Kasetsart J. (Nat. Sci.) 44 : 757 - 763 (2010)

Review Article

Maize in Pakistan – An Overview

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ABSTRACT

The alarming population growth rate in Pakistan has exacerbated the food security problem. The increase in the human population (3%) in the last two decades has nullified increased cereal production. The use of maize in the feed and wet milling industry is growing at a much larger pace than anticipated. Maize is being grown on an area of 1.016 million hectares with annual production of 3.037 million tons and an average grain yield of 2,864 kg/ha. Approximately 66% of the maize in Pakistan has access to irrigation; the remainder is farmed under strictly rain-fed conditions. Maize production in Pakistan has increased from 0.38 million tons during 1947-50 to 3.037 million tons in 2007. The trend is likely to continue at a much faster pace in the years to come. The adoption/cultivation of spring maize has increased, especially since the active involvement of multinationals in Pakistan. Today spring maize accounts for 12-15% of the total area and almost 30-35% of the total annual production. An annual increase of 20-25% in the maize area during spring has been observed, which is mainly because of very good yield levels (6-7 tons/ha). Spring maize is one of the success stories in Pakistani agriculture. Seed has been, and still is, the most important limiting factor in maize production in Pakistan. Only 34% improved seed is available. The markets are not stable and have uncertainty due to the lack of drying and grain storage facilities. The use of maize grain in poultry feed is on the increase in Punjab province up from 23% in 2001 to 55% in 2007.

Keywords: Pakistan, maize, wet milling, feed industry, spring maize, seed availability, drying and storage facilities

INTRODUCTION

Maize is a C_4 plant, having high genetic potential and is a photosynthesis- explorative crop. In Pakistan, the average productivity of maize is 2,850 kg/ha, which is the highest among all cereals grown in the country. Maize is Pakistan's third most important cereal after wheat and rice. The use of maize in Pakistan for direct human consumption is declining, but its utilization in the feed and wet milling industry is growing at a much faster pace than anticipated. Currently, sufficient maize is grown in Pakistan for domestic needs and there is neither a surplus nor deficit in maize grain supplies. Currently except potato maize is the most profitable, stable and dependable agricultural crop in Pakistan.

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Received date : 05/06/09 Accepted date : 25/12/09

In 1971, two maize and millet research institutes were opened, with one in Yousafwala (Punjab province) and the other in Pirsabak (N.W.F. province). Their major task was the development of open-pollinated maize varieties in collaboration with CIMMYT.

A coordinated research program for maize and millet was initiated in 1975 by the Pakistan Agricultural Research Council (PARC) to coordinate the research carried out in different provinces.

Maize yields have shown a steady increase since independence; in the last five years, significant yield improvements have been realized. Maize is being grown on 1.016 million ha with annual production of 3.037 million tons and an average grain yield of 2,864 kg/ha. Maize production in Pakistan has increased from 0.38 million tons during 1947 50 to 3.037 million tons in 2007 (Figure 1). The trend is likely to continue at a much faster pace in the years to come. Maize accounts for 4.8% of the total cropped area and

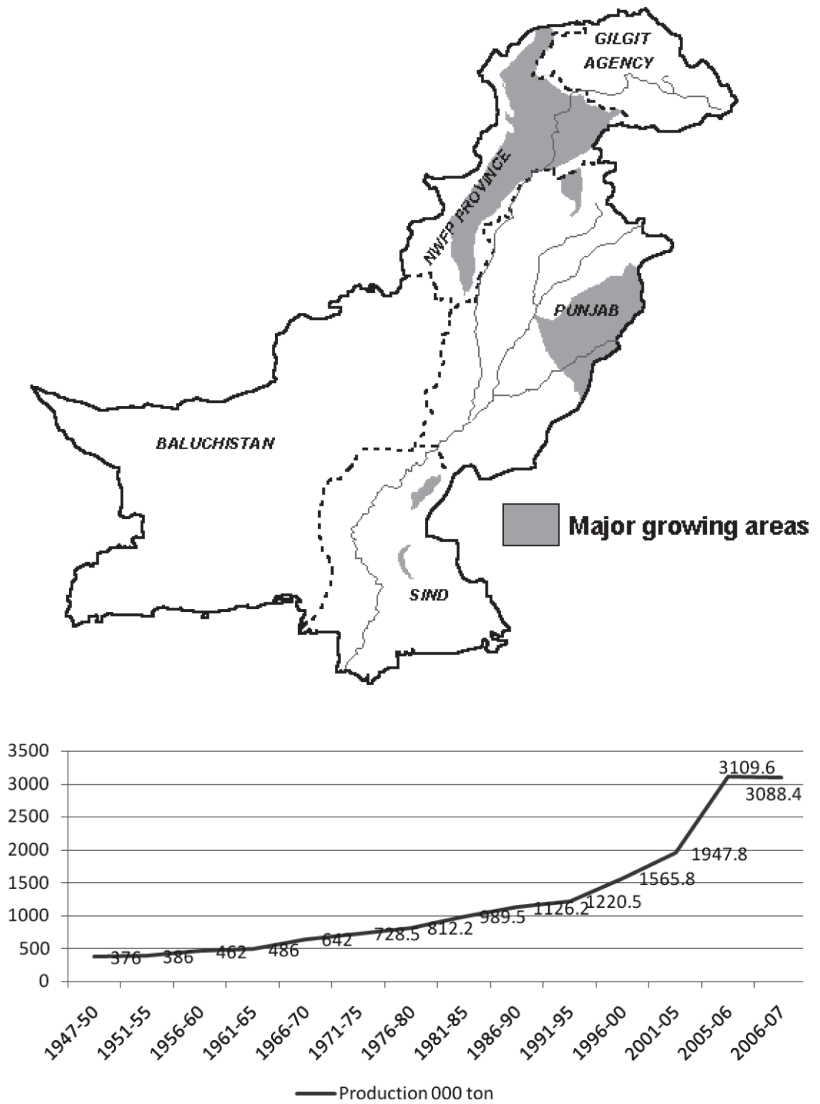

Figure 1 Maize production trend in Pakistan.

3.5% of the value of agricultural output. The upward trend in yield is mostly due to the adaptation of high yielding varieties and hybrids, which is likely to continue (Table 1).

Maize growing areas in Pakistan

The bulk (99%) of total production comes from two major provinces, with NWFP accounting for 51% of the total area and 31% of total production and Punjab contributing 48% of the area and 69% of total maize grain production. A small amount (1.0%) is produced in the provinces of Sindh and Baluchistan. Though not included in Pakistan's official statistics, maize is an important crop in Azad Jammu Kashmir, with about 0.122 million ha of maize being planted during autumn. Similarly, an increasingly important and high yielding sector is the spring maize produced in Punjab, which covers around 0.10 million ha and produces about 0.71 million tons of maize grain. Approximately 66% of the maize in Pakistan has access to irrigation; the remainder is farmed under strictly rain-fed conditions. Eighty four percent of the maize production in Pakistan is concentrated in two principal geographic clusters, consisting of 11 districts in NWFP/Northern Punjab and 9 districts in the central Punjab.

Major shift in seasons/patterns

The spring-planted area has increased slightly. The contribution to total production from spring maize is expected to increase because better hybrids are being marketed by private companies, due to strong competition for the seed market. Since the introduction of spring maize cultivation in Pakistan in 1975, there has been a gradual increase/shift in planting maize during spring in the irrigated lowland areas of Punjab. The adoption/cultivation of spring maize has especially increased since the active involvement of multinationals in Pakistan. Today, spring maize accounts for 12-15% of the total area planted during autumn and almost 30-35% of the total annual production. An annual increase of 20-25% has been observed in the area planted with maize during spring, which is mainly because of very good yield levels (6-7 ton/ha) (Table 2). The contribution in yield comes from the use of hybrid seed with better crop management/inputs.

Table 1 Contribution of hybrid cultivation.

Cultivars	Area (000 ha)	Share in area (%)	Production (000 tons)	Share in production (%)
Hybrid	254	25	1822	59
Synthetic/Local	763	75	1266	41
Total	1016.9	100	3088.4	100

Table 2 Area, production and yield of spring maize in Pakistan.

Years	Area (000 ha)	Production (000 tons)	Average yield (ton/ha)
2001-2002	47.2	212	4.52
2002-2003	47.6	229	4.84
2003-2004	47.6	229	4.84
2004-2005	55.2	356	6.43
2005-2006	90.8	640	7.04
2006-2007	105.7	712.9	6.75

Spring maize is one of the success stories in Pakistani agriculture (Table 3). However, the area planted with spring maize is to be increased. The yields from maize crops are steadily improving and hybrid seed sales during autumn are increasing, but still there is a long way to go. Winter maize provides an opportunity for improving maize production in Pakistan, but its real potential and possibilities have yet to be explored. Like Bangladesh, the climate in Sindh province provides a great opportunity.

Maize an alternate source of food security

The alarming population growth rate in Pakistan has exacerbated the food security problem. The increase in Pakistan's population (3%) in the last two decades and the movement of grain across the border have not only nullified the increased cereal production, but also have prompted the nation to import substantially more quantities of wheat to supplement domestic supplies. The urban consumers are spending billions of dollars of precious foreign exchange currency.

Thus, if the people of Pakistan are to enjoy better diets without spending hard currency or credits for food grain, especially wheat imports, it appears that increased domestic production/ utilization of additional cereals is the only solution in the short term. Since maize has usually played only a minor role in the traditional diet, the public sector/feed industry has spent little resources to explore the possibilities of its use as an alternate food source. In some areas of the world, maize has become a convenience food for urban consumers. In Costa Rica, which had been primarily a wheat consuming country, a modern factory produces daily 1.4 million loaves of maize bread (fortified with soybean flour) and markets an equivalent amount of maize flour for tortilla production. These facts suggest that maize bread can replace or supplement wheat bread in an urban diet.

With improved transportation/ communication and a raised income level, the per capita annual consumption of maize in the country is decreasing by 0.6 kg/capita, while the use of wheat as a staple food is increasing, especially in the remote hilly areas. This trend in consumption and the growing population rate might cause a serious food shortage in the country.

The alternate use of maize, blended with wheat flour will not only reduce dependence on external producers for food, but will also reduce wheat imports by about 0.5-1.0 million tons, hence saving millions of dollars of scarce foreign exchange.

Seed production

It has not been possible to solve the problem of quality seed supply. Seed has been and still is the most important limiting factor in maize production in Pakistan. This needs to be solved as a high priority. Seed production is one of the major limiting factors to increasing the yield per unit area. Farmers have started to plant improved varieties and there is demand for the improved seed, but a proper seed production system is lacking.

Table 3 Yield increase with the introduction of spring season maize and improved varieties/hybrids.

Season	Average yield (Kg per acre)		
	1970-71	1994-95	2006-07
	Land races	OPV'S	Hybrids
Autumn maize	1171		3827
Spring maize	-		6745
Average	1171		5286
Increase over 1970-71	451 %		

Although the formal commercial maize seed production system in Pakistan produces a limited tonnage of certified seed, the national public research service has attempted to produce and disseminate the seed of improved varieties through various ad hoc seed multiplication campaigns. These campaigns have relied on planting of small demonstration seed multiplication plots in farmers' fields. To some extent, they have been effective in stimulating farmer-to-farmer distribution of improved seed.

Pakistan, like many developing countries, still depends largely on open-pollinated varieties, based on public seed organizations. Currently, both the public and private sector are involved in promoting the seed production system. More recently, an individual seed producer and community production/distribution system has been encouraged. Under this system, seed growers have been offered several incentives, including doorstep availability of inputs (such as pre-basic seed, insecticide, plating machinery), the complete disposal of seed with the help of extension agents and frequent consultation with technical staff to solve confronting and new emerging problems.

The seed produced by the above-mentioned agencies and individual seed growers is insufficient. About 40% of the total area is planted to improved seed of an advanced generation and the remaining is covered by either local land races or a mixture of local and improved germ plasm, which are low yielding.

Export/Import (in the last five years)

During the last five years, no maize has been imported and exports were only 2,000 tons. Last year there were no maize exports. If maize production increases, as the trend suggests, then exports can be increased significantly. As a warning, any import of maize at this stage will take maize production back five to ten years.

Marketing trends, storage facilities & problems

There has not been sufficient certain and effective market demand for maize to induce farmers to adopt new technology. The government very actively procures wheat and rice for distribution. There has always been a psychological fear that the harvest of these commodities will be insufficient. The main outlets for maize products are the livestock and feed industry, whereas the industrial processing sector is very limited.

An increase in production would result in a surplus, which would probably not find a market, but if it did, then it would be at a much lower price. The maize market in 1997 can be best quoted for an explanation of such a situation. The livestock and poultry industry in increasing, but due to hybrid cultivation, production is also increasing.

Thus, the situation is similar to what it was before. These industries fix their own prices according to the situation. The markets are not stable and involve uncertainty. Certainly, yields could be increased by 25%, just by providing the farmers with good seed and fertilizer, when it is needed. Such a production increase, in conjunction with the growing trend of spring maize involving much higher production, will make maize farming a more profitable operation. Growth in the

Table 4 Frequency of maize utilization plants in Pakistan.

Utilization	NWFP	Punjab
Industry (wet milling)	17	25
Feed	30	55
Food	40	05
Seed and others	13	15

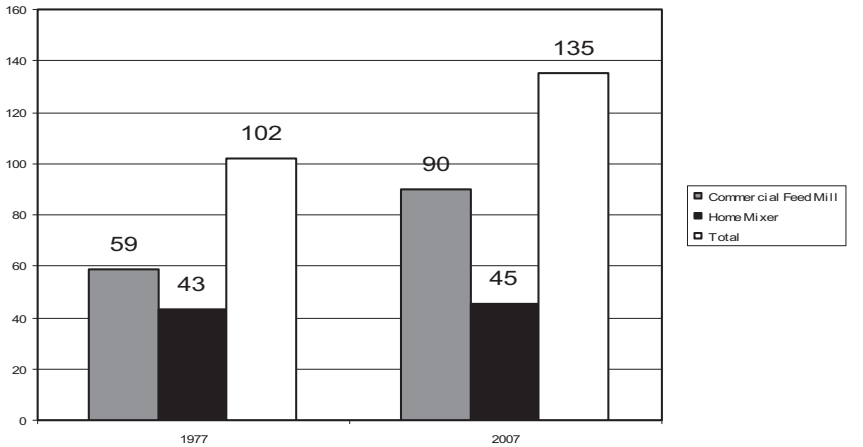

Figure 2 Number of feed mills in Pakistan.

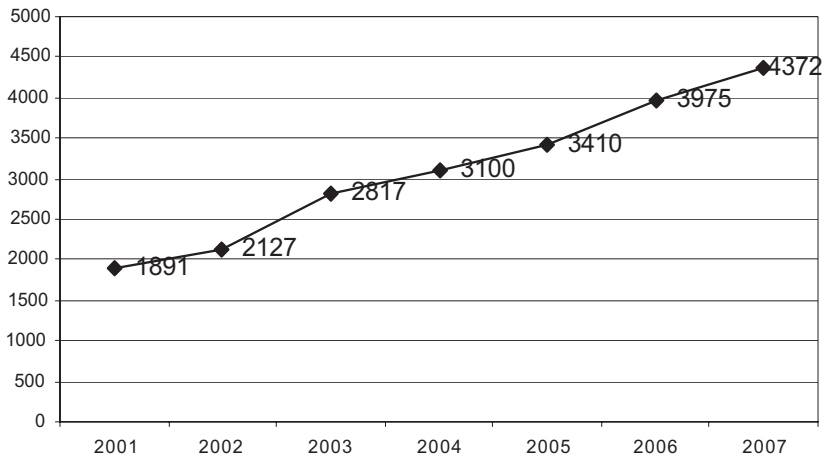

Figure 3 Total poultry feed production in Pakistan (000 tons).

organized maize market could increase price instability, unless extensive gain storage and market facilities are established, as current storage facilities are insufficient. With the increase in spring area harvest, where only hybrids are cultivated and also the increasing trend of hybrid use in the autumn season in Punjab and NWFP, maize will be in surplus, unless and until there is expansion of these industries or the provision of export markets.

Future research thrusts

Breeding

Future research should focus on:

- Derivation and maintenance of white and yellow inbred lines from indigenous and exotic sources
- Hybrid development and testing, especially for rain-fed and highland areas
- Quality protein maize
- High yield and early maturity
- Drought and heat tolerance
- Disease and insect resistance

Table 5 Rain fed areas with their yield potential.

SOAN-3	Earliest, white in colour, having "stay green" character
Agaiti-2002	Medium maturing yellow cultivar
Kissan	Medium maturing white cultivar
Pahari	Early maturity white variety
Azam	Early maturity white variety
Agaiti-85	Medium maturing yellow cultivar

Table 6 Irrigated areas with their yield potential.

Kashmir Gold	Medium maturity, Dual purpose, Yellow in colour
Golden	Full season and tall with high yield potential
Sahiwal-2002	Full season and tall with high yield potential
Sarhad White	Full season high yielding white variety
Sarhad Yellow	Full season high yielding yellow variety
Babar (Hybrid)	High yielding white hybrid
Ghori (Hybrid)	High yielding yellow hybrid
FH 421	High yielding yellow spring season
FH 810	High yielding yellow for both spring & autumn seasons
Commercial Hybrids	High yielding late yellow and& white hybrids.

Crop management

Future research should focus on:

- Low cost and effective production technology
- Weed management

Approved varieties/Hybrids recommended

Tables 5 and 6 summarize the recommended varieties and hybrids based on water availability.

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