

**STRATEGIES FOR WHEAT PRODUCTION
IN DIFFERENT REGIONS
DURING 1987-88**



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Strategies for Wheat Production during 1987-88

Due to the failure of monsoon rains in several parts of the country *kharif* crop production was very adversely effected. Concerted efforts are required to be made to increase *rabi* production in order to reduce food deficit. This is required to be done in the face of low water availability caused by depleted ground and surface water resources. Among *rabi* crops wheat is the most important. In this bulletin specific strategies for different wheat regions are proposed.

Besides the usual timely and late sown conditions wheat crop during 1987-88 will be grown under the following three main situations :

- Adequate water supply
- Restricted water supply
- No irrigation or rainfed

These would be influenced further by the prevalence of following conditions during the crop season.

- Adequate winter rains
- Inadequate winter rains
- Failure of winter rains

For the realisation of the best yield under the various above likely situations specific strategy would be required to be adopted for each region and also alternative plans kept ready to meet likely contingencies. The main items requiring advance planning would include:

- Arrangements for supply of quality seeds of appropriate varieties for each region and cultural condition.
- Arrangements for fertilizer and weedicide supply.
- Regulating canal water, diesel and electricity supply to tubewells to enable proper scheduling of irrigation as per critical growth stages.
- Procedure for quick transfer of information to cultivators.

Since there is a shortage of certified seed due to untimely rains at harvest in several parts of the country the farmers should be encouraged by the departments to use, as far as possible, the seed they produced in the previous year. *Unspecified seed from outside the state should be avoided as far as possible.* Further it is proposed that :

- Each state should organise its own seed production and place indents well in time for seed, including breeders seed.
- Anticipating shortage of seed for next *rabi*, advance action should be taken to buffer stock seed.
- Every attempt should be made to pay special attention to multiply seed of the latest recommended varieties to bring stability in wheat production.

General Guidelines for Normal Situations

- Choose the latest recommended varieties for your area specific to each cultural condition, i. e., irrigated timely sown; irrigated late sown and rainfed.
- Use certified seed of good physical purity and germination.
- Do not delay sowing beyond the recommended period. Delay of each day will result in more and more reduction in yield.
- Apply recommended quantity of fertilizers and use correct method of application.
- Keep the weeds under control. Use weedicides if necessary.
- Irrigate at the correct time and avoid over irrigation.
- Adopt proper crop protection measures.
- Use right type of equipments for various operations.

Guidelines for Low Water Situations

1. Punjab, Delhi, Jammu and Haryana

- Attempt to apply 4-6 irrigations needed for the wheat crop.
- In case of water shortage apply at least 3 irrigations at crown root initiation, boot leaf and grain filling stages.
- Use full dose of balanced fertilizers and apply micronutrients where necessary.
- Use seed treatment to control loose smut and flag smut.
- Control weeds by the use of weedicides.
- Top dress with additional dose of N if winter rains are good. Wheat can respond fairly well upto 150 kg N/ha.
- Where water availability is very poor divert wheat area to oilseeds and pulses.

2. Western Uttar Pradesh, Rajasthan and Gujarat

- Encourage timely sowing (each day's delay beyond 25th Nov. can result in 25 to 35 kg decline in yield/ha).
- Increase the use of balanced fertilizers.
- Regulate water availability in canals and electric supply for tube-wells so that irrigation can be applied at critical stages, among which crown root initiation and flowering stages are most crucial.
- Divert part of the wheat area to oilseeds and pulses where irrigation water constraint is more serious.

3. Bihar, Eastern UP, West Bengal, Assam and Orissa

- Encourage timely sowing and increase fertilizer use.
- Increase water availability by exploiting under ground resources and regulate availability from existing sources.

- Ensure availability of quality seeds of varieties suitable for late sowing and rainfed conditions.
- Do not leave fields fallow in flood effected areas even if these come to proper condition late (December).
- Prepare seed bed well and do not sow in cloddy and wet soils.
- Use higher seed rate to ensure optimum plant population.

4. Madhya Pradesh

- Regulate water supply to ensure irrigation at crucial stages like crown root initiation and flowering.
- Popularise use of seed drill and fertilizers under rainfed condition.
- Plan seed multiplication for varieties suitable for rainfed condition.
- Divert part of the rainfed area to oilseeds and pulses.

5. Maharashtra and Karnataka

- Avoid very late sowing.
- Increase seed rate and reduce row spacing.
- Apply irrigation as per recommended schedule.
- Increase fertilizer use.
- Divert rainfed wheat area to oilseeds and pulses.

6. Himachal Pradesh and other Northern Hills

- Adopt latest improved varieties and plan their seed multiplication.
- Control loose smut and hill bunt through seed treatment.
- Encourage fertilizer use.
- Avoid broadcast sowing and adopt line sowing.
- Top dress with additional dose of N in case of good winter rains.

Recommended Package of Practices

I. Improved Varieties†

Improved wheat varieties, released by the central as well as state varietal release committee, should be adopted for commercial cultivation during 1987-88 crop season. Wheat varieties released/under cultivation in each zone and different cultural conditions, are given below :

1. Northern Hills Zone :

The zone comprises of hilly parts of J&K, Himachal Pradesh and Uttar Pradesh

- (i) Irrigated, timely sown : CPAN 1796, HB 208, Sonalika
- (ii) Irrigated, late sown : Sonalika
- (iii) Rainfed, timely sown : VL 421, CPAN 1796, HB 208
- (iv) Rainfed, very early sown : VL 616
- (v) State releases
UP : UP 1109 for timely sown irrigated as well as rainfed conditions.

Notes : ● VL 401 and VL 404 grown on a limited scale can also be continued.

● Sonalika should be withdrawn/discontinued.

● For Srinagar Valley only Sonalika is recommended.

2. Northern Plains Zone :

The zone includes whole of Punjab; Karnal, Kurukshetra, Ambala and Sonapat districts of Haryana; Alwar, Bharatpur and Sriganganagar districts of Rajasthan; western Uttar Pradesh; Delhi; Gwalior, Bhind and Morena districts of Madhya Pradesh and foot hills of J&K and Himachal Pradesh.

†In the text (d) denotes *durum* and (*) denotes identified varieties.

- (i) **Irrigated, timely sown** : HD 2204, HD 2329, DWL 5023 (d), PBW 34 (d), WL 711, HD 2009, CPAN 1676, HD 2281, HD 2428*, PBW 154*.
- (ii) **Irrigated, late sown** : HD 2285, Sonalika, HD 2270*.
- (iii) **Rainfed, timely sown** : C 306, WL 410, IWP 72, DL 153-2 (Kundan), PBW 65, PBW 175*, WL 2265.
- (iv) **Saline/alkaline soils** : WH 157, PBW 65.
- (v) **State releases**
- Punjab** : WL 1562, PBW 12, and PBW 54 for irrigated, timely sown, and SKML 1 and PBW 138 for irrigated, late sown conditions.
- Haryana** : WH 147 for irrigated, timely sown condition.
- UP** : UP 368 and UP 2003 for irrigated, timely sown ; UP 2121 for irrigated, late sown and K 65 for rainfed conditions.

Notes : ● WL 711 and HD 2009 should be discouraged in sub-mountainous areas of Punjab, UP, Jammu and Himachal Pradesh and other regions where Karnal bunt is a problem.

- HD 2285 is also suitable for very late sown conditions (end December/ beginning January).

3. North Western Plains Zone :

The zone covers Rajasthan (except Alwar, Bharatpur, Sriganganagar and divisions of Kota and Udaipur), Haryana (except Karnal, Kurukshetra, Ambala and Sonapat districts) and northern Gujarat (Ahmedabad, Banskantha, Sabarkantha, Gandhinagar, Mehsana, Kutch and Rann of Kutch districts)

- (i) **Irrigated, timely sown** : WH 147, HD 2009, Raj 1972, WH 283, Raj 1555 (d), Kalyansona, Raj. 3077.*
- (ii) **Irrigated, late sown** : WH 291, Raj. 2184, VW 120, Sonalika.

(iii) Saline/alkaline soils : WH 157, Raj 1972.

(iv) State releases

Gujarat : J 24 (GAUW 10) for irrigated, timely sown condition.

Note : Kalyansona (irrigated, timely sown condition) and Sonalika (irrigated, late sown condition) still cover large areas and should be replaced by superior alternatives listed above.

4. North Eastern Plains Zone :

The Zone includes eastern Uttar Pradesh (comprising of areas lying east of the line connecting Etah and Nainital except Jhansi division); and whole of Bihar (except Chhotanagpur area).

(i) Irrigated, timely sown : HP 1102, UP 262, HUW 55, HUW 206, Janak, K 7410 (Shekhar).

(ii) Irrigated, late sown : HP 1209, HD 2307, HUW 213, HUW 234, UP 115, Sonalika, K 8020*.

(iii) Rainfed, timely sown : C 306, K 65, K 8027*.

(iv) State releases

UP : UP 368, UP 2003 for irrigated, timely sown and K 65, K 68 for rainfed conditions.

Notes: • Cultivation of Sonalika and UP 115 should be discouraged.

• HD 2307 is also suitable for very late sown conditions.

5. Far Eastern Zone :

Chhotanagpur area of Bihar, whole of West Bengal and Far Eastern States are included in this zone.

(i) Irrigated, timely sown : UP 262, Sonalika, Janak, HD 2402*.

(ii) Irrigated, late sown : HP 1209, Sonalika, BW 11*.

(iii) Rainfed, timely sown : C 306, HD 2385*.

Note : Cultivation of Sonalika should be discouraged.

6. South Eastern Zone :

The zone includes Chhatisgarh region of Madhya Pradesh, entire Orissa, Bhandara and Chandrapur districts of Maharashtra and coastal districts of Andhra Pradesh.

- (i) Irrigated, timely sown : Kalyansona.
- (ii) Irrigated, late sown : Sonalika.
- (iii) Rainfed, timely sown : C 306, Hyb 65, Mukta.
- (iv) State releases

MP : Narbada 215 (Tawa 215) and Tawa 267 for irrigated, timely sown and Narbada 112 and Narbada 195 for rainfed conditions.

7. Central Zone :

The zone comprises of Madhya Pradesh (except Gwalior, Bhind and Morena districts; and Chhatisgarh region); Jhansi division of UP; Kota and Udaipur divisions of Rajasthan, and districts of Baroda, Broach, Panchmahals, Surat, Bulsar, Dangs and Kathiawar region of Gujarat.

- (i) Irrigated, timely sown : Lok 1, WH 147, HD 2236, HD 2278, HD 4530 (d), Raj. 1555 (d), Kalyansona, HI 1077*.
- (ii) Irrigated, late sown : Lok 1, J 405, Swati, HD 2327, Sonalika.
- (iii) Rainfed, timely sown : C 306, Sujata, Mukta, JU 12(d), Meghdoot (d), A-9-30-1 (d), Narbada-4, Hyb 65.
- (iv) State releases

MP : Narbada 215 (Tawa 215) and Tawa 267 for irrigated, timely sown, and Narbada 112 and Narbada 195 for rainfed conditions.

Gujarat : J 24 (GAUW 10) for irrigated, timely sown and GW 2 (d), A 206 (d) for rainfed conditions.

8. Peninsular Zone :

The zone includes Maharashtra (except Bhandara and Chandrapur districts), plains of Karnataka, Andhra Pradesh (except coastal districts) and Tamil Nadu (except hills).

- (i) Irrigated, timely sown : HD 2189, HD 2278, DWR 39, HD 4502 (d), NI 5439.
- (ii) Irrigated, late sown : Sonalika, HI 977*.
- (iii) Rainfed, timely sown : NI 5439, N 59 (d), Bijaga Yellow (d), MACS 1967 (d), MACS 9 (d).
- (iv) State releases

Karnataka : Durum Varieties, KDW 16 (Keerthi) for irrigated and KDW 137 (Kiran) for rainfed conditions.

Note : NI 5439 should be withdrawn from irrigated areas. It can continue in rainfed fields.

9. Southern Hills Zone :

The zone includes hilly areas of Tamil Nadu.

Restricted irrigation : HW 741, HW 971, * NP 200 (dicoccum).

Rainfed : NP 200 (dicoccum).

Note : For additional information other popular literature brought out by such agencies as state departments of agriculture, extension department of agricultural universities and regional agricultural research centres etc. may be consulted.

II. Cultural Practices

Package of cultural practices for various crop production conditions of different regions are as follows :

1. IRRIGATED TIMELY SOWN CROP

- (i) **Date of Sowing** : For all high yielding semi-dwarf varieties recommended for irrigated condition, adjustments should be made in such a way that the date of sowing is reached after the mean daily temperature has dropped down to 22-23°C. The optimum time of sowing for various zones is as follows :

(A) *All Zones* :

(except Northern Hills and Southern Hills Zones) : Middle of November.

(B) *Northern Hills Zone* :

(a) **Mid Hills (upto 1500m sea level)** : 1st fortnight of November.

(b) **High Hills (above 1500m sea level)** : 2nd fortnight of October.

(c) **Very High Hills** : Beginning of May.

(Lahaul-Spiti and other very high hills of northern India where only one summer crop is possible).

(c) *Southern Hills Zone* :

Two crops of wheat in a year : (a) October for the cool season crop

(b) May/June for summer season crop

(ii) **Depth of Sowing**

All varieties : 5-6 cm deep.

(iii) **Seed Rate** :

(a) Northern Hills, Northern Plains, North Western Plains, North Eastern Plains, Far Eastern and Central Zones : 100 kg/ha.

(b) Peninsular Zone and South Eastern Zone : 125 kg/ha.

Notes : ● 100 kg and 125 kg seed rates are valid for varieties with seed weight of around 38 g/1000 grains. In case of bold seeded varieties, increase the seed rate by 25%.

● In the North Eastern Plains Zone for broadcast sown wheat in rice stubbles, use 125 kg/ha.

(iv) Row Spacing :

All varieties : 20-22.5 cm apart.

Note : A closer row spacing of 15 cm or alternatively criss-cross sowing with row spacing of 22.5 cm has also been recommended.

(v) Irrigation Schedule (for all zones) :

(A) Under optimum water availability : Four to six irrigations depending on soil and climatic conditions according to following schedule :

(a) Four irrigations : Crown Root Initiation (CRI), i.e., 20 days after sowings, tiller completion, flowering and milk stages.

(b) Five irrigations : CRI, tiller completion, late jointing, flowering and milk stages.

(c) Six irrigations : CRI, tiller completion, late jointing, flowering, milk and dough stages.

(B) Under limited water availability :

(a) One irrigation : It should be applied inbetween the crown root initiation and tillering stages.

(b) Two irrigations : The first irrigation should be applied at crown root initiation stage and the second at boot stage.

(c) Three irrigations : The first irrigation should be given at crown root initiation stage, second and the third irrigations at boot and milk stages respectively.

Notes : ● Irrigation at CRI stage should be very light.

● More irrigations may be needed in the North Western Plains Zone and Peninsular Zone under very dry climatic conditions and very light soils.

● In the humid parts of North Eastern Plains Zone and Far Eastern Zone only 3—4 irrigations may be necessary.

(vi) Fertilizer Requirement (for all zones) :**(A) Under assured irrigation :**

Nitrogen (N) : @ 80-120 kg/ha depending on previous crop. Wheat following maize, *bajra*, *jowar* and rice should be given 120 kg N/ha. Wheat following legume may be given only 80 kg N/ha.

Phosphorus (P) : @ 40-60 kg of P_2O_5 /ha.

Potash (K) : Based on soil test analysis.

(B) Under limited irrigation :

Nitrogen (N) : @60 kg/ha

Phosphorus (P) : @30 kg P_2O_5 /ha

Potash (K) : Based on soil test analysis.

Notes : • Half the quantity of nitrogen and full quantities of P and K should be applied at or before sowing. Phosphorus should be placed 5 cm below the seed. Remaining half quantity of nitrogen should be top dressed at first irrigation.

- Blanket application of fertilizers should be resorted in case if soil analysis facilities are not available. Adjustments must be made on the basis of soil analysis results.
- Quantities of chemical fertilizers should be adjusted in case of availability of farm yard manure. Combination of the two gives the best results.
- In case of rice-wheat rotation apply recommended quantity of phosphorus to wheat crop only and grow rice in residual.
- Micronutrient deficiencies of zinc, manganese, sulphur and boron are appearing in certain high intensity cropping areas and should be rectified on the advice of experts. Use zinc sulphate @ 25 kg/ha in zinc deficient soils to rectify the defect.

- In alkaline soils with pH above 9.2, apply gypsum @ 10-15 tonnes/ha in consultation with soil scientists/extension workers and adopt appropriate cultural practices.
- In saline soils with ECe above 3-4, increase seed rate and quantity of nitrogen and follow specified irrigation schedule in consultation with soil scientists/extension workers.

(vii) Weed Control :

- (A) *Chemical methods* : To be adopted where infestation of weeds is very heavy in the field.
- (a) If the dominant weed is *Phalaris minor* the following herbicides may be used :
- Methabenzthiazuron (tribunil) @ 1.5 kg a.i./ha
 - Isoproturon (tolkan, graminon or arelon etc.) @ 0.75 kg a.i./ha
 - Metoxuron (dosanex) @ 1.5 kg a.i./ha
- (b) If the dominant weed is wild oats or there is a mixed population of *Phalaris minor* and wild oats, the following herbicides may be used :
- Isoproturon (tolkan, graminon or arelon etc.) @ 0.75 kg a.i./ha
 - Metoxuron (dosanex) @ 1.5 kg. a.i./ha
- (c) For broad-leaved weeds like *Chenopodium*, *Convolvulus* etc. use :
- 2, 4-D @ 0.4 kg a.i./ha.

Note : Method of application.

- *Time of application* : 30-35 days after sowing, i.e., 7 to 10 days after first irrigation as these are post-emergence weedicides.
- *Water requirement* : Required quantity of herbicide to be mixed in 500 to 700 litres of water for spray in one hectare.

(B) Cultural and preventive weed control measures :

- (a) Use of clean wheat seed free from weed seeds.
- (b) Sowing of wheat crop at the optimum recommended time.
- (c) Closer row spacing or criss-cross sowing helps to reduce damage.
- (d) Basal dose of fertilizers to be placed 4 to 5 cm below the seed.
- (e) Weeds should be removed before they set seed.
- (f) Bunds and irrigation channels should be kept free from the weeds.
- (g) Vigilance should be kept so that weeds do not spread through irrigation water.
- (h) Some suitable alternative *rabi* crop like berseem and *rabi* maize should be grown in rotation with wheat in areas heavily infested with *P. minor* and wild oats.
- (i) Since weeds spread very fast, weed control should be organised as a national campaign and as a community effort at village or block level.

2. IRRIGATED LATE SOWN CROP**(i) Date of sowing :**

The seeding of late sown wheat crop should not be delayed beyond:

- Northern & North Western Plains Zones : 25th of December
- North Eastern Plains Zone : 15th of ,,
- Far Eastern and Central Zones : 15th of ,,
- Peninsular and South Eastern Zones : 10th of ,,

(ii) Seed rate :

125 kg/ha in all the zones except Peninsular Zone where the seed rate should be 150 kg/ha. In case of bold seeded varieties, increase the seed rate by 25 per cent.

(iii) Row spacing : 15-18 cm in all zones.

(iv) Fertilizer requirement (in all zones) :**Nitrogen (N) : @60-80 kg N/ha****Phosphorus (P) : @ 30-40 kg P₂O₅/ha****Potash (K) : Based on soil test analysis.**

- Notes :*
- Blanket application of fertilizers should be resorted to only if soil analysis results are not available.
 - Total quantities of phosphorus and potash and half the quantity of nitrogen should be applied at or before sowing. Phosphorus should be placed 5 cm below the seed at the time of sowing. The remaining quantity of N should be applied at the time of first irrigation, i.e., CRI stage.

3. RAINFED CROP

For all zones.

- (i) **Time of sowing** : End of October to beginning of November. In case moisture is conserved in upper layers of soil, semi-dwarf varieties can be sown in first fortnight of November.
- (ii) **Seed rate** : 100 kg/ha
- (iii) **Row spacing** : 20-25 cm
- (iv) **Depth of sowing** : Seed must be placed in wet zone and should not go below 5-6 cm of soil surface. In case moisture is deep, drill seed properly and do not plank after sowing.
- (v) **Fertilizer requirements :**
 - Nitrogen (N)** : @ 40 kg N/ha
 - Phosphorus (P)** : @ 20 kg P₂O₅/ha
 - Potash (K)** : Nil

Note : Total quantities of N and P should be drilled 10 cm deep (5-6 cm below the seed) at or before sowing. Use of seed-cum-fertilizer drill is very helpful for placing the seed and fertilizer at the correct depths for getting good crop stand under moisture stress conditions. Appropriate drill suitable for the region/requirement should be used.

III. Disease Control

1. Rusts

Use resistant varieties.

2. Loose smut :

- (a) Dress seed with Carboxin (vitavax) or Carbendazim (bavistin) @2.5 g/kg seed.
- (b) Adopt solar heat treatment, i.e., soaking of seed in water for four hours and then sun drying. Operation should be carried out in dry, hot and non-windy days during the month of may and June.

3. Karnal bunt :

Use thiram or MEMC @ 2.5 g/kg seed as prophylactic measure for seed-borne inoculum.

4. Hill bunt and Flag smut :

Treat the seed with organomercurial compounds like cersan or agrosan @ 2 g/kg seed or non-mercurial compounds such as Carboxin or Carbendazim 2.5 g/kg seed.

5. Powdery mildew :

Use sulphur dust or kerathane.

6. Leaf-blight :

Dithiocarbamates such as dithane Z-78 or dithane M-45 @ 0.25% may be sprayed as per recommendations.

7. Foot-rot or damping-off :

Treat the seeds with fungicide MEMC @ 2g/kg or brassicol @ 3g/kg seed.

IV. Nematode Control

1. Ear-cockle and *tundu* :

Remove nematode galls by sieving or floatation in 2% common salt solution and wash thoroughly in plain water. Dry the seed before sowing.

2. Molya disease :

- (i) Plough the fields two times during May-June.
- (ii) Rotate with non-host crops such as gram, carrot, radish, marigold and resistant varieties of barley for one or two years.
- (iii) Apply carbofuran @ 1.5 kg a.i./ha in the soil.

V. Insect Pest Control

1. Termites :

- (i) Treat seeds with aldrin 400 ml of 30 EC per quintal of seed for termite control. Before application, the insecticide should be diluted with five litres of water. The emulsion should be sprayed over the seed uniformly spread on the floor. The seed should be turned over to ensure proper mixing. The treated seed should be left overnight for drying before sowing.

OR

Soil application of aldrin 5% or BHC 10% @ 25 kg/ha after final ploughing but before planting is also effective.

- (ii) For the control of termites in standing crop, aldrin 30 EC @ 1.25 l/ha may be used with irrigation water. This treatment is also effective against root aphids.

OR

The same dose of aldrin may be diluted in 5 litres of water and mixed with 50 kg of sand and broadcasted in the field before irrigation. This is also effective if the crop is unirrigated.

2. Shoot fly :

Shoot fly attacks early and late sown crops. Hence to avoid damage by this pest, the sowing should be done between mid-November to mid-December only. If however, late sowing is done and shoot fly incidence (dead hearts) is noticed, spray cypermethrin @ 50 g a.i./ha. Repeat treatment at 15 days interval, if necessary.

3. Brown wheat mite :

Spray any one of the following pesticides against brown wheat mite on the first appearance of the pest :

- (i) formothion (anthio 25 EC @ 650 ml/ha)
- (ii) oxydemeton methyl (metasystox 25 EC @ 650 ml/ha) or
- (iii) phosphamidon (dimecron 100 @ 250 ml/ha). This treatment will also control aphids and jassids. Repeat, if necessary, after 15 days.

4. Other insect pests :

For the control of caterpillar pests like armyworm, cutworm, gram pod borer and other lepidopterous pests and Pyrrilla, spray one of the insecticides namely:

- (i) carbaryl (sevin 50 WP @ 2.5 kg/ha;
- (ii) fenitrothion (folithion 1000 @ 500 ml/ha or sumithion 50 EC @ 1 l/ha) or
- (iii) dichlorvos (nuvan 100 EC @ 500 ml/ha).

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