CHAPTER 6

The State of Mountain Agriculture in Pakistan

Introduction

Pakistan is an agricultural country and its economy depends mainly upon agricultural production. About 70% of the total population are engaged in agriculture and the agricultural sector contributes 30% of the GDP. The mountain areas of Balochistan, the North West Frontier Province (NWFP), and the Northern Areas (NA) and others constitute about 60-65% of the country (high mountains 22-25% and low mountains 38-40 %) and support about 10% of the total population (130 million)(Siddiqui 1995). Agriculture is the mainstay of the mountain people: most people are poor and depend upon income from farmland and livestock to survive. Many people are landless and work as part of the labour force in other parts of the country or in foreign countries. Landholdings are small and mostly without irrigation facilities.

Most of the mountain areas in Balochistan, NWFP, and NA are classified as dry and cold. Precipitation is very variable, with more in winter than in summer. The mean minimum and maximum temperatures are low, especially at higher elevations where it snows in winter. The growing season for vegetation is usually short.

Balochistan

Agriculture is the main economic activity in Balochistan. In 1987/88 it accounted for some 54 to 60% of the provincial gross domestic product and employed 67% of the total labour force, considerably more than the national average of 51% (Altaf1998). Production of fruit and vegetables increased rapidly during the 1980s. They grew annually by six to seven per cent and gross farm incomes improved annually by more than nine per cent in real terms. Balochistan is a dominant exporter of fruit and vegetables to other provinces in Pakistan. Between 35 and 80% of the total national production of many deciduous fruits, such as apples, apricots, pomegranates, plums, and grapes, is grown in Balochistan (Alam 1996)

The proportion of small, medium, and large farms (0-5 ha; 5.1-20.0 ha; >20 ha); the proportion of the total farm area each category occupies; the average landholding size; and the average area of each farm actually cultivated were investigated in a survey of farmers in central Balochistan (Zone I) and northern Balochistan (Zone II) in 1998. The results are shown in Tables 6.1 and 6.2. The majority of farmers in both northern and central Balochistan had small landholdings of less

Table 6.1
Distribution of farm and farm area in surveyed area, 1998

Farm Category	Zone I		Zone II	
	% of farms	% of total farm area	% of farms	% of total farm area
Small	59.3	18.9	69.8	24.4
Medium	31.5	44.9	22.9	35.4
Large	9.2	36.2	7.3	40.2

Small farms = 0-5 ha; medium farms = 5.1-20.0 ha; large farms = > 20 ha
Zone I includes Quetta, Kalat, and Mastung districts (central)
Zone II includes Qilla Saifullah, Zhob, Loralai, Ziarat, and Pishun districts (northern)
Source: Altaf et al. (1998)

Table 6.2
Average farm area and percentage cultivated in Northern and Central Balochistan, 1998

Farm status (ha)	Zone I		Zone II	
	Average farm area	% cultivated	Average farm area	% cultivated
≤2.0	1.46	89	1.40	95
2.1 to 5.0	3.10	74	2.83	87
5.1 to 10.0	7.20	62	6.72	74
10.1 to 20.0	13.30	51	12.20	59
>20	27.80	42	30.20	46
Overall	7.14	62	5.48	57

Source: Altaf (1998)

than five hectares, these covered 19 and 24% of the total farm area in each zone, respectively. Less than 10% of landholdings were large farms of more than 20 ha, but these covered approximately 40% of the total farm area. The overall average farm size was higher in central Balochistan (Zone I) than in northern Balochistan (Zone II); 7.1 ha and 5.5 ha, respectively. On average less than two-thirds of the farm area was cultivated, ranging from 95% of the area of the smallest farms in the northern zone to 42% of the area of the largest farms in the central zone.

NWFP

The majority of farmers in the NWFP have small farm holdings. The average size is only 2.5 ha, compared to 4.5 ha in Pakistan as a whole (Dijk and Hussein 1994). A high proportion of farms (16%) are 'owner-operated'.

Northern Areas (NA)

The Northern Areas are one of the most rugged regions in the world, more than half the land area is above 4,500 masl. The low rainfall and rugged topography severely limit the expansion of farmed land. Over 90% of the area consists of steep to very steep mountain slopes with thin and patchy soil. These steep slopes are unstable and generally unsuitable for the production of arable crops. Large tracts of the mountain slopes between 900 and 3,300 masl are covered by natural coniferous forest reserves. Only some 54,000 ha of the total area of 7.25 million ha are cultivated. Farms are small; the average farm size is about one ha, of which about 75% is cultivated, and the majority of farmers have holdings smaller than this.

Cropping Systems

In the Pakistan mountains, the alpine and sub-alpine pastures above 3,300m are used for transhumant summer grazing of a large number of migratory small ruminants. The animals spend the winter in the Pothwar and Indus plains. Arable farming is the most important land use in the piedmont plains, loess plains, and alluvial plains and on lower, gentler slopes of the mountains.

The three major kinds of land use in the dry western mountains are irrigated cropping, dry farming, and grazing. Irrigated cropping is on a small scale but is of great importance. In most places crop cultivation on dry land is not successful because of the scanty and erratic rainfall. Farming is, however, practised in the plains, valleys, and high lying areas at the foot of the mountains.

The crops grown under perennial irrigation include fruit; such as apples, peaches, grapes, pistachio, and almonds; and vegetables or cash crops such as onions, potatoes, turnips, tomatoes, and cabbage. Wheat, barley, and fodder are also cultivated under perennial irrigation. The main crops under dry land farming are wheat and cumin. In areas where rainfed farming is complementary to irrigated cultivation, farmers often grow wheat, maize, barley, potato, millet, and sorghum. The main crops grown in winter and summer in the different agroecological zones are summarised in Table 6.3.

Table 6.3
Cropping patterns by agroecological zone

Crop category	Very cold, arid	Cold, arid,	Cold, sub-humid	Cool, humid	Warm, sub-humid	Hot, Sub-humid	Hot, arid
Main kharif crop	Rice	maize	Rice	maize	sugar cane	Ground nut	sugar cane
Second kharif crop	Maize	rice	Maize	rice	maize	Sorghum/ Millet	rice
Third kharif crop		vegetables		cash crop	cash crop		pulses
Main rabi crop	Wheat	wheat	Wheat	wheat	wheat	Wheat	wheat
Second rabi crop	oil seeds	vegetables	oil seeds	vegetables	sugar cane	Gram	sugar cane
Third rabi crop		oil seeds		Oil seeds	cash crops		pulses
Orchards	fruit and vegetables	fruit and vegetables	fruit and vegetables	fruit and vegetables	some	No	few

Source: Compiled from Diagnostic Surveys of NWFP Agriculture May 1995: Islamic Republic Of Pakistan, Government of North West Frontier Province, Agricultural University Peshawar, Agricultural Research Project Phase-II

Note: kharif—summer; rabi—winter

Maize, sorghum, and pearl millet are the kharif (summer) cereals and are grown for a dual purpose. Sorghum and millet are inter-cropped with some fodder varieties of beans. This mixture gives a high quality fodder that is very useful for dairy animals. The grains are used in poultry and cattle feed.

Wheat is the principal rabi (winter) crop and grown on the greater part of the cultivated area. It is also intra-cropped in orchards. Rapeseed is inter-cropped with wheat and green rape is uprooted and fed to animals. Conola type rapeseed is grown for the extraction of oil. Barley, lucerne, and berseem (clover)are cultivated as fodder crops in the rabi season.

Rainfed agriculture is common in both the valleys and on mountain slopes. Wheat, maize, and oil seeds are the dominant rainfed crops. There are two cropping seasons in areas below 2,250m and one at higher altitudes. Rice is grown up to 1,400m, while wheat and maize grow up to 2,250 m. Fruit orchards and vegetables are cultivated at elevations up to 2,500m. Tropical fruit such as citrus, banana, papaya, mango, and persimmon grow well below 900m. Peaches, pears, apricots, grapes, apples, and walnuts grow well between 1,350 and 2,400m.

Food Grain Crops

Most fertile and irrigated areas, and almost 80% of the agricultural land overall, are used for food grain production.

Balochistan

The cultivable land of Balochistan is estimated to be about 1.66 million ha of which about 0.60 million ha are used for irrigated crops and fruit and 0.16 million ha for rain-fed crops, the rest are fallow. Crops contribute about 45% of the total GDP of the province. Wheat is the most important rainfed crop grown in the highlands, followed by barley and rapeseed. Rainfed crop farming is very risky because of large fluctuations in rainfall patterns from year to year. Even so, local land races of rainfed wheat grown in Balochistan yield good quantities of straw and stubble which are fed to and mostly grazed by small ruminants—sheep and goats.

NWFP

Farming in the NWFP is mainly subsistence oriented and characterised by low inputs and outputs. Wheat is the main rabi crop on both rainfed and irrigated fields. Other rabi crops include barley, chickpeas, rapeseed, and mustard. About 60% of the area used to grow wheat is barani or rainfed land; this contributes about 40% of the total wheat production. The area under wheat increased by 44% between 1975/76 and 1991/92 and is largely the result of incentives provided by the government in the form of a support price.

Maize is the major kharif crop. Over the fifteen years from 1975/76 to 1991/92, the area under maize increased by 27%. The province produces 55% of all the maize grown in the country. Other kharif crops include groundnut, sorghum, and millet. Cultivation of potato as a cash crop has expanded strongly in those mountain areas where maize was a predominant crop because of the high prices paid for quality potatoes.

Economic analysis

The average yields of rice, wheat, and maize in three of the mountain provinces and Pakistan as a whole in 1993/4 are shown in Table 6.4. The average yields of wheat and maize in the mountain provinces were lower than the national average, whereas those of rice were similar or even slightly higher.

Table 6.4
Yields of food crops in three mountain provinces (kg/ha)

Crop	Balochistan	NWFP	Pakistan
Rice	1700	1700	1600
Wheat	830	1200	1700
Maize	640	1400	1300

Source: Govt. of Pakistan (1995)

The average annual growth rates in per cent in the area, production, and yield of various food grain crops in Balochistan and the NWFP over the 18-year period from 1975/76 to 1993/1994 are shown in Table 6.5. The average annual growth rates in total production were higher for wheat, rice, barley, and pulses in Balochistan and for maize in the NWFP. The average annual growth rates for wheat, barley, and pulses in Balochistan were impressive: four, five, and seven per cent for wheat, pulses, and barley, respectively. In contrast, the growth rates in the NWFP were low, from one half to two per cent or less for all crops except barley; barley showed a slight decline. The growth rates in total production resulted as much or more from an increase in the area under crops as from an increase in yields. In Balochistan, the average annual growth rates in yield ranged from 0.5 to 2%; in the NWFP they all lay below 1% with the exception of pulses at 1.4%. Overall production of food was better in Balochistan, possibly as a result of a more favourable policy and strategies for food grain production in the province.

Table 6.5
Average annual growth rates in the area, production, and yield of various food grain crops in Balochistan / NWFP (%)(1975/76 to 1993/1994)

Crop	Area		Production		Yield	
	Balochistan	NWFP	Balochistan	NWFP	Balochistan	NWFP
Wheat	2.1	0.4	4.0	1.3	2.0	0.8
Paddy	0.6	0.1	1.0	0.1	0.5	0.1
Maize	0.6	1.4	1.6	1.9	1.0	0.5
Barley	5.1	-0.1	7.2	-0.7	2.0	-0.8
Pulses	4.0	0.1	5.4	1.9	1.4	1.8

Horticultural and Cash Crops

There are many small pockets in the mountains of Pakistan that are suitable for growing different fruits like apples, apricots, peaches, pears, and almonds; and vegetables, particularly off-season fresh vegetables to meet the demands of people living in the plains where it is too hot to grow vegetables in the summer.

Balochistan

Balochistan produces 60% of the deciduous fruits grown in Pakistan; fruit contributes 39% of the total production value of agricultural crops in the state. Fruit farming provides employment for about 80,000 farmers, and overall about 200,000 people earn their living through this sector. The great majority of orchards lie in the size range of from 3 to 10 ha (80%) and most of the remainder are between 10 and 20 ha. Between 1984 and 1994 the total production of fruit crops, such as apples and cherries, increased by more than 300%. The acreage and total production of

off-season vegetables such as tomatoes, potatoes, and onions almost doubled during the same period (Alam et al. 1996),

NWFP

In NWFP, the total area under fruit production increased by 107% in the fifteen years from 1975/76 to 1991/92. Apple cultivation tripled after 1989/90, mainly as a result of the introduction of high-yield dwarf varieties. In addition to growing fruit crops, the NWFP is highly suitable for growing off-season vegetables because of its diverse physiography and favourable agro-climatic conditions. The total area of vegetables increased by 23% over the same fifteen-year period.

Northern Areas

The construction of the Karakoram Highway has resulted in a gradual transformation of the Northern Areas. A market-oriented agricultural production system is replacing the original subsistence farming system. Increasingly, traders from the lowland plains are making use of the comparative advantage of the Northern Areas to grow specialised crops like seed potatoes. Potato cultivation is replacing wheat, and fodder crops are being grown to support livestock. Fruit orchards are being established on newly cultivated land.

Vegetables are grown near the market centres of Gilgit and Skardu. There are no commercial orchards. Fruit trees are scattered and grown in household compounds or along the boundaries of fields. The major fruit crops grown at present are apples, pears, peaches, plums, apricots, almonds, cherries, walnuts, and grapes. Most of the varieties grown are indigenous and well adapted to local conditions. Apricot is the most common fruit crop because of the suitable climatic conditions. There are as many as 1.17 million trees in the region. The apricot varieties grown are of superior quality, but they are highly perishable and cannot be transported to distant markets. Sun drying in the open is gradually being replaced by solar houses. Every year, about 40,000 kg of apricots are dried in solar houses.

Economic analysis

Table 6.6 shows the average annual growth rates in per cent in the area, total production, and yield of various fruits and vegetables in Balochistan and NWFP between 1981 and 1994.

Table 6.6
Average annual growth rates in the area, total production, and yield of fruit and vegetables in Balochistan and NWFP (%) (1981/82-1993/94)

	Area		Production		Yield	
	Balochistan	NWFP	Balochistan	NWFP	Balochistan	NWFP
Vegetables	2.96	1.88	3.18	1.38	0.23	-0.49
Tomatoes	3.59	3.23	4.20	2.93	0.61	-0.29
Apples	4.87	2.37	5.74	2.15	0.88	-0.23
Apricots	4.18	2.36	4.81	3.53	0.64	1.17
Almonds	1.39	1.87	1.65	6.49	0.27	4.63

In Balochistan, the total production of all the main fruits, fresh vegetables, and tomatoes increased at significant rates of three per cent to six per cent per annum, with the exception of almonds, for which the growth rate was under two per cent. Most of the increase in production resulted from an increase in the area used to raise the crop. The increases in yield were all below 1% per annum,

and for vegetables only 0.23% per annum. Apples showed the highest growth rates for area, total production, and yield.

The growth rates in area under the crop were significantly lower in the NWFP, and the yields of fresh vegetables, tomatoes, and apples actually decreased slightly, so that the rates of increase in the total production of these three crops were markedly lower than in Balochistan. In contrast, yields of both apricots and almonds increased significantly—for almonds, by nearly five per cent per annum. The growth rate in the total production of almonds was more than six per cent per annum, far higher than in Balochistan.

The results show that, although in both provinces the yields of fruits and vegetables are either stagnating or falling, with a few exceptions the area under production has increased significantly and thus led to an increased volume of production. Thus growing of fruit and vegetables seems to be economically viable even when the crop yields are not increasing.

Livestock

Livestock husbandry is the second biggest economic activity in Pakistan after arable and fruit farming. In 1995/96 the livestock sub-sector contributed an estimated 32% of the total agricultural output and 8% of the national GDP (Younas and Raziq 1997). There are no explicit estimates available of the contribution of the livestock sector to the mountain agricultural economy, but livestock clearly play an important role in mountain farming systems and the economy in the mountains of Pakistan. There are considerable areas of rangeland where raising sheep and goats is the main form of agriculture. In other mountain areas livestock play a key role in mixed crop systems of farming contributing draught power and manure to maintain soil fertility, as well as milk and meat for consumption.

Balochistan

The livestock sector contributes an estimated 30% of the GDP of Balochistan. There are 11.1 million sheep and 7.3 million goats in the province, 48% and 24% respectively of the total in the country. The populations of both sheep and goats have increased annually by averages of 7.2 and 7.8% respectively since 1955.

Table 6.7 shows the absolute number and growth in the populations of animals of different species between 1984/85 and 1994/95. The total livestock population grew by 131% in the ten-year period–an average annual growth rate of 13%. Sheep showed the highest growth rate (18% per cent per annum) and the largest increase in absolute numbers; the number of sheep nearly tripled to over 15 million. The number of goats nearly doubled to close to 11 million. In comparison there were few cattle, although their number also nearly doubled to over a million, and very few buffalo. This increase in the number of sheep could be the main cause of the poor condition of the mountain rangelands. The Arid Zone Research Institute (AZRI) estimates that 12 million ha (56%) of rangelands in Balochistan are in poor condition. Balochistan contains about 73% of Pakistan's total area of mountain rangeland. Ninety-three per cent of Balochistan can be classified as rangeland and all of it is mountainous (ICIMOD 1997).

Table 6.7
Population dynamics of livestock in Balochistan (1984-1995)

Livestock	Population 1984/85	Population 1994/95	Population Change 84/85 to 94/95
Cattle	690,000	1,250,000	+560,000 (81%)
Buffaloes	30,000	70,000	+40,000 (133%)
Sheep	5,330,000	15,200,000	+9,870,000 (185%)
Goats	5,750,000	10,780,000	+5,030,000 (87%)
Total	11,800,000	27,300,000	+15,500,000 (131%)

Source: Govt. of Balochistan (1996)
Note: Percentage change over 10 years given in parentheses

NWFP

In NWFP, pastoralism (transhumance) is practised by migratory tribes, mainly the Gujars. Summer is spent in the subtropical and temperate forests (April and May) and subalpine and alpine pastures (June to September) until the downward trek into the foothills and valleys starts in October. The seasonal grazing lands are found in Dir and Swat districts on mountain slopes above 3,300 m; these are covered by snow during the winter and are grazed in the summer.

Under mixed farming systems, livestock are closely integrated with crop production. Farm households maintain between two and six cattle and buffaloes each, as part of the subsistence farming system. Agro-pastoralist households in the mountains may keep up to 20 cattle each. The income from sheep and goats contributes 40 to 70% of farm income in transhumant households and 100% for nomadic pastoralists. As a result of the gradual transformation towards a market-oriented economy, the percentage of lactating female animals in the NWFP increased by 20% between 1976 and 1986 while the percentage of male cattle, used for draught power, decreased by 26%.

Table 6.8 shows the change in the numbers of animals of different species between 1976 and 1986. Overall the livestock population in NWFP declined by 9% over the ten-year period. Only buffaloes

Table 6.8
Population dynamics of livestock in NWFP

Livestock	Population (1986)	Population (1996)	Population Change
Cattle	3,285,000	4237,000	952,000 (29%)
Buffaloes	1,271,000	1395,000	124,000 (10%)
Sheep	2,231,000	2851,000	620,000 (28%)
Goats	4,197,000	6764,000	2,567,000 (61%)

Source: Govt. of Pakistan (1997)
Note: Percentage change over 10 years given in parentheses

showed a marked increase in population, by 68% to 1.3 million, an average annual increase of about seven per cent per year. The cattle population grew slowly at about one per cent per annum. In contrast, the number of sheep and goats dropped, by 39 and 10% respectively, over the ten-year period.

Economic analysis

Table 6.9 shows the changes in the percentage share of different livestock species in the total population of livestock between 1985 and 1995 in Balochistan and between 1976 and 1986 in the NWFP. The share of cattle and buffaloes increased markedly in the NWFP. In the NWFP the share of sheep dropped markedly and that of goats remained nearly constant. In contrast the share of sheep increased by 10% in Balochistan, and that of goats dropped by almost the same amount. In other words, cattle and buffaloes gained in importance in the NWFP while sheep gained in importance in Balochistan.

Table 6.9
Change in percentage share of different livestock species in the total population

	Balochistan change in percentage share (1985-1995)	NWFP change in percentage share (1976–1986)
Cattle	-1.26	+5.16
Buffaloes	0.002	+5.29
Sheep	10.50	-10
Goat	-9.24	-0.45