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Q14

What are the present challenges before crop diversification? How do emerging technologies provide an opportunity for crop diversification?

UPSC Civil Services Mains 2021 · 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

- What are the present challenges before crop diversification? How do emerging technologies provide an opportunity for crop diversification?
- Keep the explanation within a 15-mark length

Revision summary

Rice-wheat MSP, free power, and thin alternative markets are the core barriers to crop diversification.

Fragmented land, credit, and perishability add to the lock-in.

Soil maps, drip, stress-tolerant seed, e-NAM, drones, and cold-chain tech lower the risk of switching.

Technology without a buyer and a water rule will still lose to paddy.

Pair gadgets with FPO processing and targeted incentives in dark zones.

Introduction

Crop diversification means moving land, water, and support away from a narrow rice-wheat-sugarcane lock-in toward pulses, oilseeds, millets, horticulture, and fodder. India needs it for aquifers, nutrition, and price risk. Farmers stay in the old pattern because markets, MSP, and water rules still pay them to. Technology can lower that risk. It cannot repeal MSP politics by itself.

Body

Present challenges

- **MSP and open-ended paddy-wheat procurement** in Punjab, Haryana, and western UP make diversification a private loss even when it is a social gain.
- **Groundwater and free power** keep flood-irrigated paddy rational in water-stressed blocks.
- **Thin markets** for pulses, millets, and perishables: no assured buyer, high price crash after a good crop, weak storage and processing.
- **Risk and credit:** banks and input dealers know the wheat cycle; a new crop looks unbankable without insurance that actually pays.

- **Fragmented holdings** and tenancy insecurity reduce experiments that take more than one season.
- **Knowledge and labour:** horticulture and spices need skill, cold chain, and timely labour that cereal mechanisation already supplies.
- **Policy overload:** seed, fertiliser, and electricity subsidies are still cereal-tilted. **NITI** and State diversification plans stall at the mandi gate.
- Climate uncertainty raises the cost of being first to switch.

How emerging technologies open a door

- **Soil Health Cards, GIS, and remote sensing** show which blocks should not grow paddy, and can target incentive to those blocks.
- **Precision irrigation and fertigation** (drip, sensors) make horticulture and high-value vegetables feasible on less water.
- **Short-duration and stress-tolerant seed**, including public millet and pulse varieties, shorten the hunger gap between two cereals.
- **e-NAM, FPO digital platforms, and warehouse receipts** can, if actually used, give a pulse or oilseed grower a buyer beyond the local cartel.
- **Drones, advisory apps, and weather nowcasts** cut pest and climate surprise on diversified plots.
- **Traceability, GI, and export residual testing** open spices, organic, and horticulture to better prices.
- **Food processing, irradiation, and cold-chain IoT** turn a tomato glut into paste instead of a crash.
- **Solar pumps with feeder-level management** can be tied to crop-shift conditions so technology does not only pump more paddy.

What must sit beside the gadget

- **Price deficiency or limited MSP** for pulses and oilseeds, **crop holiday** or bonus for paddy in dark zones, and **direct diversification payments**.
- **FPOs** and processing so technology is not a phone app on an unsold heap of bajra.
- **Research:** not only GM slogans, but **public breeding** for local millets and oilseeds.

Flow diagram

Cereal MSP power -> Low diversification
 Seed drip sensors eNAM cold chain -> Lower risk and water
 Procurement reform FPO -> Pulses oilseeds horticulture
 Lower risk and water -> Pulses oilseeds horticulture

Conclusion

Diversification is blocked by procurement, water, and thin markets, not by a lack of farmer wisdom. Emerging tools - sensors, seed, drip, digital mandis, and cold chain - reduce risk and water cost. They work when policy pays for the crop the aquifer needs.

Facts & figures

MSP paddy-wheat

Open-ended procurement in key States that anchors the cereal lock-in.

e-NAM

Electronic national agriculture market; a potential but still incomplete diversification market.

Soil Health Card

Plot-level nutrient advice that can justify moving away from blanket cereal fertiliser.

PDMC / drip

Micro-irrigation that makes horticulture viable with less water.

FPOs

Farmer producer organisations that can aggregate diversified output for processing and contracts.

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