technology's field performance has not been carefully assessed and reported for future reference in

any scientific paper (Rehman *et al*., 2011). The aim of this research was to assess the efficiency of an enhanced version of wheat straw chopper in Southern Punjab's combined-harvested wheat areas and to determine this machine's economics. Two test sites were chosen in Multan, the first site in a farmer's field close Adda Bund Bosan, while the second site was chosen in Bahauddin Zakariya University (BZU), Multan's study fields.

Wheat crop was collected on these locations using combine harvesters. The total area of straw harvesting using wheat straw chopper was 18ha (45 acres): first site 12ha (30 acres) and second site 6ha (15 acres). The first site's soil texture was sandy and the second site loamy. First site areas consisted of large limits within the field at 10-15m range. Second-site areas have ordinary 30mapart tiny limits. Five experiments were performed to evaluate the machine's efficiency (three first-site tests and two second-site tests). The test plot region varied between 0.39 and 0.61ha.

Conclusion

It is concluded from the review of different survey and research conducted on farm mechanization in Pakistan always emphasis to tractors only. Farm mechanization has therefore been wrongly conceived as tractorization. Consequently, the use of tractors has become popular among the farmers through owning or renting. So far, Pakistan has experienced only selective mechanization featuring easy and speed of operation previously done by men or bullocks. To increase yield per unit area proper used of tractor with farm equipment should made compulsory.

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