

# COUNTRY REPORT: PAKISTAN

*Presented*

*at*

Third Session of Technical Advisory Committee (TAC) of the  
Asian and Pacific Centre for Agricultural Engineering and Machinery  
(APCAEM) held at  
Hanoi, Vietnam

*by*

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*13-14 December, 2004*

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## **1. Country Profile**

The Islamic Republic of Pakistan is an ancient civilization, although its political boundaries were drawn only a little over half a century ago when it gained independence on August 14, 1947. Initially comprising East and West Pakistan, separated by 1770 kilometers of India, its present territory since December 1971 is confined to the former West Wing which has a total area of 79.61 million hectares<sup>1</sup>. It mainly comprises of four provinces i.e. Balochistan, North West Frontier, the Punjab and Sindh (*Figure 1*). Pakistan lies between the longitudes of 23°30' and 36°45' North and between the longitudes of 61° and 75°31' East. This territory is a region of diversified relief, with mountains to the north and west, and arid and semi-arid expanses to the south and east. Down in the centre is a flat fertile plain, fed by the Indus and its tributaries. Beneath the northern part of this plain, hydrologist found a huge fresh water lake, equal in volume to ten times the annual discharge of the rivers flowing above. The Indus plain has the largest canal irrigation system in the world, making cultivation possible despite scanty and erratic rainfall and ranges of extreme temperature<sup>2</sup>.

Climatically Pakistan, located in the north of the tropic of cancer, possesses a great range of diversity, from some of the hottest in the world in the Jaccobabad and Sibbi districts to the snowy cold of Laddakh and Balochistan. In the plains, minimum temperature in the month of January varies from 4°C to 15°C and June/July from 25°C to 30°C. The maximum temperature in January varies from 17°C to 24°C and in June/July from 32°C to 45°C. Jaccobabad has even recorded an absolute maximum of 53°C. Pakistan suffers from a general deficiency of rainfall. In the plains rainfall varies from 127 mm in upper Sindh to 1250 mm in the Himalayan sub-mountain

areas. It usually takes place during July to September due to its monsoon origin.



Figure 1: Map of Pakistan

The population in Pakistan, since its inception in 1947 has more than quadrupled to 148.72 million on July 1, 2004 whilst the production of wheat, a staple food crop has increased only three fold<sup>3</sup>. The gap between food supply and demand requires great effort to increase agricultural production to ensure self-sufficiency in food commodities.

Despite movements of people from farms to cities, the country remains predominantly rural. Almost three fourths of the population lives in rural areas. The literacy rate in Pakistan which was estimated at 54 percent (66.25 percent male and 41.75 percent female) during 2004 is still behind other countries of the region<sup>1</sup>.

Pakistan's economy is characterized by: a predominance of agriculture; a strong industrial base with a large domestic market; and, an ample supply of skilled human resources. In general, Pakistan enjoys a well developed physical infrastructure and good communication facilities.

## **2. Agriculture**

Agriculture is the single largest sector and driving force of Pakistan economy. In 1947, agriculture was dominant sector of the country and contributed 53 percent of the gross domestic product (GDP). Its share in the GDP has fallen considerably since then, while the share of manufacturing, construction and services has risen. Although agriculture's share in the GDP has declined considerably between 1949-50 and 2003-2004, from 53 percent to 23.3 percent, it remains leading sector of the economy. Employment share of agriculture has declined by far less (from 66 percent to 42.1 percent) over the same period<sup>1</sup>.

Agriculture and agro-based products also account for about three-fourth of the total foreign exchange earnings from exports. They supply many of the major industries with raw materials and consume around one third of the industrial finished goods. In terms of contribution to national income, employment, markets for industry and supply of raw materials or products for export, agriculture remains the foundation

of Pakistan's economy<sup>1,4</sup>.

The total geographical area of Pakistan is 79.61 million hectares out of which Balochistan, North West Frontier, the Punjab and Sindh Provinces have 34.72, 10.17, 20.63 and 14.09 million hectares areas, respectively. **Table 1** gives the land utilization statistics of Pakistan. Pakistan's agriculture mainly depends on the canal irrigation system. Out of the total cultivated area of 22.11 million hectares, 18.09 million hectares are irrigated and the balance 4.02 million hectares are rainfed<sup>5</sup>.

Agricultural production is dominated by crop production. Wheat, rice, cotton and sugarcane are the principal crops. Wheat crop is grown in Rabi (winter) along with oilseeds, coarse grains and pulses. The most important Kharif (summer) crops are cotton and rice, depending upon the ecological zone. The busiest periods in farming occur between April and June, and October and November, when harvesting of the major crops overlaps with land preparation for the next crop. The power and labor constraints are felt most severely where water availability permits double cropping on the same land. The area, production and yield of the four major crops are given in **Table 2**. Over time, share of the cropped area accounted for various crops has changed (**Table 3**).

### **3. Agricultural Mechanization**

#### **3.1 Overview**

Agricultural mechanization is selective in Pakistan and only those operations are mechanized for which there is constraint of labor or power or a combination of both. The effects of mechanization are overall positive. It has not only increased on-farm income and labor productivity but also generated off-farm employment in manufacturing, supply/servicing of agricultural machinery, supply of other inputs and post-harvest handling of increased agricultural production<sup>6</sup>.

The most popular form of mechanization in Pakistan is; bulldozers, power rigs, tubewell and tractors with cultivators, wheat threshers, sprayers and trailers.

**Table 1: Land Utilization Statistics of Pakistan, 2002-2003<sup>5</sup>**  
(million hectares)

| Province            | Geographical Area | Total Area (4+5+6+7) | Forest Area | Not Available for Cultivation | Culturable waste | Cultivated Area (8+9) | Current Fallow | Net Area Sown | Area Sown More Than once | Total Cropped Area (9+10) |
|---------------------|-------------------|----------------------|-------------|-------------------------------|------------------|-----------------------|----------------|---------------|--------------------------|---------------------------|
| 1                   | 2                 | 3                    | 4           | 5                             | 6                | 7                     | 8              | 9             | 10                       | 11                        |
| Punjab              | 20.63             | 17.52                | 40.51       | 2.95                          | 1.63             | 12.43                 | 1.40           | 11.03         | 4.93                     | 15.96                     |
| Sindh               | 14.09             | 14.09                | 0.84        | 6.12                          | 1.34             | 5.79                  | 3.52           | 2.27          | 0.79                     | 3.06                      |
| North West Frontier | 10.17             | 8.35                 | 1.33        | 3.92                          | 1.20             | 1.90                  | 0.51           | 1.39          | 0.53                     | 1.92                      |
| Balochistan         | 34.72             | 19.51                | 1.36        | 11.33                         | 4.83             | 1.99                  | 1.10           | 0.89          | 0.02                     | 0.91                      |
| <b>Pakistan</b>     | <b>79.61</b>      | <b>59.47</b>         | <b>4.04</b> | <b>24.32</b>                  | <b>9.00</b>      | <b>22.11</b>          | <b>6.53</b>    | <b>15.58</b>  | <b>6.2</b>               | <b>21.85</b>              |

**Table 2: Area, Production and Yield of Major Crops, 2002-2003**

| Crop      | Area ('000 ha) | Production ('000 tonnes) | Yield (kg/ha) |
|-----------|----------------|--------------------------|---------------|
| Wheat     | 8034           | 19183                    | 2388          |
| Cotton    | 2794           | 10211*                   | 621**         |
| Rice      | 2225           | 4478                     | 2013          |
| Sugarcane | 1100           | 52056                    | 47324         |

\*000 bales; \*\* Lint

**Table 3: Distribution of Cropped Area**  
(Percent of cropped area)

| Crops       | 1959-60 | 1969-70 | 1979-80 | 1989-90 | 1999-2000 | 2002-2003 |
|-------------|---------|---------|---------|---------|-----------|-----------|
| Food Grains | 54.8    | 58.3    | 56.0    | 54.0    | 56        | 55        |
| Cash Crops  | 12.1    | 14.5    | 14.9    | 16.0    | 18        | 19        |
| Pulses      | 11.6    | 8.0     | 8.1     | 7.0     | 6.0       | 7         |
| Oilseeds    | 4.1     | 3.2     | 2.8     | 2.0     | 3.0       | 3         |
| Vegetables  | 0.7     | 0.7     | 0.8     | 1.0     | 1.0       | 2         |
| Condiments  | 0.3     | 0.3     | 0.6     | 1.0     | 1.0       | 1         |
| Fruits      | 0.6     | 1.2     | 1.5     | 2.0     | 3.0       | 3         |
| Others      | 15.8    | 13.7    | 15.1    | 17.0    | 11.0      | 12        |

N.B. Vegetables include Potatoes

Food grains : Wheat, Rice, Jowar, Maize, Bajra and Barley.  
Cash crops : Sugarcane, Cotton, Tobacco, Sugar beet, jute & Guarseed.  
Pulses : Gram, Mung, Mash, Masor, Mattari, other Kharif and Rabi Pulses.  
Oilseeds : Rapessed & Mustard, Sesamum, Groundnut, Linseed, Castor seed and other oilseeds.  
Condiments : Chillies, Onion, Garlic, Corriander, Turmeric and Ginger.

Mould board plough and disc plough for deep tillage are gaining popularity. **Table 4** shows population of tractors and important tractor operated machinery available in the country according to census of 1994 compared with censuses of 1975 and 1984<sup>7</sup>. It reflects increasing trends of their use.

**Table 4: Selected tractor drawn machinery owned by tractor owners in Pakistan**

| Census Year | Tractor | Machinery   |                   |                  |             |       |        |         |          |
|-------------|---------|-------------|-------------------|------------------|-------------|-------|--------|---------|----------|
|             |         | Cultiva-tor | Mold Board Plough | Bar/ Disc Harrow | Disc Plough | Drill | Rigder | Trailer | Thresher |
| 1994        | 252861  | 236272      | 28413             | 13233            | 20372       | 64126 | 10987  | 176412  | 112707   |
| 1984        | 157310  | 146863      | 7319              | 8140             | 6355        | 11251 | 4711   | 98787   | 78377    |
| 1975        | 35714   | 31619       | 2734              | 2373             | 2938        | 1174  | 1174   | 18074   | 5635     |

The bulldozers and power rigs are operated and maintained by the public sector on subsidized rates to the farmers whereas tractors and other machines are owned by large and medium sized farmers themselves. The medium sized farmers generally provide their tractors and other farm machines on rental basis to their neighboring small farmers in addition to their own use.

### **3.2 Infrastructure**

The organizations dealing with the issues related to agricultural mechanization in Pakistan include: Ministry of Food, Agriculture and Livestock; research and development institutions; agricultural machinery manufacturers; financial institutions; federal and provincial autonomous bodies; provincial directorates of agricultural engineering; and, agro-services<sup>6</sup>. A National Board for Agricultural Mechanization (NBAM) headed by the Minister of Food, Agriculture and Livestock was set up in 1981 with the mandate of advising the government in the formulation of agricultural mechanization policies and strategies. The National Board for Agricultural Mechanization has established two committees namely, Farm Mechanization Promotion Committee and Farm Machinery Standardization Committee. These are responsible for the introduction of suitable farm machines and development of farm machinery standards in the country, respectively.

### 3.3 Research and Development

The need for Research and Development (R&D) institutions on agricultural mechanization was established relatively late in Pakistan. Currently, a Farm Machinery Institute (FMI) at Islamabad under Pakistan Agricultural Research Council (PARC) at Federal level, Agricultural Mechanization Research Institute (AMRI) at Multan under the Government of Punjab and Agricultural Mechanization Research Cell (AMRC) at Tandojam under the Government of Sindh are solely engaged in farm machinery research and development work. Furthermore, Centre for Agricultural Machinery Industries under the Government of Punjab is also engaged in farm mechanization promotion activities.

Three universities of agriculture located in the provinces of Sindh, Punjab and North West Frontier are also contributing in operational and academic research in the field of agricultural engineering. Tractor manufacturers/distributors and financial institutions have also played an important role in promoting farm mechanization in the country.

FMI and AMRI are involved in R&D, testing and evaluation of local and imported farm machines, adaptation of imported machines to local conditions, improvements in locally manufactured machines and rendering technical assistance to farm machinery manufacturers by providing engineering drawings, prototypes, expertise of engineers and technicians and arranging field demonstrations of the machines to the end-users. Both FMI and AMRI have undertaken a considerable amount of work in developing/adapting farm machines (**Annexure I**). A few machines like; seed drill, zero-till drill, reaper-windrower, wheat thresher, groundnut digger, groundnut thresher, maize sheller, potato digger, sunflower thresher and sugarcane planter have been commercialized on large scale by local farm machinery manufacturing industry.

Faculties of agricultural Engineering and Agricultural Engineering Departments of the Agricultural Universities are engaged mainly in teaching of undergraduate and post-graduate students. They are also conducting basic and applied research through their graduate students.

In the private sector, tractor manufacturers have made efforts in indigenization of tractors by deleting substantial quantities of imported components. Local manufacturing of tractors has not only saved foreign exchange but also provided employment opportunities by establishing assembly lines at tractor manufacturer's premises and through vending industries.

### **3.3.1 Recent Developments**

#### **a) Crop Establishment Engineering**

##### **FMI Seeder**

Handling of combine harvested paddy residue is becoming a great concern to the farmers in rice-wheat cropping system. The residue is either removed or spread in the field manually. In general, farmers prefer to burn it as an easy and cost-effective method of disposal. However, burning of residue not only results in loss of potential nutrients to the soil but also poses a great threat to the natural environment.

Residue appears to be the only organic matter available to most rice farmers. Incorporation of crop residue into the soil enhances soil fertility through supplementing soil nutrients. Burning of residue causes almost complete loss of Nitrogen, 25% Phosphorus, 20% Potassium and Sulphur between 5-60 percent. Farm Machinery Institute (FMI), NARC, Islamabad has developed a

prototype machine namely FMI Seeder (Figure 2) in order to address this issue squarely.

This machine at first harvests the stubbles as well as picks up the loose straw lying in front of each opener of Zero-Till Drill, chops into small pieces and spreads it uniformly over the seeded rows in a single operation. It is a pto operated tractor mounted eight-row machine suitable for most tractors available in Pakistan. Its effective field capacity is around one acre an hour. Efficient use of FMI Seeder will result in: timely sowing of wheat; substantial savings in its operating cost; soil moisture conservation; early decomposition of crop residue; reduced environmental pollution; and, improved soil aeration and fertility.

### **Fertilizer Band-Placement Wheat Drill**

Wheat production in Pakistan is about 20 million tones per annum. This must be increased at least @ 2.7% per annum to catch up with the population growth of the country. In Pakistan, phosphate fertilizer in wheat is conventionally applied by the broadcast-method before sowing crop. This is a wasteful method of fertilizer application as only 15-25% of the applied phosphate is utilized by wheat crop. The seed-cum-fertilizer drills currently manufactured and used in Pakistan place fertilizer either too far from the seed or in direct contact with it. In the former case, fertilizer use efficiency is hampered and in the latter situation, relatively high rate of ammoniated phosphate fertilizer (like DAP) affects the seed germination and crop yield. To overcome these problems, PARC has developed an appropriate fertilizer band-placement drill for wheat crop (Figure 3). The drill was field tested and evaluated during 2002 wheat sowing season with encouraging performance. This drill places fertilizer about 5 cm away and 5 cm deeper than the seed. The crop roots utilize fertilizer thus applied very effectively, as 60-70% of the applied phosphate is utilized by wheat crop.

Field experiments have confirmed that this drill saves 50% phosphate fertilizer compared with broadcast method. In addition, about 10% more grain yield was obtained in plots where 50% fertilizer doze (40 kg DAP/acre) was band-applied using this drill than where full recommended phosphate doze (80 kg DAP/acre) was broadcast-applied. Thus, a farmer may get a benefit of Rs. 1300/acre using this technology as compared to conventional broadcast method.

## **b) Crop Harvest Engineering**

### **Wheat Straw Chopper-cum-blower**

Use of combine harvesters for wheat harvesting is gaining popularity in the country. The conventional combines are, however mainly concerned with the grains only. They leave the straw partially uncut and partially ejected back as a swath in the field. To manage the straw from combine harvested fields, a tractor operated wheat straw chopper-cum-blower (Figure 4) was identified in India which was acquired with the courtesy of Rice-Wheat Consortium.

The chopper was initially tested and demonstrated at National Agricultural Research Centre (NARC), Islamabad and subsequently at farmer's field in Sheikhpura area to assess its suitability for adoption in the local conditions. Farmers showed their keen interest in its use on the basis of its field performance. To make the machine available in the local market, agreements were made with local manufacturers for its local manufacturing at three different locations i.e. Daska, Lahore and Multan.

The chopper is toed behind a tractor during transportation as well as field operation. The power for machine operation is provided from tractor pto through a universal shaft. The machine harvests the uncut straw as well as picks up the combine ejected straw from the field, chops the straw into fine

pieces and blows it into a trolley hooked at its rear. The trolley is covered with a steel mesh canopy for handling of chopped straw which is unloaded at a convenient point. Effective field capacity of the machine was recorded to be 0.35 ha/h with 'bhoosa' recovery ranging between 1.5 to 2 t/ha.

### **Paddy Thresher**

Traditionally, paddy is harvested and threshed manually in Pakistan. Although during last few years, combine harvesters have been introduced for harvesting and threshing of paddy crop in Punjab but still most crop is managed by traditional methods. In general, after manual harvesting, the grains are separated by beating the paddy stalks against a drum or wooden log. However, animal/tractor treading is more common in Sindh and Balochistan for the purpose. These methods are not only inefficient but also result in high grain losses.

In order to mechanize paddy threshing operation, a tractor operated high capacity (throw-in type) paddy thresher (Figure 5) was identified by FMI and was acquired from Thailand. The machine was tested at Rice Research Institute, Dokri, Sindh to assess its performance and adaptability in the local conditions. The test results were found very encouraging and farmers showed their entire satisfaction on its performance. To make the machine available in the local market, the indigenization of thresher has been arranged through local manufacturing. For the purpose, PARC made agreements with six local manufactures and provided them technical assistance for its local manufacturing.

The thresher is operated like conventional wheat thresher by tractor pto. It has an axial-flow threshing mechanism. The crop is fed into the machine from one end, which then moves axially along the threshing drum and the straw is blown out at the other end. During the process, the grains are separated and fall down on oscillating sieves where they are exposed to air blast for cleaning.

The clean grains are discharged at main grain outlet. Unthreshed material is recycled through the threshing drum with the help of a screw conveyor. Grain output capacity of the thresher ranges between 1.5 to 2 t/h are depending upon the crop condition with over 99% cleaning efficiency and negligible grain loss.

### **c) Post-harvest Engineering**

#### **FMI Mobile Seed Processing Unit**

Seed is a fundamental input for crop production. Quality seed is essential for profitable crop production. An increase of 10-20% in crop yield can be achieved by using the seed which is viable and free from weeds seeds and diseases. However, access to healthy seed has not always been easy for farmers. The demand for quality seeds has increased substantially over time. There are 400 small seed companies in the country which supply 8.4% of certified seed to farmers besides Punjab Seed Corporation. Last year, total availability of certified seed of wheat, cotton, paddy, maize and mung crops was 13.8%, 55.6%, 17.7%, 10.2%, and 6.0% respectively. Rest of the seed demand was met through poor quality seeds marketed by grain merchants, traders and fellow farmers.

Seed processing is the art and science of removing undesirable materials from crop seeds to the extent that the seed lot meets purity and germination standards. When seed is brought from the field, it contains a variety of undesirable materials such as stones, weed seeds, dust, soil particles, dead insects, broken seeds, immature seeds and sometimes other crops seeds. Before the major crop seed can meet acceptable standards, the undesirable materials must be separated from the crop seed.

In the past, the main emphasis was given to produce and process wheat seed. Now the demand is increasing for producing and processing seed of edible oil and vegetable crops. Facilities will also be required to process seeds of

sunflower, rapeseed, soybean, pulses, maize and vegetables. Small seed production and processing companies will bridge the gap between the demand and supply of quality seeds. FMI has designed and developed a Mobile Seed Processing Unit (Figure 6) in order to equip the small seed companies, progressive farmers and farming communities at village level with a portable seed processor.

The FMI seed processor removes inert material, weeds, broken grains and shriveled grains from healthy grains. It also grades seeds into three components i.e. healthy seeds, light seeds, broken and shriveled seeds. Cleaning-cum-grading capacity of the processor is recorded to be 2 t/h of wheat, gram and mung and 1 t/h in case of paddy.

### **Solar-cum-gas Fired Dates Drying System**

Dates are one of the most important cash fruit crops of Pakistan. Dates are cultivated over an area of 78,000 ha in Pakistan with an annual production of 0.625 million tons. Most of it is produced in Sindh and Balochistan provinces. Major dates producing areas in the country are Khairpur, Turbat and D.I. Khan. There is no proper drying and processing facility for dates in the country. Hence, only around 10% of the total production is currently exported. The post-harvest losses associated with dates are about a quarter of the total production. Nation can earn considerable amount of foreign exchange provided dates are dried and processed on scientific lines. Dates are commonly sun-dried in Pakistan. During sun-drying, dates are neither protected against dust and rain nor against rodents, birds and insects.

FMI has designed and developed a solar-cum-gas fired dates drying system (Figure 7) in order to address the above issue. This system consists of eight flat plate solar collectors, an axial-flow fan, a drying chamber and a supplementary source of heating i.e. gas. A unit of this system was installed at Mitra Abad, Dhkki, D. I. Khan in May, 2003 for conducting the solar dates drying trial. The trial was conducted from August 11, 2003 to September 5, 2003. The key

performance parameters were measured during this trial. The results were found encouraging.

On the basis of this trial, drying chamber of the system was modified and tested during the dates drying season of 2004. A field demonstration of the system was organized on August 19, 2004. The stakeholders i.e. researchers, extension workers, farmers and date processors witnessed and appreciated performance of the system.

The original taste and condition of dates can be easily maintained and these can be kept safe from the effects of windstorm and heavy rains. This system can reduce the moisture of fresh dates from 66% to 22% in about 4 days against 10 to 12 days of conventional sun-drying technique. Drying capacity of the system is about 600 kg/4 days and about 4 tons of dried dates/season.

This technology is being released to local manufacturers for production and marketing on commercial scale. Consequently, date's processors will have access to this technology and they will be able to produce and market better quality dates especially for foreign markets.

### **3.3.2 R&D Issues**

- i) Farm Machinery R&D is mainly confined to the public sector. The existing capabilities (manpower and facilities) and operational funds of the public sector R&D Institutions are inadequate to cope up with the rate of technological advancements and creating awareness among the farming community about usefulness of farm mechanization.
- ii) There are little R&D activities in the private sector due to the fear of copying of their products.
- iii) There is little coordination among the existing R&D Institutions.
- iv) The planning approach is top down. Therefore, the research projects are not demand driven and have little impact.

- v) Monitoring and evaluation of research work in subjective.
- vi) Farm machinery R&D has so far concentrated in mechanizing crop production operations. Little attention is paid to mechanizing vegetables & fruits production, post-harvest technologies, livestock mechanization, renewable energy resources etc.

### **3.4 Agricultural Machinery Manufacturing Industry**

#### **3.4.1 Tractors**

There were five firms who were licensed in assembly/local manufacturing of following makes of tractors in collaboration with foreign firms:

- Massey Ferguson (MF-240, MF-265/MF-375)
- Fiat (Fiat-480 & Fiat-640)
- Belarus (MTZ-50, UMZ-6AKM)
- Ford (3600 & 4600)
- IMT (540 & 560)

There are only two firms which are presently mainly engaged in tractor manufacturing and they have achieved over 80% deletion. Local manufacturing/assembling has contributed significantly not only in saving of foreign exchange but also establishment of vending industries and providing employment opportunities. The major issues of tractor manufacturers are:

- a) allocation of insufficient resources for R&D of tractors and matching implements;
- b) fluctuations in the sale of tractors due to high prices and insufficient availability of institutional credit for tractor purchase; and,
- c) little effort for introduction of farm machinery.

#### **3.4.2 Other Machinery**

There were 15 farm machinery manufacturers in 1959. As a result of liberal government policies such as rebate in import duty for raw material, exemption of sales and income tax, their number went to about 500. Local farm machinery industry is producing farm implements/machines for land development, seedbed preparation, seeding/planting, inter-culture, reapers, wheat threshers, maize shellers, sprayers and farm trolleys and meeting demand of the country. However, the quality of locally produced farm machinery is generally poor due to:

- a) poor layout of workshops;
- b) lack of managerial, engineering and technical manpower;
- c) poor machine designs;
- d) improper manufacturing techniques;
- e) lack of availability of quality raw material, components such as gears, sprockets etc.;
- f) lack of finance and marketing skills; and,
- g) non-awareness of manufacturers about standards, non-availability of standards in Urdu and their enforcement.

### **3.5 Testing and Standardization**

Testing is of paramount importance to maintain the quality of locally produced agricultural machinery and to assess the suitability of imported farm machines. Whereas, standardization is required for use of right type of materials and ensuring inter-changeability of components and thus facilitate repair/maintenance of the products. Testing of farm machines before selling to farmers is almost non-existent in the country. There are inadequate instrumentation and test facilities with the manufacturers. In public sector, FMI and AMRI have limited testing facilities. These institutes also lack technicians for instrumentation.

Pakistan Standard & Quality Control Authority (PSQCA) is responsible for formulation of standards and it has developed standards for farm machinery. However, these are of little use to local farm machinery manufacturers for the reasons:

- a) their non-availability in Urdu (national language);
- b) there is no legislation for enforcement of standards particularly on safety aspects (e.g. spraying machinery, pto shafts etc).
- c) non-awareness of farmers on the importance of standards and test reports of the products being sold by the manufacturers.

### **3.6 Agricultural Credit**

Credit requirements of the farming sector have been increasing over the years with the rise in the use of fertilizer, pesticides and machinery and hike in their prices. In order to cope with the increasing demand for the agricultural credit, Institutional Credit to the farmers is being provided through Zarai Taraqiate Bank Limited (ZTBL) formerly known as Agricultural Development Bank of Pakistan (ADBP); Commercial Banks, Cooperative and Domestic Private Banks. Of these, the ZTBL provided the lion's share of the total credit distribution followed by Commercial Banks. The agricultural loans extended to the farming community are generally for agricultural inputs, for enhancement and improvement of irrigation facilities, orchards, on-farm godowns/storages, production loans for improved seeds, horticulture and micro credit etc.

Tractor sales mainly depend on the availability of Institutional Credit. Generally demand for tractors has been determined by the availability of credit from government and private financial institutions. The credit availability has, however, generally been low as compared to requirements.

### **3.7 Policy Highlights**

President of Pakistan while addressing 'Kisan (farmers) Convention' at Islamabad on June 10, 2004 announced an 'Agricultural Package' for boosting the farm sector. Some excerpts from the package related to promotion of agricultural mechanization/engineering in the country are enumerated as follows<sup>8</sup>:

- a) Zarai Taraqati Bank Limited (ZTBL) would reduce the interest rate from 14 to 9 percent from July 1, 2004. Further more, the farmers who returned the loans within the stipulated time would be charged only 8 percent mark-up.
- b) No customs duty, sales tax and withholding tax would be charged on the import of agricultural implements not manufactured in the country.
- c) Establishments of new tractor plants would be encouraged in the country.
- d) The import of tractors below 35 hp and over 100 hp would be allowed with no General Sales Tax or Withholding Tax. However, 10 percent import duty will be charged on these tractors as these are currently not produced in the country.
- e) Eighty Seven Thousand water courses will be lined across the country within the next four years at a cost of Sixty Six billion Pak Rupees.

### **3.8 Recommendations**

- a) The existing capabilities of public sector R&D institutions should be strengthened.
- b) There is a need to establish R&D institutes like AMRI (located in Punjab) in other three provinces.
- c) National Network for Agricultural Machinery (NNAM) should be established to coordinate farm machinery R&D activities for efficient

utilization of available resources. The NNAM should identify researchable issues and then prioritize those as per market demand.

- d) Suitable machinery be developed for livestock sector such as harvesting and chopping of fodder, silage making and storage, milking of animals, dairy products etc. at farm level.
- e) The scope of R&D should be extended to farm level processing for value addition to agricultural produce.
- f) Private sector should be encouraged for the following:
  - i) Initiate R&D activities at their premises.
  - ii) Improve the quality & standard of their products to meet international requirements.
  - iii) Improve their manufacturing set-ups in order to produce/manufacture machines and implements according to international market demands at reasonable production cost.
  - iv) Setting-up custom hire services for costly machinery in order to make them available to small and medium landholders.

#### **4. Conclusion**

Pakistan food security and surplus for export at competitive prices require the efficient development and utilization of agricultural resources. Costs of production of various crops are not competitive due to low productivity mainly due to inefficient farming practices. The future challenges of the free market and faster globalization have further necessitated modernization of agriculture mainly through development/adaptation, testing and commercialization of efficient and cost-effective mechanization technologies in the country. The efficient use of scarce agricultural resources and accelerated agricultural mechanization is, therefore, imperative and demands formulation of a comprehensive mechanization strategy for the country.

## REFERENCES

1. Anon., (2004). Pakistan Economic Survey 2003-2004. Economic Adviser's Wing, Finance Division, Government of Pakistan, Islamabad, June 10.
2. Khan, Fazle Karim (2003). Pakistan – Geography, Economy and People. Oxford University Press, Karachi, Pakistan.
3. Anon., (1997). 50 Years of FAO in Pakistan. FAO Saudi Pak Tower, Islamabad, Islamabad, October, 16.
4. Anon., (2001). Ten Year Perspective Development Plan 2001-11 and Three Year Development Programme 2001-04. Planning Commission, Government of Pakistan, Islamabad, September 1.
5. Anon., (2004). Agricultural Statistics of Pakistan 2002-03. Economic Wing, Ministry of Food, Agriculture and Livestock, Government of Pakistan, Islamabad, April.
6. Anon., (1988). Report of the National Commission on Agriculture. Ministry of Food, Agriculture and Cooperatives, Government of Pakistan, Islamabad.
7. Anon., (1997) Report of Sub-working Group on Crop Production Target and Inputs for Ninth Five Year Plan (1998-2003). National Fertilizer Development Centre, Islamabad.
8. Shaiq Hussain, (2004). Mark-up on Agricultural Loans Down. The daily News, Islamabad, June 11.

**SALIENT ACHIEVEMENTS OF FARM MACHINERY R & D INSTITUTIONS**

| <b>Description</b>  | <b>Farm Machinery Institute, Islamabad</b>   | <b>Agricultural Mechanization Research Institute, Multan</b>  |
|---|--|---|
| Mechanization technologies developed and commercialized       | Tractor front mounted reaper-windrower, groundnut digger, groundnut thresher, sunflower thresher, zero-till drill, hold-on and throw-in-type paddy threshers, pneumatic row crop planter, soybean thresher and wheat straw chopper-cum-blower. | Wheat thresher, seed drills, groundnut digger, maize sheller, rotary potato digger, multicrop planters, interculture tool bar, sugarcane planter, axial flow pump, rotary slasher, biogas plant, seed cleaner/grader, bed and furrow shaper/planter, soil hard pan tester, disc weeder, hand driller, single row planter and pesticide sprayer.   |
| Mechanization technologies being developed and commercialized | Canola thresher, paddy transplanter, solar dryer for fruits and vegetable, FMI seeder, fertilizer band placement wheat drill, mobile seed processing unit.   | Power tiller, chain trencher, fodder cutter bar, sugarcane base cutter, pneumatic drill, gasifiers, briquetter, rotary ditcher, creeper gear, ejector pump, maize cob harvester, cheaper biogas plant, vegetable nursery transplanter and groundnut sheller, rice thresher, seed-bed finisher, stubble shaver, rotary weeder, disc ratooner, jute decorticator and orchard spray machine. |



**Figure 2: FMI Seeder**



**Figure 3: FMI Fertilizer Band-placement Wheat Drill**



**Figure 4: Wheat Straw Chopper-cum-blower**



**Figure 5: Paddy Thresher**



**Figure 6: FMI Mobile Seed Processing Unit**



**Figure 7: FMI Solar-cum-gas Fired Dates Drying System**