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# Role of Intensive Management of Wheat in Poverty Alleviation of NWFP, Pakistan

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**Abstract:** Poverty is the worst problem faced by the masses of Pakistan in general and by the masses of her North West Frontier Province (NWFP) in particular. Wheat is the staple food of the people of NWFP but it is always dependent on Punjab, the neighbouring province, for the wheat supply, because the yields produced in the province are very low. A series of agronomic experiments were conducted at the Agricultural Research Institute, Dera Ismail Khan (DIK) from 1997 to 2000, to formulate a package of production technology for the wheat growers of the province to increase their wheat yields. Various row spacings, fertilizer doses, crop varieties, sowing dates and seed rates were studied during the course of experiments. It was observed that improved varieties seeded at a seed rate of 120 kg $ha^{-1}$ during mid November in narrow row spacing (20 cm) with optimum fertilizer rate (NPK: 120-90-30) produced higher yields. It was concluded that more than three times increase over the provincial mean wheat yield could be achieved by adopting the improved package of production technology.

**Key words:** Wheat, poverty alleviation, NWFP, Pakistan

## INTRODUCTION

Pakistan is confronted with several challenges. Poverty is one of the worst challenges faced by the nation. The problem of poverty is deepening day by day. More and more population is falling below the poverty line, which is a great challenge to the scientists, nation building departments and the policy makers. Agriculture sector is the mainstay of the economy of Pakistan. Any boost or depression in the agriculture sector, very conspicuously reflects on the national economy. Spring wheat (*Triticum aestivum* L.) is the most important crop of Pakistan. It enjoys unique a position among cultivated crops. Firstly, it is grown on the area larger than the area of any other crop. Secondly, it provides more calories and proteins in the world diet than any other crop. Thirdly, the world trade in wheat exceeds trade in all others commodities combined. In Pakistan, during 2003-04, wheat was grown on an area of 8.216 million ha, with a total production of 19.5 million tons (Agriculture Statistics of Pakistan, 2004). The area consists of about 7.13 million ha irrigated and 1.1 million ha of un-irrigated land. During the same year, in NWFP, wheat was grown on an area of about 0.741 million ha. One-third of this area is irrigated, while two-third is rainfed (Agricultural Statistics of Pakistan, 2004). Unfortunately, wheat yield in Pakistan is very low and actual farm yield is about 30-35% of the potential yield. It is 50% of the mean yield realized in nations leading in wheat production like China and Mexico (Anonymous, 1997). In NWFP, wheat yield is the lowest among all the four provinces of Pakistan (Agricultural Statistics of Pakistan, 2004). The constraints in the way of higher yields of wheat are poor crop stand, poor nutrition, inadequate water supply, improper varietal selection, genetic impurity of seeds and weed competition (Marwat *et al*., 2003b).

There is an enormous gap between the yield realized on farmers' fields and the research stations. In NWFP, the average yield of farmers is 1382 kg $ha^{-1}$ almost equal to the half of that obtained in Punjab (2500 kg $ha^{-1}$) (Agricultural Statistics of Pakistan, 2004), whereas the yield at experiment stations with intensive management has been realized to the tune of 5000 to 6000 kg $ha^{-1}$. Some of the experiments conducted at Agricultural Research Institute, Dera Ismail Khan, NWFP to research out a package of advance production technology for local conditions to increase the per unit area production of growers are the subject matter of the instant presentation.

## MATERIALS AND METHODS

Different experiments were conducted at the Research Farm of Agricultural Research Institute, Dera Ismail Khan on varaietal performance, date of sowing, seeding rate,

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plant spacing, fertilizer doses and category of seed size etc during 1997-98, 1998-99 and 1999-2000. The individual experiments were undertaken in Randomized Complete Block design with a plot size of 6×5 $m^2$ in case of a single factor and split-plot in case of more than one factor. All cultural practices applied were the same except the respective treatments in each concerned experiments. During the course of the experiments, the data were recorded on the yield and yield components, but the data on grain yield (kg $ha^{-1}$) are emphasized here in the different studies. The data were analyzed statistically by using MSTATC computer software and the statistically significant means were separated by using the Least Significant Difference (LSD) test as outlined by Steel and Torrie (1980).

## RESULTS AND DISCUSSION

**Row spacing and fertilizer:** The perusal of data in Table 1 exhibits that across all the fertilizer doses and years of sowing, the highest yield of 4.35 tons $ha^{-1}$ was obtained under the row to row distance of 20 cm. Similar trend was recorded during all the years of studies. The highest grain yield of 4.44 tons $ha^{-1}$ was obtained with fertilizer dose of 120-90-30 NPK kg $ha^{-1}$, which was not significantly different from the grain yield of 4.28 tons $ha^{-1}$, produced by the fertilizer level of 150-100-30 kg $ha^{-1}$. The 20 cm row sowing gave higher yield as compared to the 30 cm row sowing, because the plant population per unit area increased in closer rows which could suppress weeds more efficiently and could better utilize the available fertilizer and solar radiation (Ahmad *et al*., 2003; Dwyer *et al*., 1991; Malik *et al*., 1996; Marwat *et al*., 2002; 2003a, b).

**Varietal response:** Yield is the outcome of the interaction of genotype and environment (Shah, 1994; Tollenaar and Aguilera, 1992). For optimum yields a better yielding, resistant to insect pests and diseases genotype with the optimum package of production technology is essential. The data in Table 2 exhibits the variable performance of different wheat genotypes under three year of studies. During 1997-98, the highest grain yield (6200 kg $ha^{-1}$) was harvested in Inqilab-91, which was statistically at par with all other varieties except Dera-98 (4800 kg $ha^{-1}$), Raj and Nowshera-96 (4600 kg $ha^{-1}$ each) and Rawal-87 (4900 kg $ha^{-1}$). Inqilab-91 is a standard variety grown in Dera Ismail Khan and elsewhere in the country. Because of the drier nature of the area, the incidence of rust (to which the susceptibility of Inqilab-91 has been reported) was minimal in DI Khan, hence Inqilab-91 can antagonize the other latest evolved cultivars under the agro-ecological conditions of DI Khan. However, at large the yields are more than two times higher than the national average and more than three times higher than the NWFP mean yields (Agricultural Statistics of Pakistan, 2004). During 1998-99, there was statistically significant difference among the cultivars, however, the highest yield of 3700 kg $ha^{-1}$ was produced by Kohistan-97 followed by Inquilab-91 with 3426 kg $ha^{-1}$ grain yield. During 1999-2000, significant differences were observed in grain yield of different varieties. The highest yield of 5100 kg $ha^{-1}$ each was produced by Kohistan-97 and Kohsar 95. Their production was however statistically comparable with all other cultivars except Chakwal-97, which yielded 3800 kg $ha^{-1}$. Inquilab-91 produced 4500 kg $ha^{-1}$ grain yield.

**Planting dates and seeding rates response:** Data in Table 3 exhibits that the highest yield (5.55 t $ha^{-1}$) was achieved in planting during mid-November. It was followed by the planting of the early first week of November (4.9 t $ha^{-1}$). Grain yield of planting date earlier than the 1st week of November or later than the mid November was far lower. A yield loss of 42% has been reported when planting was delayed till Dec.5 (Subhan *et al*., 2004). Both varieties i.e., Dera-98 and Daman-98 produced statistically comparable yields and similarly, all seed rates yielded equally (Table 3). A statistically non-significant but the highest yield of 6.5 t $ha^{-1}$ was harvested in Daman-98 when seeded at 160 kg $ha^{-1}$ seed rate during mid-November. The

Table 1: Grain yield (t $ha^{-1}$) of wheat crop planted at different row spacings and N, $P_2O_5$ and $K_2O$ fertilizer regimes at ARI, D.I. Khan during 1997-98, 1998-99 and 1999-2000

| | Year/row spacings | | | | | | |
|---|---|---|---|---|---|---|---|
| Fertilizer levels | 1997-98 | | 1998-99 | | 1999-2000 | | |
| (kg $ha^{-1}$) | 20 cm | 30 cm | 20 cm | 30 cm | 20 cm | 30 cm | Fertilizer means |
| 90-60-30 | 5.00 | 4.83 | 3.14 | 2.97 | 3.60 | 3.50 | 3.84b |
| 120-90-30 | 5.16 | 4.83 | 4.33 | 4.03 | 4.60 | 3.70 | 4.44a |
| 150-100-30 | 5.50 | 5.16 | 3.38 | 2.95 | 4.40 | 4.30 | 4.28a |
| Means | 5.22 | 4.94 | 3.62 | 3.32 | 4.2 | 3.83 | |
| Year wise means | 5.08a | | 3.47b | | 4.02ab | | |
| Row spacing means | 20 cm: 4.35a | | 30 cm: 4.03b | | | | |

Mean values in the same category followed by different letter(s) are significantly different at 5% level of probability

Table 2: Varietal performance of wheat for grain yield (kg ha$^{-1}$) under irrigated conditions of D.I. Khan during 1997-98, 1998-99 and 1999-2000

| Variety | 1997-98 | 1998-99 | 1999-2000 |
|---|---|---|---|
| Kohistan-97 | 5800ab | 3700 | 5100a |
| Kohsar-95 | 5100ab | 3018 | 5100a |
| Chakwal-86 | 5000abc | 3371 | 4000ab |
| Dera-98 | 4800bc | 2926 | 3800ab |
| Daman-98 | 5300ab | 2833 | 4700ab |
| Raj | 4600bc | 2871 | 4900ab |
| Nowshera-96 | 4600bc | 3185 | 4400ab |
| Bakhrawar-92 | 5500ab | 2963 | 4400ab |
| Tatara | 5000abc | 2593 | 4900ab |
| Rawal-87 | 4900bc | 3000 | 4500ab |
| Inqilab-91 | 6200a | 3426 | 4500ab |
| Chakwal-97 | 5500ab | 2815 | 3800b |

Mean values in the same category followed by different letter(s) are significantly different at 5% level of probability

Table 3: Effect of varieties, sowing dates and seed rates on the grain yield (t ha$^{-1}$) of wheat during 1999-2000

| | Seed rates/varieties | | | | | | |
|---|---|---|---|---|---|---|---|
| | 120 kg ha$^{-1}$ | | 140 kg ha$^{-1}$ | | 160 kg ha$^{-1}$ | | |
| Sowing dates | Dera-98 | Daman-98 | Dera-98 | Daman-98 | Dera-98 | Daman-98 | S. date means |
| 23.10.99 | 4.6 | 3.6 | 4.9 | 4.0 | 3.7 | 3.9 | 4.10c |
| 03.11.99 | 5.3 | 4.9 | 4.9 | 4.9 | 4.5 | 4.8 | 4.90b |
| 13.11.99 | 5.1 | 6.2 | 5.0 | 5.3 | 5.2 | 6.5 | 5.55a |
| 23.11.99 | 4.1 | 4.4 | 3.8 | 4.0 | 4.1 | 4.4 | 4.13c |
| 04.12.99 | 3.9 | 3.0 | 2.7 | 3.2 | 2.3 | 3.3 | 3.10d |
| 14.12.99 | 3.9 | 3.8 | 3.6 | 4.0 | 4.2 | 3.8 | 3.90c |
| Means | 4.48 | 4.35 | 4.15 | 4.23 | 4.00 | 4.45 | |
| Seed rate means | 4.4 | | 4.19 | | 4.22 | | |
| Varieties means | Dera-98: 4.21 | | Daman-98: 4.32 | | | | |

Mean values in the same category followed by different letter(s) are significantly different at 5% level of probability

statistical equality of different seeding rates is attributable to the compensation of tillers per unit area in wheat by enhanced tillering at wider spaces.

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