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## Determinants of Wheat Productivity in Irrigated Balochistan

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**Abstract:** The survey was conducted in two districts of irrigated Balochistan i.e., Nasirabad and Jaffarabad from 73 farmers. The farmers allocated over 46 % of their holdings to wheat production during 1999-2000. However, the area under wheat crop declined by 5.2 % during Rabi 1999-2000. Relatively greater reduction (13.1 %) in wheat acreage was recorded in Jaffarabad district than that in Nasirabad district. Both basal and top dressing methods were used by the farmers. The farmers used fertilizer both at the time of sowing and with first irrigation mostly with N as a second dose, but the quantity far below the recommended 120-60-90 NPK. Late sowing and weed infestation was found as the second major cause of low yield. Lodging and rust contributed in yield loss due to using tall varieties which was found 1.3 and 1.3 % respectively in both the districts. Farmers used only 12.1 and 10 kg of N and P per acre as basal dressing during Rabi 1999-2000. The rate in Basal application was low, 10 kg N and P, while in top dressing the rate of N was high i.e., 15.7 kg but no phosphorus. As top dressing farmers in irrigated Balochistan were only applying N at the rate of 15.7 nut Kg per acre. Fertilizer rate was highest in Nasirabad for basal dressing as compared to Jaffarabad district using more fertilizer as top dressing. Irrigated Balochistan experienced a decline of 2.4 mounds acre<sup>-1</sup> in its wheat yield during Rabi 1999-2000 on overall basis The yield in Jaffarabad district remained unchanged whereas Nasirabad district experienced inclines of 4 mounds acre<sup>-1</sup> in wheat yield during the year 1999-2000 due to high rate of fertilizer.

**Key words:** Low yield, fertilizer, late sowing, wheat

### Introduction

Balochistan is the largest province of Pakistan comprising 44 % of the country's total geographical area and occupies 13 % of total national farm area. Wheat, jowar/bajra, rice, oilseeds, and orchards are the main crops having 46, 17, 8, 7 and 4% share in total provincial cropped area respectively (Anonymous, 1994). Average land use intensity and cropping intensity of the province are 54 and 94%, respectively (Anonymous, 1994).

Wheat is a chief source of staple food for people in Balochistan. Wheat is cultivated under both irrigated and rainfed conditions and their share in total area were 8.5 and 15 %, respectively during 1998-99 (Anonymous, 2000). Therefore, it was decided to analyze the performance of wheat crop in the irrigated Balochistan which contributed 93 % to the total province.

The irrigated Balochistan is mainly fed by pat feeder canal originating from Gaddo Barage. Jaffarabad district is the most fertile and productive district Rice, wheat, pulses, oilseeds and cotton are the major crops of the district (Anonymous, 2000a). Khan (1986) reported that planting of wheat in the middle of November gave higher yield than early and late sown crop. Ciha (1983) observed that late October and early November sowing was better for grain yield among other dates. Subhan *et al.* (1999) claimed that maximum grain yield was obtained from planting on November 15 and yield declined significantly with late planting.

Table 1: Land types in irrigated Balochistan districts

Land types	Percent farms		
	Jaffarabad	Nasirabad	All
Loamy	60.5	60.0	60.3
Clay loam	36.8	40.0	38.4
Sandy loam	02.6	00.0	01.4

All the major types of soil are found in the study area i.e., clay, loam and sandy soils (Table 1). The only released varieties, which are cultivated in most of the area are Zarghoon and Zamindar but most of the farmers as nearer to Sindh also cultivate those varieties, which are mostly grown in Sindh and some banned varieties are also cultivated due to ignorance. Thus wheat losses due to lodging may also affect wheat yield. Less inputs from the recommended dose i.e., 120-90-60 NPK ha<sup>-1</sup> Shahjehan *et al.* (2000) also is the major drawback for low yield. Noor (1988),

reported that maximum yield depends on several factors but organic and inorganic fertilizers play a vital role to ensure maximum yield coupled with improved varieties on different soils. Talug *et al.* (1988), argued that fertilizers are a major factor in a package of improved farm inputs and practices and also reported significant response of N fertilizer on wheat and barley yield. In other words, majority (62.3 %) of the farmers were applying nitrogenous fertilizer to their wheat crop at the stage of flowering commonly called boot/gobh stage.

Noxious weeds may also be dealt as limiting factor for low yield. Cyprus. Pohli, Sodan grass are the major wheat weeds found every where, which are difficult to eradicate. Jamro and Kakar (1996) reported maximum weeds in crop sown in Nov.15 and Minimum in Dec. 15. Klingman and Ashton (1982) reported that one of the causes of losses although very serious, but less noticeable was weed infestation. Gill *et al.* (1979) reported that yield losses occur because of weed infestation, which vary 15-50 % depending upon weed density. Tanji (1987) noted that weed competition resulted in grain yield losses up to 35 % and straw upto 23 %. As for as time of application of weedicide is concerned, the Department of Agriculture recommends application of weedicides between 25-35 days after cultivation. Some of the farmers apply weedicides according to the recommendation of Agriculture department, but some don't use it, due to huge expenses.

The major objectives of the survey were identification of differences in wheat production practices as compared with previous year in irrigated Balochistan and to determine the factors responsible for low productivity of wheat during Rabi 1999-2000.

### Materials and Methods

The Agricultural Economics Research Unit (AERU) and Arid Zone Research Center (AZRC), Quetta conducted a formal survey in the irrigated districts of Jaffarabad and Nasirabad during September, 2000. The respondents were randomly selected during the survey. In total 73 wheat growers were interviewed. Comparative analysis was made between Rabi 1999-2000 and Rabi 1998-1999 in order to investigate the factors responsible for yield during 1999-2000. Wheat varieties grown in the study area were classified into three categories (i) new recommended (ii) old recommended and (iii) banned varieties i.e., the varieties strictly banned by the Department of Agriculture. The respondents were randomly

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Table 2: Distribution of sample farms by districts (Jaffarabad and Nasirabad) and size

Size/District	Jaffarabad	Nasirabad	All districts
<b>Farm size categories</b>			
Small	10 (26.3)	7 (20.1)	17 (23.3)
Medium	10 (26.3)	4 (11.4)	14 (19.2)
Large	18 (47.4)	24 (68.6)	42 (57.5)
All	38 (100.0)	35 (100.0)	73 (100.0)

Figures in parenthesis represent percentages

Table 3: Average farm size and area allocated to wheat crop by districts Jaffarabad and Nasirabad

Items	Jaffarabad	Nasirabad	All
<b>Rabi, 1999-2000</b>			
Average farm size (acres)	91.1	149.1	119.9
Average wheat area (acres)	33.9	078.5	055.2
Percent wheat area	37.2	052.7	046.5
<b>Rabi, 1998-99</b>			
Average farm size (acres)	91.1	149.1	119.9
Average wheat area (acres)	38.9	079.3	058.3
Percent wheat area	42.7	053.2	049.0
Percent change	-13.1	-1.0	-5.2

selected during the survey. The sample included 17 small, 14 medium and 42 large farms (Table 2). Farmers operating less than 12.5 acres of land were put under small farm category, the farmers managing an operational holding of 12.5 acres or more than 25 acres of land were classified as medium farms and > 12.5 acres of land were classified as large farms (Table 3).

Results and Discussion

**Planting time:** Over 72.1 % of the total wheat area was planted till 30th November during Rabi 1999-2000 in irrigated Balochistan, while it was 54.7% for the last year. This implies that 17.4 % more wheat acreage was planted in time during Rabi 1999-2000. Substantial change was noticed in Jaffarabad district, where area planted till 30th November was increased from 42.6 in 1998-1999 to 61 % in 1999-2000. In the overall, majority (64.4 %) of the farmers planted one wheat variety during Rabi 1999-2000. It was observed that area under banned varieties reduced drastically from 71.8 to 56.1 % in Nasirabad district whereas the area increased from 48.6 to 53.9 % in Jaffarabad district (Table 4). Wheat cultivation under water (using residual moisture of the previous crop) condition was doubled throughout the irrigated Balochistan irrespective of any district boundary. It is a well proved fact that planting time has important implications on wheat yield. It significantly affects seed germination, number of tillers, number of grains per spike and eventually the grain yield. Here in Nasirabad and Jaffarabad wheat plantation starts in the month of November and continues till the end of December. The plantation is made usually on the water present after the harvest of Rice (Table 5).

**Lodging:** Wheat crop is prone to risk of lodging rust and grain shriveling etc. During the survey, an attempt has been made to quantify wheat yield losses due to lodging, incidence of rust and grain shriveling etc. Wheat crop during Rabi 1999-2000 encountered yield loss mainly due to lodging and grain shriveling. Overall 8.7% wheat area was affected by crop lodging causing 1.3 mounds acre<sup>-1</sup> yield loss (Table 6). The intensity was severe in Jaffarabad district where 19.9 % wheat area was affected by lodging causing a yield loss of 1.4 mounds acre<sup>-1</sup>. Loss in wheat yield due to grain shriveling was highest (3.3 % of total yield) in Nasirabad district.

**Rust:** Incidence of rust attack was reported on some farms during Rabi 1999-2000. This may be related to the fact that a significant proportion of wheat acreage was under susceptible varieties. The rust incidence reduced wheat yield of 1.3 mounds care<sup>-1</sup> during Rabi 1999-2000. The values was higher than other previous Rabi season mainly because of the higher incidence of rust in Nasirabad

Table 4: Wheat varietal distribution in the districts Jaffarabad and Nasirabad

Items	Jaffarabad	Nasirabad	All
<b>Rabi, 1999-2000</b>			
Percent area			
Farmers growing one variety	84.2	42.9	64.4
Farmers growing > one variety	15.8	57.1	35.6
Area under new recom. varieties	-	-	-
Area under old recom. varieties	46.1	56.1	52.9
Area under banned varieties	53.9	56.1	47.1
<b>Rabi, 1998-99</b>			
Farmers growing one variety	84.2	65.7	75.3
Farmers growing > one variety	15.8	34.3	24.7
Area under new recom. varieties	-	-	-
Area under old recom. varieties	51.4	28.2	36.3
Area under banned varieties	48.6	71.8	63.7

Table 5: Wheat planting schedule in districts Jaffarabad and Nasirabad

Planting schedule and planting method	Jaffarabad	Nasirabad	All
<b>Rabi, 1999-2000</b>			
Percent area			
Area planted before 15th November	05.8	13.6	11.1
Area planted between 15.30 Nov.	76.7	53.6	61.0
Area planted after 30th November	17.5	32.8	27.9
Area planted by wadh water method	12.4	14.3	13.7
<b>Rabi, 1998-99</b>			
Area planted before 15th November	06.2	15.3	12.1
Area planted between 15.30 Nov.	27.5	50.6	42.6
Area planted after 30th November	66.3	34.1	39.3
Area planted by wadh water method	06.3	06.8	06.6

Table 6: Incidence of lodging and wheat yield losses due to lodging rust and shriveling in districts Jaffarabad and Nasirabad

Reasons of yield losses	Jaffarabad	Nasirabad	All
<b>Rabi, 1999-2000</b>			
Area Affected by Lodging (%)	19.9	3.5	8.7
Yield Loss by Lodging (mds/ac)	1.4	1.0	1.3
Yield Loss by Rust.(mds/ac)	0.6	1.6	1.3
Yield Loss by Shriveling (mds)	2.5	3.3	2.9
<b>Rabi, 1998-99</b>			
Area Affected by Lodging (%)	16.6	1.0	6.4
Yield Loss by Lodging(mds/ac)	1.2	0.6	1.1
Yield Loss by Rust(mds/ac)	0.8	0.6	0.1
Yield Loss by Shriveling(mds/ac)	0.2	1.3	0.3

Table 7: Incidence of weed infestation in wheat and methods of weed control in districts Jaffarabad and Nasirabad

Weeds Incidence and control measures	Jaffarabad	Nasirabad	All
<b>Rabi, 1999-2000</b>			
Wheat area seriously infested with weeds (% acreage)	29.9	31.1	30.7
Manually weeded area (% of infested acreage)	10.3	24.2	19.8
Wheat area treated with weedicides (% of infested acreage)	08.4	6.0	6.8
Average cost of weedicide (Rs/acre)	258.1	187.8	215.6
Manual weeding time (days after sowing)	29.2	30.1	29.7
Chemical weeding time(days after sowing)	29.0	29.4	29.2
<b>Rabi, 1998-99</b>			
Wheat area seriously infested with weeds (% acreage)	16.2	30.3	18.9
Manually weeded area (% of infested acreage)	14.6	17.7	16.6
Wheat area treated with weedicides (% of infested acreage)	04.8	7.1	6.3
Average cost of weedicide (Rs/acre)	216.1	97.9	129.5
Manual weeding time (days after sowing)	30.7	31.2	30.9
Chemical weeding time(days after sowing)	29.6	29.5	29.6

district (Table 4). The study also incorporated the perceptions of those farmers, whose yield was low comparing with the last year in order to cross-examine the results. Majority (79.4 %) of those farmers held responsible water shortage for low yield at their farms. Other main reason was the deficient use of fertilizers (Table 6).

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**Weeds:** It was observed that overall 11 % more area was seriously infested with weeds this year. Consequently, the percentage of farmers adopting manual and chemical methods of weeding was higher during current than the last year. Manual weed control was exercised on relatively large proportion of weed infested wheat acreage during both the seasons (Table 7). However, the percentage of weed infested wheat acreage covered with chemical control measures increased during Rabi, 1999-2000. From the results it is obvious that the ignorance of the farmer played a major role in yield loss. He used those varieties, which were banned and weeds were eradicated as he was unable to know the contribution of such weeds in yield losses. Fertilizer used by the farmer was also not according to the recommended dose and schedule. As most of the farmers were tenants, thus they were not in a position to bear the huge expenses on weedicides or labor. They were mostly illiterate and having no/less relation with the agriculture experts. These were all the factors contributed in their low productivity.

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