

## **Realising Production Potential Wheat in Cold Arid Kargil Region of J & K**

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### **ABSTRACT**

*Four released wheat varieties (Sonam, Singchen, Mansarover and Kailash) against local check were evaluated through front line demonstrations conducted on farmer's field during kharif/summer season of the years 2008, 2009 and 2010. A total of 25, 16, 20, 15 & 25 demonstrations of Sonam, Singchen, Mansarover, Kailash and Local check were laid covering an area of 2.50, 1.50, 1.50, 1.25 & 1.50 hectare, respectively in 28 villages across 7 blocks of the Kargil district. The soils of FLD field are mostly sandy loam with high available potassium, medium phosphorus and low nitrogen and slightly alkaline in reaction. Sowing was done using residual soil moisture of snow melt from 15th April to 15th May every year. Recommended seed rate i.e. 250 kg ha<sup>-1</sup> against existing farmers practice of using 600 kg ha<sup>-1</sup> (local check) was broadcasted and nutrients i.e. N, P & K in the ratio of 100: 50: 40 kg ha<sup>-1</sup> were applied in the form of DAP, MOP and Urea. Total amount of P and K and half of N was applied as basal dose and the remaining 50% of N was top dressed in two equal splits at 25 (CRI) & 55 (Jointing) days after sowing, while in local check only 100 kg DAP ha<sup>-1</sup> was used and that too as basal application. First irrigation was applied at CRI stage i.e. 21-25 days after sowing and further irrigations were given at 10 days interval in light of high evapotranspiration and light textured soil conditions. Cultivation of released varieties of Wheat viz. Sonam, Singchen, Mansarover and Kailash recorded grain yield between 29.6 to 37.3 q ha<sup>-1</sup>, while as local check recorded a yield of only 11.9 q ha<sup>-1</sup>. Technological gap, which shows the gap in demonstration yield over potential yield varied between 2.7 and 9.7%. Extension gap was recorded maximum in Singchen (25.4%). The technology index being lower shows its feasibility at the farmer's field. It can be concluded from the results of Front Line Demonstration laid over the years in the region, that replacement of local old and impure seed by released varieties and following recommended package of practices for the crop would increase both grain and straw production by many folds.*

**Key words:** *Wheat; Cold arid region; Extension gap; Technological gap;*

**W**heat (*Triticum aestivum*, L.) is the second most important food crop in India after rice both in terms of area and production. Wheat, rice and maize make up 75% of the world's grain production. Wheat enjoys recognition of being a global crop, which is widely cultivated occupying over 22% of the area devoted to cereal grain production in the world. It is a staple food for about a billion people in as many as 43 countries of the world (Verma *et. al.*, 2010). India is the second largest producer of wheat contributing 12% to the world wheat basket. In India, wheat growing regions lie between 110N to 550N latitude and 720E to 920E longitude and altitudes crossing above 3000m above

mean sea level thus representing diverse agro-climatic conditions.

Jammu and Kashmir has diverse agro-climatic conditions ranging from sub-tropical to temperate cold desert and wheat is grown in all these regions. Wheat is grown in an area of about 266 thousand hectare with annual production of 4983 thousand quintals with an average productivity of 19.0 q/ha in the state (Anonymous, 2006-07). Kargil district is located between 320–360 N latitude and 760-790 E longitude at an altitude ranging between 2,700 m to about 4,200 m above mean sea level with a total geographical area of 14,036 square kilometers. In Kargil district wheat is

grown as a kharif/summer crop unlike in other parts of the country where it is grown as a winter crop and is second most important crop of the region. Due to severity of winter wheat fits only in the mono-cropping situation covering an area of 2.50 thousand hectare with annual production of 40 thousand quintals and average productivity of 16 q ha<sup>-1</sup> (Anonymous, 2009). Though, the agro-climatic conditions are best suited for higher productivity of wheat but due to its long duration, farmer's preference is for short duration barley which after harvest can be easily followed by 45-50 days fodder crop cultivation. In the region people are generally worried about fodder as they have to stall feed their cattle for about 7-8 months due to harsh winter. Fodder is a scarce commodity and sometimes fetches higher price than the grain in the region. Keeping this in view wheat varieties yielding both grain as well as higher straw released by state varietal release committee were used under front line demonstrations.

## METHODOLOGY

In the present study performance of four wheat varieties (Sonam, Singchen, Mansarover and Kailash) against local check were evaluated through front line demonstrations conducted on farmer's field during kharif/summer season of the years 2008, 2009 and 2010. A total of 25, 16, 20, 15 & 25 demonstrations of Sonam, Singchen, Mansarover, Kailash and Local check were laid covering an area of 2.50, 1.50, 1.50, 1.25 & 1.50 hectare, respectively in 28 villages across 7 blocks of the Kargil district. Released varieties of Sonam, Singchen, Mansarover & Kailash have a productive potential of 40, 40, 35 & 40 q ha<sup>-1</sup> respectively (Sharma, 2002). The soils of the study area are mostly sandy loam in texture with high available potassium, medium phosphorus and low nitrogen and slightly alkaline in nature. During the crop growing season minimum & maximum temperature extremes ranged between 5.9 0C to 14.2 0C and 14.7 0C to 33.4 0C, respectively. The region does not experience precipitation during the crop period. High velocity winds and long photoperiods are the other characteristics features of the area. Sowing was done using residual soil moisture of snow melt from 15th April to 15th May every year. Recommended seed rate i.e. 250 kg ha<sup>-1</sup> against existing farmers practice of using 600 kg ha<sup>-1</sup> (local check) was broadcasted

and nutrients i.e. N, P & K in the ratio of 100: 50: 40 kg ha<sup>-1</sup> were applied in the form of DAP, MOP and Urea. Total amount of P and K and half of N was applied as basal dose and the remaining 50% of N was top dressed in two equal splits at 25 (CRI) & 55 (Jointing) days after sowing. While, in local check only 100 kg ha<sup>-1</sup> was used and that too as basal application. First irrigation was applied at CRI stage i.e. 21-25 days after sowing and further irrigations were given at 10 days interval in light of high evapo-transpiration and light textured soil conditions. One hand weeding at 30 days after sowing was done by farmers and fed to the cattle. Due to climatic conditions no pest infestation was observed over the years. Before harvesting final plant height (cm) was recorded. At harvesting five random samples of one meter square area from each demonstration fields were harvested and composite samples were weighed for total biological yield. After weighing grains were separated by beating ear heads and cleaned grains were weighed for grain yield. Harvest index, technological gap, extension gap and technology index were calculated using following equations (Samui et al., 2000):

$$\text{Harvest index (\%)} = \frac{\text{Biological yield}}{\text{Grain yield}} \cdot 100$$

$$\text{Technology gap} = \text{Potential yield} - \text{Demonstration yield}$$

$$\text{Extension gap} = \text{Demo. yield} - \text{Farmer's yield}$$

$$\text{Technology index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \cdot 100$$

## RESULTS AND DISCUSSION

A perusal of Table 1 regarding performance of different wheat varieties clearly indicates superiority of Sonam, Singchen, Mansarover and Kailash over Local Check. Plant height which is a clear indicator of straw yield was recorded maximum in Singchen (110.6 cm) about 90 % more over Local Check (58.2 cm). Mansarover recorded a height of 103.7 cm followed by Sonam (97.9 cm) and Kailash (92.7 cm). Plant height had a direct relationship with the straw yield. Highest straw yield of 83.5 q ha<sup>-1</sup> was again recorded in Singchen followed by Mansarover (82.0q ha<sup>-1</sup>). Kailash recorded a yield of 54.7 while as, Sonam recorded a yield of 54.7 q ha<sup>-1</sup>. Local check recorded a yield of only 38.8 q ha<sup>-1</sup> which was 115.3 % less than Singchen. Grain yields of different wheat varieties ranged between

29.6 q ha-1 in Mansarover to 37.3 q ha-1 in Singchen. Lowest grain yield of 11.9 q ha-1 was recorded in local check, which was 213 % less than Singchen variety.

Harvest index was however maximum in Sonam (39.4 %) followed by 35.6 % in Kailash, while local check recorded lowest harvest index of 23.5 % only. Data pertaining to potential and demonstration yields, yield gaps in terms of technological & extension gap and technology index are presented in Table 2. It is evident from data that demonstration yield varied from 29.4 q ha-1 in Mansarover to 37.3 q ha-1 in Singchen. However, maximum increase of 212.6 % over local check was recorded in Singchen followed by Sonam (187.7 %) and Kailash (153.6 %). Technological gap, which gives difference between potential and demonstration yields, was maximum (9.7 q ha-1) in Kailash, while as it was least (2.7 q ha-1) in Singchen. Mansarover and Sonam recorded a technological gap of 5.6 q ha-1 and 5.7 q ha-1 respectively. Huge extension gap existed in all the varieties of wheat. Maximum extension gap of 25.4 q ha-1 was recorded in Singchen followed by Sonam (22.4 q ha-1). Kailash and Mansarover recorded an extension gap to the tune of

18.4 and 17.5 q ha-1 respectively. Package of practices in terms of optimum seed rate, nutrient applications and other management practices need to be popularized among farmers through various extension means. This will help in increased production thereby bridging the extension gap and helping in increasing monetary returns from wheat cultivation, as well as meeting the fodder requirements during winter months. Technology index shows the feasibility of evolved technology at the farmer's field. The lower the value of technology index more is the feasibility of the technology (Jeengar *et. al.*, 2006). Since the technology index varied between 6.8 % in Singchen to 24.3 % in Kailash, therefore, the feasibility of the technology is more.

The data presented in Table 3 indicates the monetary advantage of growing released wheat varieties over local check. As mentioned above wheat straw is equally good source of income in cold arid Ladakh region therefore, income from both grain as well as straw is included in calculating the gross and net income from wheat cultivation. Data showed that net income from local check was Rs. 23,310/= only while as maximum net income of Rs. 92,819/= was obtained in Singchen followed by Mansarover (Rs.

**Table 1. Yield performance of different wheat varieties under front line demonstration in cold arid conditions of Kargil**

Evaluation Parameters	Wheat varieties					
	Years	Sonam	Singchen	Mansarover	Kailash	Local Check
No. of Demonstration	2008	08	06	08	05	10
	2009	10	05	05	05	08
	2010	07	05	07	05	07
	<i>Total</i>	25	16	20	15	25
Total Area (ha)		2.50	1.50	1.50	1.25	1.50
Plant height (cm)	2008	97.6	110.8	103.4	92.6	59.2
	2009	95.9	107.4	100.9	87.9	53.4
	2010	100.3	113.6	106.7	97.8	62.1
	<i>Mean</i>	97.9	110.6	103.7	92.7	58.2
Straw yield (q ha-1)	2008	53.2	83.3	82.9	54.7	38.4
	2009	50.7	79.2	80.1	53.4	38.2
	2010	54.2	87.9	83.2	56.1	39.7
	<i>Mean</i>	52.7	83.5	82.0	54.7	38.7
Grain yield (q ha-1)	2008	34.7	37.1	29.7	30.6	12.3
	2009	32.3	36.5	27.4	28.5	10.6
	2010	36	38.3	31.2	31.7	12.9
	<i>Mean</i>	34.3	37.3	29.6	30.3	11.9
Harvest Index (%)	2008	39.5	30.8	26.4	35.9	24.3
	2009	38.9	31.5	25.5	34.8	21.7
	2010	39.9	30.3	27.3	36.1	24.5
	<i>Mean</i>	39.4	30.9	26.4	35.6	23.5

**Table 2. Yield, yield gaps and technology index of different wheat varieties**

Wheat Varieties	Potential grain yield (q ha-1)	Demonstration yield (q ha-1)	% increase over local check	Technological Gap (q ha-1)	Extension Gap (q ha-1)	Technology Index (%)
Sonam	40.0	34.3	187.7	5.7	22.4	14.3
Singchen	40.0	37.3	212.6	2.7	25.4	6.8
Mansarover	35.0	29.4	147.6	5.6	17.5	16.0
Kailash	40.0	30.3	153.6	9.7	18.4	24.3
Local Check	-	11.9	-	-	-	-

**Table 3. Economics of different wheat varieties in Kargil district (J&K)**

Wheat Varieties	Cost of cultivation (Rs./ha)*				Gross income (Rs/ha)			Net income (Rs./ ha)
	Seed <sup>1</sup>	Fertilizers <sup>2</sup>	Labour <sup>3</sup>	Total	Straw @ Rs. 1000/q	Grain @ Rs. 1100/q	Total	
Sonam	6,250	2,496	20,900	29,646	52,700	36,050	88,750	58,937
Singchen	6,250	2,496	20,900	29,646	83,467	39,165	1,22,632	92,819
Mansarover	6,250	2,496	20,900	29,646	82,067	30,905	1,12,972	83,159
Kailash	6,250	2,496	20,900	29,646	57,733	31,780	86,513	56,700
Local Check	6,000	893	20,900	27,793	38,767	12,530	51,297	23,310

83,159/=), Sonam (Rs. 58,937/=) and Kailash (Rs. 56,700/=). Cost of cultivation in case of recommended varieties is more due to costly seed and balanced nutrient inputs, but the same is offset by huge grain and straw yield. Since released varieties have more production potential than their local check, therefore, they have a direct bearing on the economics thereby benefiting the farmers.

Cost of inputs per hectare:

1. Seed : - Sonam, Singchen, Mansarover & Kailash-250 kg @ Rs 25/ kg and local check 600 kg @ Rs 10/kg.
2. Fertilizers: - DAP 109 kg @ Rs.10.60/kg (demonstration)  
- MOP 80 kg @ Rs. 5.60/kg (demonstration)  
- Urea 175 kg @ Rs. 5.10/kg (demo. & local check)
3. Mechanization & labour:
  - Land preparation @ Rs. 6000/ha
  - Two labours for sowing & basal fertilizer application @ Rs. 150/labour/day

- 24 labours for 12 irrigations & 2 top dressing of urea @ Rs. 150/labour/day
- 40 labours for harvesting @ Rs. 150/labour/day
- Threshing @ Rs 5000/ha

## CONCLUSION

Cultivation of released varieties of Wheat viz. Sonam, Singchen, Mansarover and Kailash and following recommended package of practices for the crop would increase grain yield upto 37.3 q ha-1. Technological gap shows the gap in demonstration yield over potential yield which may be attributed to variations in between research farm and farmer's field. The technology shows its feasibility at the farmer's field; however, extension gap was recorded that need to be reduced.

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