



Wheat Cultivation in Rainfed Conditions of India

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Wheat is the second most important crop after rice and is widely cultivated in India mainly under irrigated condition; however a large area is covered under rainfed. Wheat production in these regions can be enhanced by adopting certain management practices that includes infiltrating and conserving moisture into the soil, selecting suitable cultivars, timely sowing by recommended method, judicious use of fertilisers, controlling pests and weeds and proper harvesting of the crop.

Introduction

India ranks first among the countries that practice rainfed agriculture both in terms of extent and value of production. Out of an estimated 140.3 m ha net cultivated area of the country, 79.44 m ha (57%) is rainfed, contributing 44% of the total food grain production. It is estimated that even after achieving the full irrigation potential; nearly 50% of the net cultivated area will remain dependent on rainfall. Rainfed agriculture supports livelihood of nearly 40% of India's population.

Wheat is the second most important crop after rice and is widely cultivated in India mainly under irrigated condition; however a large area is covered under rainfed wheat where crop is produced without supplemental irrigation. The choice of suitable varieties to be grown as well as crop management strategies to be followed are important factor for harvesting good crop in these areas dependent on rainfall.

Wheat production in rainfed region can be enhanced by adopting certain management practices that includes infiltrating and conserving moisture into the soil, selecting suitable cultivars, timely sowing by recommended method, judicious use of fertilisers, controlling pests and weeds and proper harvesting of the crop.

Conserving Soil Moisture

Soil moisture is an important factor affecting wheat crop at various stages of its growth. Crop management practices such as tillage and crop rotation are also helpful in improving the yield. Water storage in the root zone can be achieved by controlling runoff, improving infiltration and adopting different water harvesting methods.

- To conserve more water, the soil can be loosened by tillage up to a depth of more than 20 cm using a chisel plough before the advent of rainy season to enhance water permeation capacity of the soil.

- Primary tillage with mould-board plough in the rainfed areas should be avoided as it turns the land upside down bringing salts at the surface layer hampering wheat germination and growth.
- When the rains stop, the land should be planked tightly to withhold maximum moisture. The moisture magnitude retained in the soil depends upon the extent of precipitation, temperature, degree of management and soil properties like depth, texture and organic matter status.
- Rainfed lands may be left unsown during the summer/kharif season to provide all moisture contents conserved in the soil for successful wheat production.
- Water losses during crop growth period can be reduced by mulching that could be natural mulch including straw, leaves, farm residues, compost etc. or artificial including plastic sheet, rock, gravel etc.

Selection of Variety

Selection of a suitable variety is a crucial step for harvesting good crop under rainfed conditions. The zone wise recommended wheat cultivars for rainfed conditions of India are given in the table given below:

S. No.	Zone	Area	Recommended Varieties
1	Northern Hills Zone (NHZ)	Western Himalayan regions of J&K (except Jammu and Kathua distt.); H.P. (except Una & Paonta valley; Uttarakhand (except Tarai area); Sikkim and hills of west Bengal and NE states.	VL 907, VL 738, HPW 349, HS 365, VL 829, VL 616
2	North Western Plains Zone (NWPZ)	Punajb, Haryana, Delhi Rajasthan (except Kota and Udaipur divisions) Western UP (except Jhansi division), Tarai regions of Uttarakhand, Paonta valley and Una district of HP, Jammu and Kathua district of J&K	WH 1080, PBW 175, PBW 396, PBW 644
3	North Eastern Plains Zone (NEPZ)	East UP, Bihar, Jharkhand, West Bengal (excluding hills), Orissa Assam and plains of NE states	K 8962, K 9465, K 8027, HD 2888, MACS 6145
4	Central Zone (CZ)	MP, Chhattisgarh, Gujarat, Udaipur and Kota divisions of Rajasthan and Jhansi division of UP.	HW 2007, HI 1500, HI 1531, Sujata, MP 3288
5	Peninsular Zone (PZ)	Maharashtra and Karnataka, plains of TN, AP and Goa.	K 9644, HD 2781, PBW 596, NIAW 1415

Sowing Time and Seed Rate

Sowing time for wheat in rainfed areas is very important. Early sowing during last week of October and first week of November allows seeds to imbibe more water for germination due

to sufficient moisture in the seeding zone. Moreover, temperature of approximately 25°C during this period supports rapid germination for a vigorous crop stand. The sowing time for rainfed wheat in different wheat growing zones is as follows:

S. No.	Wheat Zone	Sowing Time
1	NHZ	Oct 15-21
2	NWPZ	Oct 20-31
3	NEPZ	Oct 25-Nov 10
4	CZ	Oct 15-31
5	PZ	Oct 15-31

Seed rate for rainfed crop is variable depending upon the time of sowing. Timely sowing of wheat helps in harvesting the stored moisture therefore delayed sowing should be avoided. For instance, the seed rate for sowing up to 15 November is 125kg per hectare (ha) while late sowing between 16 November and 15 December requires 150kg per ha. Germination percentage of the seed must be equal to or more than 90 per cent.

Seed can be soaked in water for 10-12 hours before sowing so that it may absorb sufficient moisture to support germination. Precaution must be taken while selecting seed as poor seed quality may lead to poor germination and hence poor crop stand.

Tillage and Field Preparation

It is suggested that fields in rainfed areas be sown using a drill without any preparatory tillage. Eventually the zero tillage drills have proved to be better for wheat cultivation in rainfed areas. Although, tillage plays significant role in managing weeds, however, moisture conservation is more critical while weeds germinated before sowing can be controlled using a non-selective herbicide like Gramaxone (3.0 L per ha) or Round-up (2.5 L per ha) with 600 litres of water.

For uniform germination an optimum seeding depth should be maintained. Normally the seed is placed 5-6 cm deep in soil. Seed placed deeper than 8 cm results in reduce emergence leading to poor crop stand while seeds placed in near surface are unable to acquire enough moisture for germination. Drill sowing places the seed at adjusted depth. 125 kg seed/ha with a spacing of 20 cm between the rows results in higher yields.

Fertilizer Management

Fertilisers if managed properly contribute more or less 50 per cent to total production of a crop. Moreover fertilisers enhance the 1000-grain weight, protein content, gluten quality and bread making quality of the wheat. All fertilisers in rainfed sown wheat are drilled along with seed and placed 5-10 cm below the seed to maximise its utilisation. Fertiliser rates must be decided on the basis of soil type and the amount of rainfall received during the season. In case soil analysis facilities/result are not available, a basal dose of fertilizer @ 60:30:20 kg N:P:K should be placed 5-10 cm below the seed for one hectare area. For restricted irrigated conditions farmers should apply NPK at 90:60:40 Kg/ha.

Foliar application of 5% urea and KCl solution at 50, 70 and 85 days intervals after sowing is advantageous to improve dry matter accumulation and net assimilation rate in wheat. Moreover, spray of 5% Zinc Sulphate at 60 days after sowing activates certain

enzymes, promotes plant growth and boosts flowering and seed setting. Take short duration green gram before wheat in rotation to improve the physico-chemical properties of soil.

Weed Management

Weeds compete with wheat for moisture, nutrients, space and other inputs. Therefore, these should be controlled from the very beginning. Pre-emergence application of Stomp 25EC (Pendimethalin) at 1.5 L per ha effectively controls weeds in rainfed wheat. On the other hand sanitary measures and other cultural practices help minimise weed flora.

Termites

Termites severely threaten the rainfed cultivated wheat by attacking the plant roots usually in patches causing the yellowing of plants and death. In the termite prone areas, seed treatment with Chlorpyrifos @ 0.9g a.i /kg seed, be taken up for their management. Seed treatment with Thiamethoxam 70WS (Cruiser 70WS) @ 0.7 g a.i./kg seed or Fipronil (Regent 5FS @ 0.3 g a.i./kg seed) is also very effective. In the standing crop, the broadcasting of the insecticide treated soil 15 DAS may be practiced. For this, Chlorpyrifos @ 3 Litre mixed in 50 Kg soil be used for one hectare field.

Diseases

Diseases like rusts, smuts, ear cockle and foot rot etc. can gravely diminish wheat output. Pre-sowing seed treatment with fungicides like Vitavax, Carbendazine, Benlate (each at 2 gram per kg of wheat seed) depresses the disease infestation. Rouging to eradicate infected plants prevents further dispersal of diseases. Spray the crop with Propiconazole (Tilt 25 EC @ 0.1 per cent), or Tebuconazole (Folicur 250EC @ 0.1%) or Triademefon (Bayleton 25WP @ 0.1%) at yellow rust initiation. Usually, it is required in the first half of February. This spray will also help in the control of powdery mildew and Karnal bunt diseases.

Harvesting

In rainfed areas wheat crop matures little earlier than the irrigated ones. Grain hardening, turning of leaves to light golden yellow and drying of straw are the signs of maturity. Field maturity should be distinguished with the physiological maturity. Moisture status of wheat grains at maturity is 18-22 per cent which should be reduced by drying to less than 12 per cent for safe storage.

Conclusion

From the information shared above it can be concluded that good yield of wheat can be harvested in rainfed areas through management practices that includes infiltrating and conserving moisture into the soil, selecting suitable cultivars, timely sowing by recommended method, judicious use of fertilisers, controlling pests and weeds and proper harvesting of the crop.