



Commercial Cultivation of HT Basmati Rice

[Source: HT](#)

Why in News?

Recently, the Indian government for the first time allowed the commercial cultivation of two **non-transgenic varieties of herbicide-tolerant (HT) basmati rice: Pusa Basmati 1979 and Pusa Basmati 1985.**

- It has been developed by the [Indian Council of Agricultural Research \(ICAR\)](#) to promote sustainable paddy cultivation practices that conserve water and reduce carbon emissions.

Note:

- **Transgenic** refers to a [Genetically Modified Organism \(GMO\)](#) or cell whose genome has been altered by the **introduction of one or more foreign DNA sequences or genes** from another species by artificial means.
 - GMO is an organism that contains a genetically modified genome.
 - All transgenic organisms are GMOs.
- **Non-Transgenic does not** involve inserting any foreign DNA.

What are the Key Features of the New Varieties of Rice?

- These new varieties contain a **mutated AcetoLactate Synthase (ALS) gene** making it possible for farmers to spray **Imazethapyr (a herbicide)** to control weeds.
 - **Mutated ALS gene prevents** the ALS enzymes from having binding sites for Imazethapyr, ensuring that amino acid synthesis remains unaffected.
 - The ALS gene in rice **encodes an enzyme responsible for synthesising amino acids** essential for the crop's growth and development.
 - While, in normal rice plants, the **herbicide binds to the ALS enzymes**, inhibiting amino acid production.
- **Imazethapyr** effectively targets a variety of broadleaf, grassy, and sedge weeds but **cannot distinguish between the crop and invasive plants.**
 - As a result, these **plants can tolerate the herbicide, which kills only the weeds.**
 - Since no foreign genes are involved in the process, **herbicide tolerance is achieved through mutation breeding**, making these plants non-[Genetically Modified Organisms](#) (non-GMOs).
- **Significance:** These HT rice varieties offer several benefits such as eliminating the need for nursery preparation, puddling, transplanting, and field flooding, reducing methane emissions, a major greenhouse gas by supporting [Direct Seeding of Rice \(DSR\).](#)

Concerns Regarding the Use of HT Variety of Rice

- There is a **risk of developing "super weeds"** that become resistant to herbicides through repeated use, making them harder to control.
- There are worries about potential **herbicide residue accumulation** in food products, despite developers' assurances that the grain is residue-free.
- While India permits certain herbicides like imazethapyr, the European Union bans them, which could impact **international trade and safety standards**.
- Questions arise about the **long-term sustainability of HT crops**, as increased herbicide use over time might lead to ecological concerns.

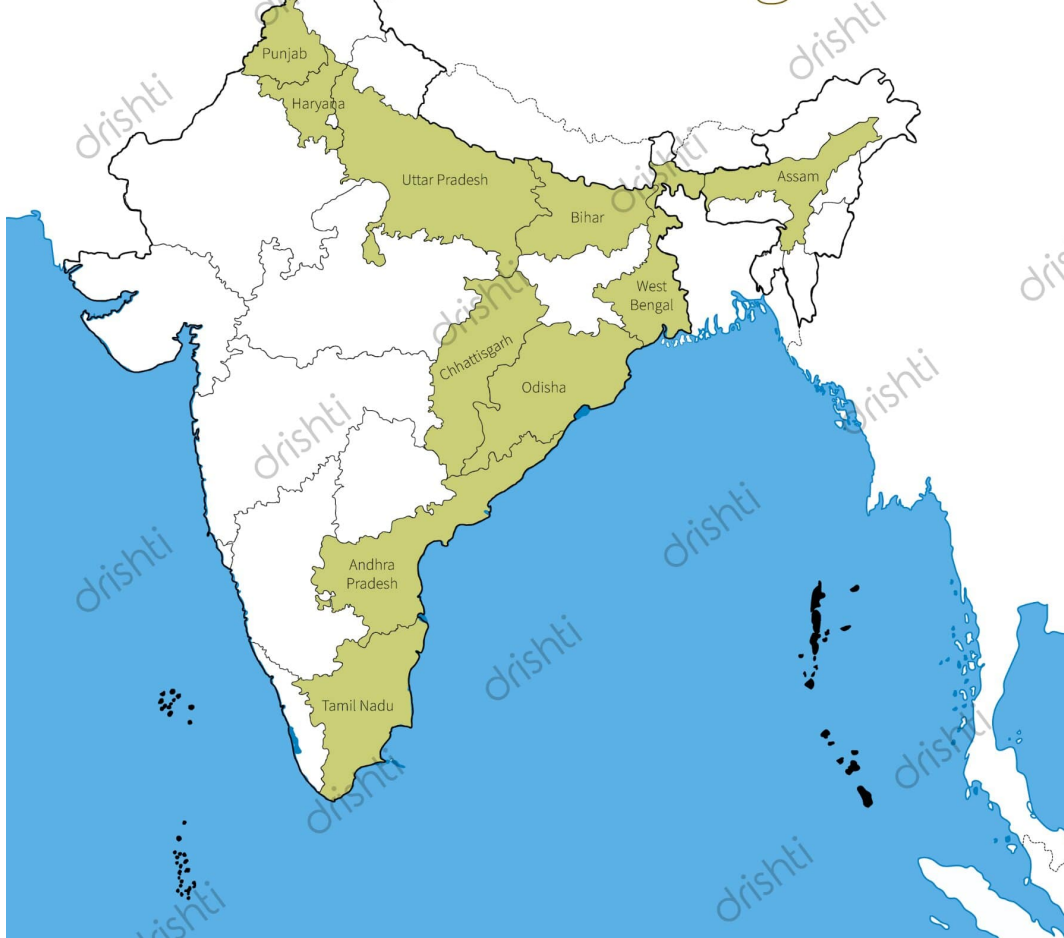
Paddy Transplantation vs Direct Seeding of Rice (DSR)	
Paddy Transplantation	DSR
<ul style="list-style-type: none"> ▪ The field where the seedlings are transplanted has to be "puddled" or tilled in standing water. 	<ul style="list-style-type: none"> ▪ The pre-germinated seeds are directly drilled into the field by a tractor- powered machine.
<ul style="list-style-type: none"> ▪ For the first three weeks or so after transplanting, the plants are irrigated almost daily to maintain a water depth of 4-5 cm. 	<ul style="list-style-type: none"> ▪ There is no nursery preparation or transplantation involved in this method.
<ul style="list-style-type: none"> ▪ Farmers continue giving water every 2-3 days even for the next four-five weeks when the crop is in tillering (stem development) stage. 	<ul style="list-style-type: none"> ▪ Farmers have to only level their land and give one pre-sowing irrigation.
<ul style="list-style-type: none"> ▪ Paddy transplantation is both labour- and water-intensive. 	<ul style="list-style-type: none"> ▪ It is water and labour efficient and reduces methane emissions due to a shorter flooding period and comparatively decreased soil disturbance.

Rice:

- It is a kharif crop that requires high temperature (**above 25°C**) and **high humidity** with **annual rainfall above 100 cm**.
- In southern states and West Bengal, the climatic conditions allow the cultivation of two or three crops of rice in an agricultural year.
 - In West Bengal farmers grow three crops of rice called '**aus**', '**aman**' and '**boro**'.
- About **one-fourth** of the total cropped area in India is under rice cultivation.
 - **Leading producer states: West Bengal, Uttar Pradesh, and Punjab.**
 - **High Yielding States: Punjab, Tamil Nadu, Haryana, Andhra Pradesh, Telangana, West Bengal and Kerala.**
- India is the **second-largest producer** of rice after China.
- **Basmati rice** is India's top agricultural-export produce. In 2022-23, India exported 4.56 **million tonnes** of this valued at USD 4.78 billion.
 - **Basmati's distinctive fragrance** is attributed to **2-acetyl-1-pyrroline (2-AP)**, an organic compound produced during maturation that gives this rice grain its nutty and fragrant aroma.

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Major Rice Producing States



UPSC Civil Services Examination Previous Year Question (PYQ)

Q. What is/are the advantages/advantages of zero tillage in agriculture? (2020)

1. Sowing of wheat is possible without burning the residue of the previous crops.
2. Without the need for a nursery of rice saplings, direct planting of paddy seeds in the wet soil is possible.
3. Carbon sequestration in the soil is possible.

Select the correct answer using the code given below:

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 3 only
- (d) 1, 2 and 3

Ans: D

