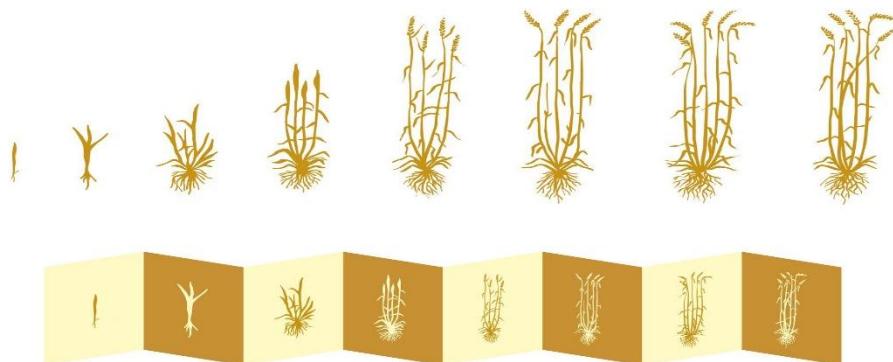


Comprehensive Smart Precision Irrigation Advisory - Wheat Crop

What is Wheat?



Wheat is one of the world's most important cereal crops used to make flour for bread, chapati, pasta, biscuits, and many other foods.

- Scientific Name: *Triticum aestivum*
- Family: Poaceae (Grass family)
- Type: Rabi crop (in India)
- Origin: Fertile Crescent (Middle East region)
- India's Major Wheat Producing States: Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Rajasthan

1. Types of Wheat

Type	Scientific Name	Uses
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Type	Scientific Name	Uses
Bread Wheat	Triticum aestivum	Chapati, bread
Durum Wheat	Triticum durum	Pasta, semolina
Emmer Wheat	Triticum dicoccum	Traditional foods

2. Wheat Growth Stages (110–140 Days)



1 Germination (0–7 Days)

- Seed absorbs water and sprouts.
- Requires 20–25°C temperature.

2 Tillering (20–40 Days)

- Side shoots develop.
- Most critical stage for yield.

3 Jointing & Booting (45–70 Days)

- Stem elongates.
- Spike formation begins.

4 Heading & Flowering (70–90 Days)

- Pollination occurs.
- Needs adequate moisture.

5 Grain Filling (90–120 Days)

- Grain develops starch.
- High water requirement.

6 Maturity (110–140 Days)

- Leaves turn yellow.

- Moisture reduces to 12–14%.
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3. Water Requirement & Irrigation

Total Water Requirement:

- 👉 450–650 mm during entire crop cycle.

Critical Irrigation Stages:

1. Crown Root Initiation (CRI) – 20–25 DAS
2. Tillering
3. Booting
4. Flowering
5. Grain Filling

- ⚠ CRI stage is MOST critical.

For your Smart Precision Irrigation System, soil moisture should be:

- 60–70% field capacity during vegetative stage
 - 50–60% during maturity
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4. Climate & Soil Requirements

Temperature:

- Sowing: 20–25°C
- Growing: 15–20°C
- Harvesting: 25–30°C

Soil:

- Well-drained loamy soil
 - pH: 6.0–7.5
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5. Fertilizer Management

Recommended NPK (per hectare):

- Nitrogen (N): 100–150 kg
- Phosphorus (P_2O_5): 50–60 kg
- Potassium (K_2O): 40–50 kg

Application Schedule:

Stage	Fertilizer
Before sowing	Full P & K + 50% Nitrogen
CRI stage	25% Nitrogen
Tillering	Remaining 25% Nitrogen

In your AI advisory system, you can:

- Detect yellow leaves (Nitrogen deficiency) using CV.
 - Suggest fertilizer based on NDVI index.
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6. Major Diseases & Pests

Diseases:

- Rust (Yellow, Brown, Black)
- Powdery Mildew
- Loose Smut

Pests:

- Aphids
- Termites
- Armyworm

Using Computer Vision + Deep Learning, you can:

- Detect rust disease from leaf images.
 - Predict severity percentage.
 - Suggest pesticide dosage.
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7. Yield Information

- Average Yield in India: 3–5 tons/hectare
 - High Yield Varieties: 6–8 tons/hectare
 - Harvesting Time: March–April (India)
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8. Nutritional Value (Per 100g)

- Carbohydrates: 71g
 - Protein: 12–14g
 - Fiber: 10–12g
 - Iron, Zinc, B vitamins
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9. Advanced Technologies in Wheat Farming

Since you're working on AI + IoT irrigation projects, here are advanced integrations:

◆ 1. NDVI Monitoring

Detect crop health using satellite/drone imagery.

◆ 2. AI Yield Prediction

Use ML models with:

- Soil moisture
 - Temperature
 - Humidity
 - Fertilizer data
- ◆ 3. Disease Detection Using CNN

Train MobileNet / YOLO models for leaf disease classification.

◆ 4. Smart Irrigation Automation

Integrate:

- DHT22
- Soil moisture sensor
- ESP32
- Node-RED Dashboard
- ◆ 5. Digital Twin of Wheat Field

Simulate crop growth using:

- Weather API
 - Sensor data
 - Growth models
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10. Wheat Processing

- Cleaning
 - Conditioning
 - Milling
 - Flour separation
 - Packaging
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11. Global Importance

- Staple food for 35% of world population.
 - Top Producers: China, India, Russia, USA.
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Summary for Your Smart Irrigation Project

Since you're building an AI-based smart irrigation system, wheat is ideal because:

- ✓ Clear growth stages
- ✓ Predictable irrigation schedule
- ✓ Good dataset availability
- ✓ Easy disease detection via CV
- ✓ Suitable for NDVI-based advisory

1. Crop Duration

Wheat crop duration ranges from 110–130 days depending on variety and agro-climatic conditions.

2. Growth Stages with Moisture Requirement

Stage	Days After Sowing	Soil Moisture (%)	Remarks
Germination	0–7	70–80	Ensure proper emergence
CRI	20–25	70–80	Most critical stage

Tillering	25–45	65–75	Vegetative growth
Jointing	45–60	65–75	Stem elongation
Booting	60–75	65–70	Spike formation
Flowering	75–90	70–80	High water demand
Milk Stage	90–110	60–70	Grain filling
Maturity	110–130	50–60	Reduce irrigation

3. Irrigation Schedule

Irrigation No.	Stage	Days After Sowing	Water Depth (mm)	Approx Duration (Drip)
1	CRI	20–25	60–70	2–3 hrs
2	Tillering	40–45	60–70	2–3 hrs
3	Jointing	60–65	60–70	2–3 hrs
4	Booting/Flowering	80–85	60–70	3–4 hrs
5	Milk Stage	100–105	60–70	2–3 hrs
6 (Optional)	Dough Stage	115–120	50–60	2 hrs

4. Fertilizer Application Based on Growth Stage

Stage	Fertilizer	Dose (kg/ha)	Purpose
Sowing (Basal)	DAP / NPK	N:60, P:60, K:40	Root establishment
CRI Stage	Urea	30 kg N	Tillering improvement
Jointing Stage	Urea	30 kg N	Stem & spike growth
Before Sowing	Zinc Sulphate	25	Micronutrient correction

1. Total Seasonal Water Requirement

Total water requirement for wheat crop is approximately 450–650 mm during the complete crop cycle. Irrigation should be scheduled using soil moisture sensors for precision irrigation systems.