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Q14

What are the major reasons for declining rice and wheat yield in the cropping system? How crop diversification is helpful to stabilize the yield of the crop in the system?

UPSC Civil Services Mains 2017 · GS III · 15 marks · Crops, Irrigation and Marketing

Major crops - cropping patterns in various parts of the country; different types of irrigation and irrigation systems; storage, transport and marketing of agricultural produce and issues and related constraints; e-technology in the aid of farmers.

Core demand of the question

- Explain major reasons for declining rice and wheat yields in the dominant cropping system
- Show how crop diversification can stabilise yields
- Keep the Green Revolution belt and rainfed India both in view

Revision summary

The rice-wheat system is losing yield momentum because soils, aquifers, pests, and heat are stressed.

Puddling, urea bias, **residue burning**, and a narrow variety base make the decline worse.

Diversification with pulses, oilseeds, millets, maize, and horticulture breaks pest cycles and saves water.

System yield and farm income stabilise only if the new crops have a buyer.

Eastern India still has a rice-wheat yield gap to close; the north-west needs less paddy on overdrawn blocks.

Introduction

The **rice-wheat** rotation, especially in **Punjab, Haryana and western Uttar Pradesh**, was **the Green Revolution's gift: high yield** on irrigation, dwarf seed, and fertiliser. Yield **growth has slowed**, and in many plots **absolute yield is flat or falling** once soil and water are exhausted. That is a **system** problem - the same two cereals, the same aquifers - not a single bad monsoon. **Diversification** is the yield-stability answer, not a slogan against grain.

Body

Why rice and wheat yields decline in the system

- **Soil fatigue:** continuous cereals mine organic carbon; puddled paddy destroys structure for the next wheat; micronutrients (zinc, iron, manganese) run short while urea is poured.
- **Water:** paddy on a falling water table raises pumping cost and stress; wheat on late-sown, moisture-poor beds after a delayed paddy harvest loses grain-fill.
- **Salinity and sodicity** from canal seepage and poor drainage in command areas.
- **Pests, weeds, and resistance:** brown plant hopper, blast, Phalaris and other weeds; overuse of the same pesticide and herbicide.

- **Variety plateau:** a narrow genetic base after the first dwarf-wheat and HYV-rice wave; seed replacement is weak on small lots.
- **Climate:** warmer nights cut wheat grain weight; untimely rain at harvest; extreme heat at flowering.
- **Residue burning** after combine harvest strips organic matter and pollutes; it is a symptom of a tight paddy-wheat calendar.
- **Extension and tenancy:** hired machines and absentee owners chase short-run tons, not soil tests.
- Outside the classic belt, rainfed rice and wheat fail on **monsoon breaks** and poor seed, which looks like "declining yield" in State averages when drought years cluster.

How diversification stabilises yield in the system

- **Break the pest and weed cycle:** a pulse, oilseed, maize, or vegetable year cuts the specialised enemies of rice and wheat.
- **Nitrogen fixation** by pulses and green manure restores fertility so the next cereal needs less urea for the same grain.
- **Water:** replacing some kharif paddy with **millets, maize, or short pulses** in Punjab-Haryana rest the aquifer; system yield (calories plus cash) can hold even if rice tons fall.
- **Risk:** a second crop type fails on different weather; farm income and **calorie supply at national level** are more stable than a two-crop bet.
- **Soil structure:** maize, cotton (where fit), and horticulture with residue return raise organic matter versus perpetual puddling.
- **Market:** diversification only stabilises if **procurement, processing, and price** exist for the new crop. Otherwise the farmer returns to paddy because the Food Corporation of India is the only certain buyer.
- **Tools:** **crop holidays** for paddy in over-exploited blocks, **direct-seeded rice**, **happy seeder** wheat without burning, **MSP and PDS space for millets and pulses**, and horticulture clusters with cold chain.
- Diversification is **not** abandoning rice-wheat in the eastern **Gangetic plain** where groundwater is still kinder and yield gaps are large; there, **closing the gap** with drainage and seed is the first stability move.

Flow diagram

Rice wheat monoculture -> Yield slowdown
 Yield slowdown -> Soil water pests heat
 Diversification pulses millets horticulture -> Break pest water cycle
 Break pest water cycle -> More stable system yield
 MSP processing for new crops -> Diversification pulses millets horticulture

Conclusion

Rice-wheat yields fall in the old Green Revolution system because soil, water, pests, heat, and a tight calendar are exhausted. Diversification - pulses, oilseeds, millets, maize, horticulture - breaks that calendar, rests aquifers, and spreads weather risk, but only if markets and procurement move with the seed. Stabilise the system; do not only chase last year's paddy ton.

Facts & figures

Rice-wheat system

Dominant irrigated rotation of Punjab, Haryana, and western Uttar Pradesh after the Green Revolution.

Groundwater stress

Kharif paddy in the north-west is a main driver of falling water tables and rising pumping cost.

Residue burning

Combine-harvested paddy straw is burned to free the field for wheat, stripping soil carbon and adding winter pollution.

Pulses in rotation

Fix nitrogen and break cereal pest cycles; they diversify protein supply as well as the field.

Direct-seeded rice

Sowing rice without puddling to save water and protect soil structure for the wheat crop that follows.

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