

Monitoring Wheat Varietal Diffusion in the Irrigated Punjab: Results from 1987-88



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Agricultural Economics Research Unit (PARC),
Ayub Agricultural Research Institute,
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1987-88

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Abbreviations

AARI: Ayub Agricultural Research Institute.
AERU: Agricultural Economics Research Unit.
CIMMYT: International Maize and Wheat Improvement Center.
U.A: University of Agriculture

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MONITORING WHEAT VARIETAL DIFFUSION IN THE IRRIGATED PUNJAB: RESULTS FROM 1987-88

Introduction

Recommended wheat varieties play a significant role in increasing wheat productivity. Wheat breeders at different research institutes in Pakistan are continuously working to develop rust and disease resistant varieties. Evidence suggests that over time improved wheat varieties lose their yield potential and their disease resistance breaks down (Plucknett and Smith, 1986). Adoption of new improved wheat varieties in Pakistan's Punjab is rather slow. (Akhtar et al 1986, 1987). Promising cultivars that were released seven years ago are still not widely adopted by Punjab farmers.

Information on the extent of adoption of these varieties is not readily available. Annual monitoring of wheat varieties is needed to assess the areas under different cultivars. These data and information are useful for breeders at research stations, extension agents and policy makers.

For 1985-86 and 1986-87 the Agricultural Economics Research Unit, Faisalabad, reported on wheat varieties in the most important cropping systems of the irrigated Punjab. The major purpose of this report is to present the extent of diffusion and adoption of wheat varieties for 1987-88 in the same areas.

Research Methods

For the 1987-88 wheat crop a survey was conducted in early April, 1988. A team from the Agricultural Economics Research Unit (PARC), Faisalabad, undertook the survey in the same villages which were chosen (randomly) for the previous two years. These villages were chosen from two cropping systems, i.e. rice-wheat in the northern districts and cotton-wheat in the southern districts of the irrigated Punjab. In all 48 villages were selected from three adjacent Tehsils of the rice zone and the cotton zone. Ferozewala, Gujranwala and Daska Tehsils were selected from Sheikhpura, Gujranwala and Sialkot Districts respectively for the rice zone. Lodhran, Mailsi and Bahawalpur Tehsils were selected from Multan, Vehari and Bahawalpur Districts respectively, for the cotton zone. Fifteen farmers were interviewed from each village to give a total sample size of 720 farmers. Data were analyzed on a Thompson microcomputer

using the SPSS package. Data in Table 1 show the breakdown of sample farmers by cropping zone and Tehsils. On the whole, 59, 21 and 20 percent of the farmers were in small (<5 ha), medium (5-10 ha) and large (> 10 ha) farm size categories, respectively.

Table 1. Sample distribution by Tehsil and farm size in the rice and cotton zones, 1987-88.

Area	Farmers		Farm size		
	Number	Percent	Small (<5ha)	Medium (5-10 ha)	Large (>10 ha)
(Percent Farmers)					
Rice Zone					
Gujranwala	120	16.6	66.7	18.3	15.0
Daska	120	16.6	66.7	20.0	13.3
Ferozewala	120	16.6	44.2	26.7	29.2
All	360	50.0	59.0	20.0	21.0
Cotton Zone					
Bahawalpur	120	16.6	65.8	10.8	23.3
Lodhran	120	16.6	45.8	26.7	27.5
Mailsi	120	16.6	65.8	21.7	12.5
All	360	50.0	59.0	22.0	19.0
Both Zones	720	100.0	59.2	20.7	20.1

Results and Discussion

Farm Size and Wheat Area

Average farm size was found to be 7.8 and 10.6 hectares in the rice and cotton zones, respectively (Table 2). The data in the Table also reveal that small farmers devoted more area to wheat than large farmers. For the 1987-88 wheat crop, cotton zone respondents had devoted only 37 percent of the area to wheat. In the cotton zone, many farmers elected to have an additional cotton picking, with consequences in terms of late wheat planting (Byerlee et al, 1987).

Number of Wheat Varieties Grown

Many farmers, especially large farmers, grow more than one variety to accommodate different planting periods (Byerlee et al, 1987). This statement is supported by data given in Table 3.

However, only 15 percent of the small farmers planted more than one variety. These figures are comparable to the 1986-87 data for the same areas (Akhtar et al, 1987).

Table 2: Average farm size and wheat area in the rice and cotton zones, 1987-88.

Farm size	Average total area (ha)	Average wheat area (ha)	Percent farm area in wheat
Rice Zone			
Small (<5 ha)	2.8	1.8	64
Medium (5-10 ha)	7.6	4.6	60
Large (>10 ha)	23.5	12.5	53
All	7.8	4.4	56
Cotton Zone			
Small (<5 ha)	2.9	2.0	69
Medium (5-10 ha)	7.5	4.9	65
Large (>10 ha)	34.9	12.9	37
All	10.6	4.9	46

Table 3. Number of wheat varieties planted by farm size in the rice and cotton zones, 1987-88.

Farm size groups	Number of varieties planted		
	One	Two	More than two
(Percent farmers)			
Rice zone			
Small (<5 ha)	83.1	15.5	1.4
Medium (5-10 ha)	74.4	19.2	6.4
Large (>10 ha)	55.1	24.6	20.3
All	75.8	18.1	6.1
Cotton zone			
Small (<5 ha)	85.4	14.1	0.5
Medium (5-10 ha)	76.1	16.9	7.0
Large (>10 ha)	61.8	27.6	10.5
All	78.6	17.5	3.9
Both zones	77.2	17.8	5.0

Wheat Varietal Diffusion

In both zones, about 15 varieties of wheat were in use by farmers. The percentages of the sample area planted to different wheat varieties are presented in Tables 4 and 5. The break-up of area under different varieties by Tehsils is given in Appendix i and ii.

Table 4: Area under different wheat varieties in the rice zone of the Punjab during 1985-86, 1986-87, 1987-88.

Varietal Group	Rice zone		
	1985-86	1986-87	1987-88
	(Percent Area)		
New Recommended			
Pak-81	26.3	38.4	50.5
Punjab-81	-	-	-
Faisalabad-83	0.2	1.4	1.4
Faisalabad-85	-	-	0.1
Kohinoor-83	0.1	0.8	1.7
New but does not know name	4.7	7.2	15.2
Old but still recommended			
Bahawalpur-79	-	-	-
B.Silver/Sonalika	10.4	11.3	5.3
Sandal	5.7	5.3	4.0
Pari-73	4.1	3.4	1.7
LU-26	1.4	1.6	1.2
Lyallpur-73	4.3	1.8	1.1
Banned			
Punjab-81*	17.4	7.3	6.7
Bahawalpur-79	0.2	-	-
WL-711	2.3	0.4	1.0
Yecora	10.5	7.8	2.3
Old but does not know name	9.2	9.8	4.8
Others**	3.2	3.5	3.0

* Punjab-81 & Bahawalpur-79 varieties are banned for the rice zone and recommended only for the cotton zone of the Punjab (Bajwa et.al., 1987).

** Mix, Noori, Chenab-70, Mexi, Pawan etc.

Source: 1985-86, 1986-87 data, Akhtar et.al., 1986 and 1987, respectively.

Table 5: Area Under different wheat varieties in the cotton zone of the Punjab during 1985-86, 1986-87 and 1987-88.

Varietal Group	Cotton zone		
	1985-86	1986-87	1987-88
(Percent area)			
New Recommended			
Pak-81	6.2	10.9	11.4
Punjab-81	9.0	5.4	13.5
Faisalabad-83	0.5	-	0.8
Faisalabad-85	-	-	-
Kohinoor-83	0.1	1.5	2.1
New but does not know name	3.2	8.9	3.2
Old but still recommended			
Bahawalpur-79	12.3	9.1	12.3
B.Sliver/Sonalika	21.2	21.6	27.0
Sandal	0.6	0.8	0.7
Pari-73	0.1	-	-
LU-26	0.1	0.2	1.2
Lyallpur-73	0.7	0.4	1.7
Banned			
WL-711	37.2	28.9	23.5
Yecora	1.0	1.3	0.1
Old but does not know name	5.7	5.8	1.0
Others*	2.1	5.2	1.5

* Mix, Noori, Chenab-70, Mexi, Pawan, etc.

Source: 1985-86 and 1986-87 data, Akhtar et.al. 1986 and 1987, respectively.

For the 1987-88 crop the area under the most promising variety, Pak-81, increased considerably in the rice zone. Half of the wheat area in this zone was planted to Pak-81 this year. Areas by percentage of major varietal groupings in this zone for 1987-88 crop were, "new, but does not know name" (15%), Punjab-81 (7%), Blue Silver/Sonalika (5%) and Sandal (4%). This year the area under the varietal group, "new, but does not know name" has increased, compared to the previous two years. Seed for planting 1987-88 wheat crop had been severely damaged by rains. Farmers thus purchased new seed, from seed corporation depots, but they were not able to name it. The area under Blue Silver/Sonalika variety decreased considerably because Pak-81 is seen by farmers as superior.

In the cotton zone, the major varieties were: Blue Silver/Sonalika (27%), WL-711 (23%), Punjab-81 (13%), Bahawalpur-79 (12%) and Pak-81 (11%).

The only noticeable change of varieties was that the area under WL-711 decreased from 37 percent in 1985-86 to 23 percent in 1987-88. The area under Blue Silver/Sonalika has increased from 21 percent in 1985-86 and 1986-87 to 27 percent in 1987-88. Farmers are replacing WL-711 with the short duration variety Blue Silver/Sonalika. There was a significant increase in the area of Pak-81 compared to the previous two years.

Varieties were further classified into new recommended (released since 1980), old but still recommended (released before 1980) and banned or not recommended (see Akhtar et al, 1987). Using this criterion for 1987-88 wheat crop, 69 percent of the wheat area in the rice zone was found to be planted to new recommended varieties. Some 13 percent of the wheat area was planted to old recommended varieties and 18 percent of wheat area was under banned varieties. In the cotton zone, only 31 percent was planted to new recommended varieties. Almost 43 percent was to old recommended varieties, and the remaining 26 percent to banned varieties. Overall, for this year the area under banned varieties had decreased significantly. However, only about 3 percent of the area was planted to varieties released in 1984 or later. This reflects the slow adoption of new cultivars in the Punjab. Farmers have devoted just over half of wheat area in the rice zone to Pak-81 six years after its approval.

Table 6: Summary of wheat varieties planted in the rice and cotton zones of the Punjab, 1987-88.

Area Tehsils	Category		
	New recommended	Old recommended	Banned
(Percent Area)			
Rice zone			
Gujranwala	52.9	14.9	32.2
Daska	60.8	21.6	17.6
Ferozewala	82.7	7.8	9.5
All	68.9	13.3	17.8
Cotton zone			
Bahawalpur	22.4	54.8	22.8
Lodhran	42.2	35.3	22.5
Mailsi	27.2	38.6	34.2
All	31.0	42.9	26.1

Wheat Varietal Diffusion by Farm Size

The data regarding area under different wheat varietal groups by farm size and zone are presented in Table 7. The percentage of area under banned varieties was significantly higher on small farms than that of the large farms, in both zones. In contrast, the area under varieties released since 1980 was significantly higher on large farms as compared to small farms in the rice zone. But there was no significant difference on this issue among small and large farms in the cotton zone. Generally, it can be concluded that small farmers were relatively slow in adopting new recommended wheat varieties in the study area. The information on wheat area planted by zones and farm size to different varieties are presented in appendices iii and iv.

Table 7: Area under different varietal group by farm size and zone, 1987-88.

Varietal Group	Rice zone			Cotton zone		
	Small	Medium	Large	Small	Medium	Large
(Percent Area)						
New recommended	58	66	75	29	36	30
Old still recommended	17	17	10	32	51	45
Banned	25	17	15	39	13	25

Area Under Different Wheat Varieties: Temporal Change

Akhtar et al, 1986 and 1987 conducted the wheat varietal verification survey for 1985-86 and 1986-87 wheat crops in the same villages of both zones. These data can be used to analyze the change over time in the extent of adoption of wheat varieties (Table 8). The area under new recommended varieties increased from 31 to 69 percent in the rice zone. Correspondingly, the area under banned varieties decreased from 43 to 18 percent. In the cotton zone, the area under new recommended varieties has remained unchanged, but the area under banned varieties decreased sizeably from 46 to 26 percent.

The share of old but still recommended varieties in the rice zone has halved from 26 to 13 percent due to more acreage under Pak-81. Whereas, area under this category in the cotton zone has increased from 23 to 43 percent due to more acreage devoted to Sonalika in 1987-88.

Table 8: Area under different wheat varieties in the rice and cotton zones of the Punjab: Temporal change.

Category	Rice Zone			Cotton Zone		
	1985-86	1986-87	1987-88	1985-86	1986-87	1987-88
	(P e r c e n t A r e a)					
New recommended	31	48	69	31	27	31
Old but still recommended	26	23	13	23	32	43
Banned	43	29	18	46	41	26

Source 1985-86 and 1986-87 data, Akhtar et al, 1986 and 1987, respectively.

Summary and Conclusions

This report is the result of regular wheat varietal monitoring survey in the irrigated Punjab. The results over three years suggest that adoption of new wheat varieties by farmers has been rather slow. A major finding of this report is that the area under new recommended varieties is increasing and the area under banned varieties is decreasing, especially in the rice zone. In this zone, Pak-81 is now the dominant variety, being planted on just over half of the area surveyed. However, farmers in both zones devoted only 3 percent of their area to wheat varieties released since 1984 or later.

The area under banned varieties has decreased substantially in the rice zone. The major varieties in this group were Punjab-81 and those whose names were not known by farmers. Punjab-81 is recommended only for areas free of stripe rust. In the cotton zone, farmers still are not replacing WL-711 because its yield has been higher than other varieties. This variety was first banned in 1982, due to its leaf and stripe rust susceptibility.

Three main conclusions may be drawn from the present study. Firstly, there is a need for continuous release of new rust resistant varieties. A sizeable area remains planted to varieties that are known to be susceptible to leaf and stripe rust, especially in the cotton zone. Secondly, the pace of dissemination of new improved seed to farmers remains very slow. Improvements in the seed distribution system and an active extension programme can greatly help farmers to adopt newly-released varieties. Finally, regular monitoring of wheat varieties in the Punjab is needed to assess the adoption patterns of farmers.

Appendix i: Wheat Varieties planted in the rice zone of the Punjab by tehsils, 1987-88.

Category (Varieties)	Tehsils		
	Gujranwala	Daska	Ferozewala
	(Percent Area)		
New recommended			
Pak-81	40.8	43.4	60.0
Faisalabad-83	-	3.7	1.0
Faisalabad-85	-	0.2	-
Kokinor-83	5.1	1.0	0.1
New but does not Know name	7.0	12.5	21.6
Old but still recommended			
Blue silver/Sonalika	5.5	7.5	3.8
Sandal	2.6	7.6	2.8
Pari-73	1.8	2.9	1.0
LU-26	1.5	2.9	0.2
Lyallpur-73	3.5	0.7	-
Banned			
Punjab-81*	16.4	0.8	4.2
WL-711	3.0	-	0.4
Yecora	3.3	0.7	2.5
Old but does not know name	5.8	9.1	1.9
Others**	3.7	7.0	0.5

* Punjab-81 is banned for rice zone.

** Mix, Noori, Chenab-70, Mexi, Pawan, etc.

Appendix ii: Wheat varieties planted in the cotton zone of the Punjab by Tehsils, 1987-88.

Category (varieties)	Tehsils		
	Bahawalpur	Lodhran	Mailsi
	(Percent Area)		
New recommended			
Pak-81	10.7	10.3	12.8
Punjab-81	6.4	25.4	7.6
Faisalabad-83	-	-	2.7
Faisalabad-85	0.1	-	-
Kohinoor-83	1.3	4.9	-
New but does not know name	3.9	1.6	4.1
Old but still recommended			
Bahawalpur-79	15.7	15.7	4.4
B.silver/sonalika	34.0	14.4	34.2
Sandal	1.9	-	-
Pari-73	-	-	-
LU-26	1.7	1.8	-
Lyallpur-73	1.5	3.4	-
Banned			
WL-711	19.6	19.7	32.5
Yecora	-	-	0.3
Old but does not know name	1.3	0.3	1.4
Others*	1.9	2.5	-

* Mix, Noori, Chenab-70, Mexi, Pawan etc.

Appendix iii: Area under different wheat varieties by farm size
in the rice zone, 1987-88.

Varieties	Small (< 5 ha)	Medium (5-10 ha)	Large (> 10 ha)
(Percent area)			
New recommended			
Pak-81	39.6	49.8	55.6
Punjab-81*	-	-	-
Kohinoor-83	1.0	0.3	2.5
Faisalabad-85	-	-	0.1
Faisalabad-83	1.3	2.1	1.2
New but does not know name	16.1	13.8	15.4
Old but still recommended			
B.silver/sonalika	6.4	2.6	5.8
Sandal	3.5	7.9	2.6
Lyallpur-73	2.2	-	1.2
Pari-73	2.7	3.5	0.6
LU-26	1.9	2.7	0.3
Banned			
Punjab-81*	6.0	5.1	7.6
Yecora	4.4	2.9	1.0
WL-711	1.8	0.2	1.1
Old but does not know name	10.3	7.5	1.2
Others**	2.8	1.6	3.8

* Punjab-81 is banned for rice zone.

** Mix, Noori, Chenab-70, Mexi, Pawan etc.

Appendix iv: Area under different wheat varieties by farm size in cotton zone.

Varieties	Farm size		
	Small	Medium	Large
(Percent Area)			
New recommended			
Pak-81	11.2	13.3	10.5
Punjab-81	13.0	16.8	12.5
Kohinoor-83	-	-	4.0
Faisalabad-83	0.9	1.6	0.5
New but does not know the name	4.3	3.9	2.4
Old but still recommended			
Bahawalpur-79	8.4	15.5	12.8
B.S/Sonalika	22.5	31.0	27.7
Sandal	-	-	1.2
Pari-73	-	-	-
LU-26	0.5	2.5	1.1
Lyallpur-73	0.2	1.9	2.3
Banned			
WL-711	33.9	11.6	23.2
Yecora	-	0.4	-
Old but does not know the name	3.9	-	0.1
Others	1.2	1.5	1.7

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