

FARM MECHANIZATION IN PAKISTAN

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Farm mechanization means performing farm operations with the help of a machine; be it a hand tool, animal drawn equipment, tractor drawn equipment, processing equipment, irrigation equipment or any other farm equipment. Transition from animal (animate) power to mechanical (inanimate) power in early twentieth century to operate different farm machines has revolutionized the farm production system. Farm mechanization aims to increase crop production by; timely sowing/harvesting crops, effectively using biological, chemical and hydrological inputs, bringing more land under cultivation and enhancing cropping intensity. Farm mechanization is a very vast field covering a whole range of farm equipment and power units which may be divided into two groups, that is, farm power and farm machinery. Though the actual farm operation is performed by an implement, but it cannot function unless powered by some power source whether animal, tractor or electric motor. Thus the machinery and power source are complementary to each other. The two should be properly integrated in any modern farm mechanization program.

1.1 HISTORICAL BACK GROUND

The use of mechanical power in Pakistan's agriculture first appeared in the early fifties in the form of private tubewells to tap groundwater for irrigation purposes. The progress of tubewell installation in the Fifties, however, was slow, as despite of a full decade (1959-69) of development, their number did not exceed 4200. After 1959-60, the pace of the development of private tubewells gained momentum and the recorded number of tubewells reached a figure of 25,000 by mid 1964. Following the advent of the seed-fertilizer revolution and the rapid increase of tubewells in subsequent years, introduction of tractors and tractor-tillage implements became inevitable as shown in Table 1.1 for mid sixties and onward.

Farm mechanization, initially encountered bitter opposition of planning and development bureaucrats, agricultural economists and national and international policy making agencies. The economists and bureaucrats were of the view that the farm machinery would displace farm labor and create unemployment problems. After the mid-Sixties, the fear of labor displacement proved to be a mere apprehension and tractorization made headway because of following three factors. Firstly, the tubewell technology and seed-fertilizer revolution was to double the labor requirement in agriculture, leading to unprecedented labor shortages during peak seasons. Secondly, the two developments also resulted in a considerable increase in cropping intensities, unattainable with the use of bullocks for cultivation. Finally, and as a consequence of the above developments, bullock's prices, wages, and opportunity costs of feeding bullocks rose tremendously. All these factors were sufficient to convince the farmers to adopt the use of tractors and related equipment in order to alleviate power constraint and to keep costs at a low level.

effectively and hence the crop yield per hectare is still 2-3 times lower compared with developed countries. Since, the mechanical technology is very expensive, therefore, the farmers could not afford to adopt mechanization completely. In addition to this most of the farming community was ignorant of the other agricultural machinery. This necessitates that efforts should be made both at the government level and private sector to introduce farm technology in its true sense. This can be accomplished by making necessary funds available to the farmers as well as the agencies willing to run custom-hire services. However, some difficulties may arise in running custom-hire services due to non-recovery of rents from the farmers. This problem can be overcome by providing necessary security by the government to such agencies through proper legislation as being practiced in the House Building Finance Corporation and Agricultural Development Bank of Pakistan. This is imperative for the reason that the far-flung areas deprived of such services, cannot raise good crops for want of adequate mechanical power. Furthermore, the farm size falls below 5 hectares for almost 75 % farms of the country. This clarifies that majority of the farmers cannot afford to buy/adopt expensive technology; therefore, the solution of the problem lies in popularizing and financing custom-hire service agencies. This practice has been carried on in most of the European countries. Keeping the above discussion in mind the following strategies are proposed for complete mechanization.

1. Agricultural Extension Department of the provinces can render a great help in introducing the tillage implements other than N.T. cultivator. This can be accomplished by appointing Assistant Agri. Engineers at Tehsil level, like Agronomist, Soil Scientist, Plant Protection Officer etc. in order to popularize the recommended tillage machinery.
2. Provincial Agricultural Engineering Departments should cooperate to demonstrate the recommended tillage implements by setting up demonstration plots at Union Council level. This would help the farmers in appreciating the use and benefits of recommended tillage practices and consequently adopt them.
3. Local design and development of seedbed preparation machines should be encouraged.
4. Farmers may be advised to select and purchase appropriate tillage implements and exchange them to mechanize their farms economically. This is absolutely necessary because an individual farmer cannot afford to have a series of implements.
5. Regular programs on tillage technology should be broadcasted on Radio and Television.
6. Private sector should be encouraged to establish Agri. Machinery workshops at markaz level. This will ensure the availability of adequate service to the farmers in terms of hiring agri. machinery on custom basis as well as repair facilities for the farmers owning agricultural machinery.

Past experience suggests that the extension departments of the public sector have failed to advertise and help in adoption of new technologies. Therefore, private sector should be encouraged to introduce new farm technologies.

Table 1.1 Number of tractors and other farm machines used for agriculture in 1975 and 1980.

Equipment	1968	1975	1980
Tubewells and Lift Pumps	83,702	155,784	205,440
Tractors	18,909	34,583	97,373
Threshers/Shellers	-	5,970	35,250
Tractor-driven blades	-	12,599	41,199
Tractor-driven drills	-	1,617	17,316
Self-operated sprayers	-	473	7,676
Hand-operated sprayers	-	-	36,233

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Initially, tractors were imported in limited numbers and their assembly and production remained a debatable issue until 1970. However, upon realizing the positive impact of mechanized farming, a Farm Mechanization Committee was set up by Govt. of Pakistan in 1970. The Committee assessed that the available power at farm was around 0.5 horsepower (hp) per acre while for optimum mechanization about 0.5 hp per acre tractor power was required. Now, on the part of tractors the power available per acre is 0.5 close to the target set for optimum mechanization and shows full adoption of tractors.

1.2 STATUS OF FARM MECHANIZATION

The liberal import, local assembly and manufacturing of tractors and farm equipment have now laid a good foundation for farm mechanization in Pakistan because emphasis had always been 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 ease and speed of operations previously done by man or bullocks. The most popular package consists of a tractor and a tine cultivator for tillage, seed drill for sowing, stationary thresher for threshing wheat and tubewells for irrigation. To evaluate the factors responsible for crop production there is need to compile the status of farm mechanization in the country.

1.2.1 Farm Power

Farm power is an essential component of modern farm mechanization programme. In Pakistan, tractors of 50 to 85 horsepower are working right now. But majority of them fall in 50 horsepower category. For 21.54 million hectares under cultivation Table 1.2 shows different sources of farm power and their contribution in Pakistan. According to

Table 1.6. Number of tubewells and lift pumps as per census years.

Administrative Unit/Province	Number of Tubewells and Lift Pumps		
	1975	1984	1994
Punjab	139224	214106	414188
Sindh	7995	9481	16236
NWFP	4915	9217	14365
Balochistan	3714	5186	9468

1.3 PROSPECTS OF FARM MECHANIZATION in Pakistan

The scope of farm mechanization in Pakistan is quite encouraging as the population of country is increasing very rapidly which would need food and fiber.

1. The irrigation water in Pakistan is becoming scarce. For efficient use of existing irrigation supplies and to control salinity, sprinkler and drip irrigation technologies should be adopted.
2. Tubewells in fresh water zones may be installed to supplement scarce irrigation water. In water logged areas tubewells may be used to control water table.
3. Mulch tillage, conservation tillage and minimum tillage may be used for areas where they suit in order to minimize energy, irrigation and drainage requirements.
4. Pakistan has adopted selective mechanization for few crops. Farm machinery is still needed to transplant/harvest rice, sow/harvest sugarcane, harvest and thresh maize, pick/harvest cotton, etc.
5. Thousands of acres of agricultural land have gone barren due to salinity and sodicity problems. Much of these lands can be brought back to cultivation by breaking up their sodic or hard pan, planting trees with pit digger or adopting strip tillage.
6. The cropping intensity of Pakistan is low as compared to many of its neighboring and developed countries. This may be increased by timely sowing and harvesting different crops. Combine harvesters should be used to minimize harvesting time of wheat, rice and other cereal crops.
7. Precision land leveling has proved to increase water application efficiency and crop production by about 15 to 20%. This is only possible through laser leveling technology.
8. Pakistan has about 24 million acres of culturable wasteland. The development of such land is only possible through heavy earth moving machinery.

1.4 FARM MECHANIZATION STRATEGIES

Since, the inception of mechanical technology in this country, tractor, narrow tine cultivator and stationary threshers are the only farm implement and equipment used in the country and they are also prevailing at large now. Needless to say the proper efforts have not been made in the past to introduce proper mechanical equipment to use tractor power

FAO, a range of 0.5 to 0.7 hp/ha (0.2 to 0.3 hp/acre) was considered an optimum requirement of power for crop production. Presently, the power available from tractors only is approximately 0.58 hp/ha, which shows that the farm mechanization has reached to its optimum state. But it is still less than many developed and developing countries. For example Japan has 12.3, USA 2.4, France 3.1, Germany 3.1, Italy 4.0 and India 2.5 hp/ha. Our yield is also two to four times less than Japan, Europe, Canada, USA, Taiwan, U.A.R., India, etc. This is because of the following reasons.

Table 1.2. ✓ Sources of farm power and their proportions

Power Source	HP Capacity	Population	HP available	HP/ha
Tractors	50	2,52,861	12.6×10^4	0.584
Work Animals	0.5	2×10^7	0.1×10^6	0.005
Human Labor	0.1	38.6×10^6	3.86×10^6	0.179
Tubewells	16.75	4,54,257	7.60×10^4	0.353
Total			24.16×10^4	1.121

Mechanization means the proper use of both the tractors and other farm equipment such as plows, drills, sprayers, harvesters, etc. Our crop yields are not up to their optimum level because of improper or very little use of farm implements/equipment.

The human and animal power is not as efficient as tractor and therefore, should not be mixed together.

Not all the tractors are working on the farms and hence not contributing towards agricultural production.

Tractor Population

Tractor is an efficient and versatile source of power at the farms. According to the Ministry of Agricultural Machinery, 1994 a total number of tractors in Pakistan have been recorded. In 1975, they were 35,714 while in 1984 their number increased to 1,57,310. At national level, the increase in the number of tractors from 1975 to 1984 was 341%, and 61% from 1984 to 1994. Tractors alone are providing about 0.58 hp/ha, which is considered optimum for mechanized agriculture in Pakistan. Table 1.3 shows the number of tractors in different provinces of Pakistan. According to the Table, about 83% of tractors are working in Punjab indicating that some effective policies should be implemented to increase tractor population in the other provinces of Pakistan. About 99.6% of tractors are owned by private sector and only 0.4% is owned by public sector.