



**Improving
farmer resilience,
income & ensuring
sustainability**

**An Impact Study of
25 Years of**

ARIZE®

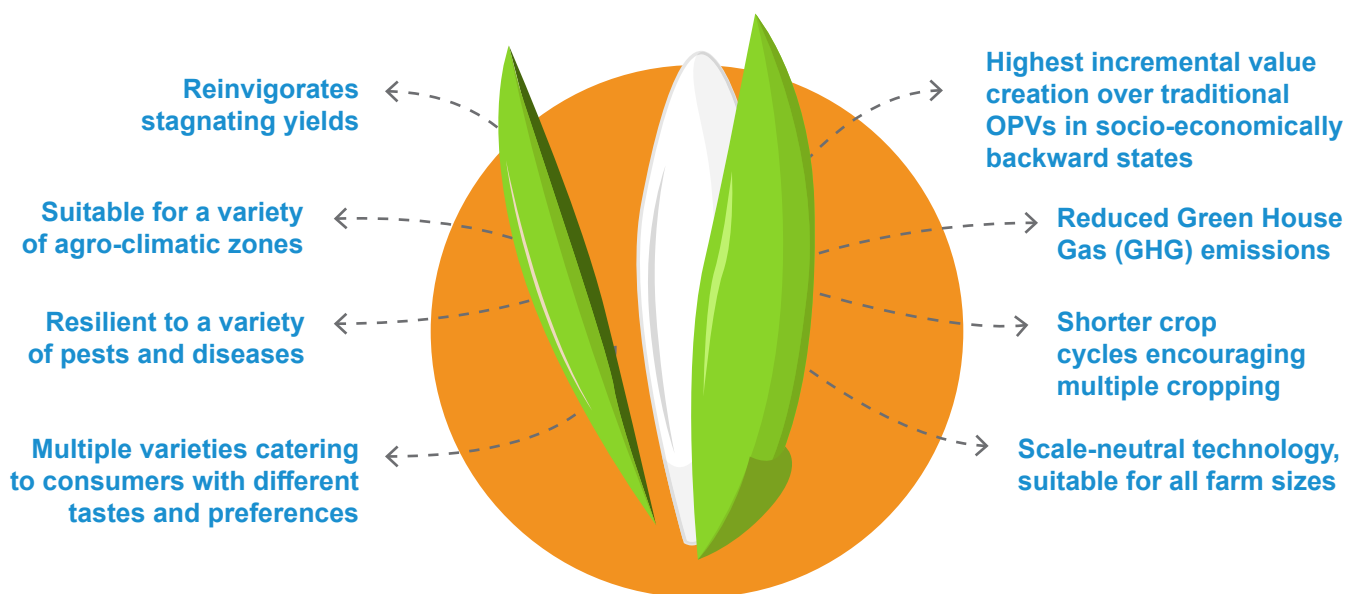


Hybrid Rice:

Enabling smallholder farmers to sustain food security

Rice can be called the lifeline crop of India as it contributes significantly to her food security and is a source of livelihood for over 50 million households. The increased adoption of improved technologies like hybrid rice has had a major role in sustaining this food security. Hybrid rice is bred from two very different parents, ensuring a much higher productivity than other rice varieties grown under similar conditions. Even though, in India the area under hybrid rice cultivation is very small when compared to the overall 43.19 million hectares¹ of land under rice production, the adoption of hybrid rice has increased total production as is evident in many areas. It has demonstrated better performance under unfavourable soil and climatic conditions and has been found to display greater tolerance to water stress. Conventional pure-line rice varieties emit 49%² more methane than hybrids, and hybrid rice varieties have been found to have a 19% lower carbon footprint than other traditional open pollinated varieties (OPVs) of rice.

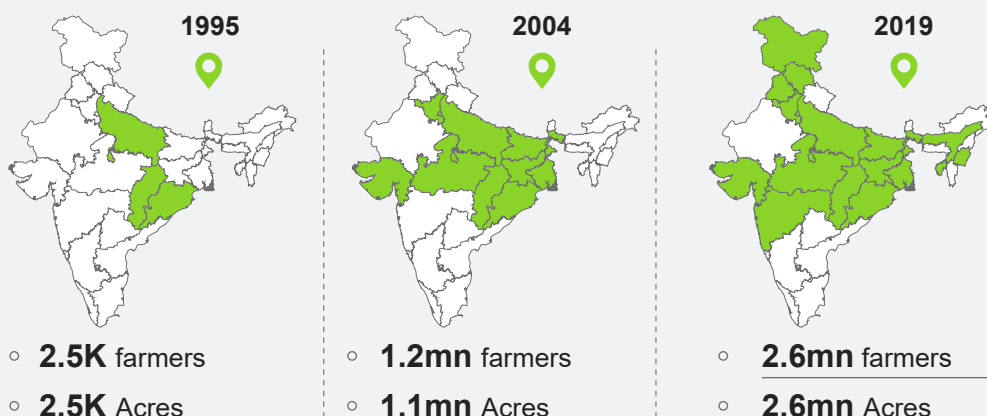
India was the first country to initiate hybrid rice research at the Central Rice Research Institute, Cuttack, in the early 1950s³



ADVANTAGES OF HYBRID RICE

Bayer introduced hybrid rice in India in 1995, under the brand name Arize® building on India's pioneering innovation in this space, with an objective to improve rice productivity, especially amongst smallholder farmers.

Out of the 14 Arize® hybrids currently grown in India, 7 have received official public notification for consistent performance. Arize® has been rapidly adopted by farmers as several hybrids provide higher tolerance for pests and diseases and have performed well in water stress conditions.



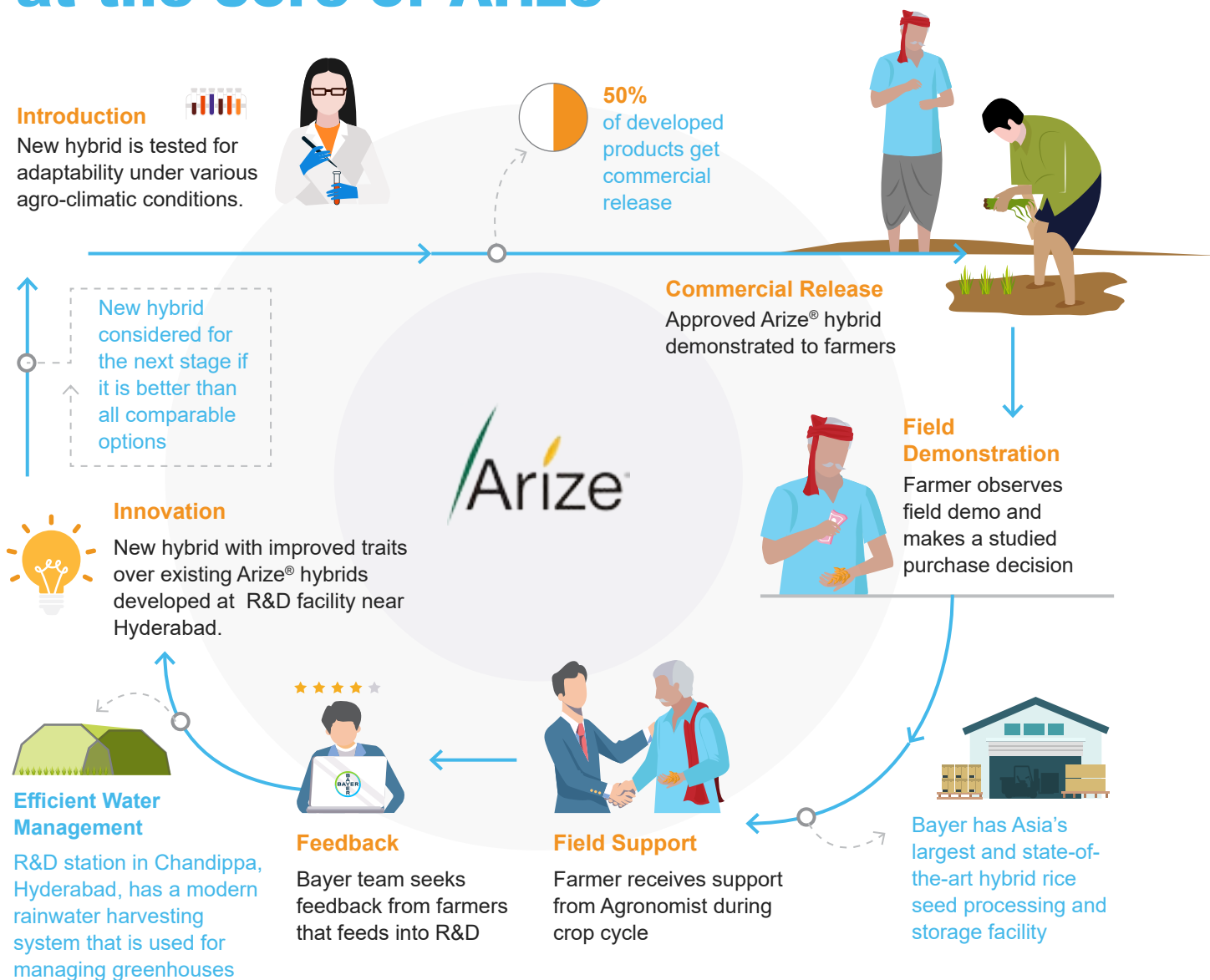
Assuming the average Indian farming household has 5 people, almost all of who are engaged in agriculture, it could be inferred that Arize® impacts the lives of about 10mn people.*

* "How many farmers does India really have", Hindustan Times, Aug 11, 2014

¹ <https://eands.dacnet.nic.in/PDF/Agricultural%20Statistics%20at%20a%20Glance%202017.pdf>; pg 87

² Estimating Spatial Differences in Methane Emissions to Identify Sustainable Rice Sources", Crop Economics, Production, and Management, February 15, 2018

Innovation and Partnership at the core of Arize®



At Bayer, a dedicated team of more than 35 scientists work to constantly find solutions to specific challenges faced by Indian rice growers supported by field staff and agronomists across the country. Currently, about 14 varieties of Arize® are popular in India. Arize 6444 Gold, India's highest-selling rice hybrid is tolerant to Bacterial Leaf Blight (BLB). Another hybrid: Arize 8433 DT offers tolerance against both BLB and Brown Plant Hopper (BPH). The recently launched hybrid: AZ 7006 can grow in partially submerged conditions, which makes it a preferred choice for farmers in areas that are affected by flash floods. The short crop cycles have enabled multi-cropping, mostly with vegetables that can improve soil quality in the long-term.

Bayer has launched "A for Arize®" initiative in 2018 that enables education awareness and awards scholarships to farmers' children for higher education and improving school infrastructure.



Namita Dubey

Daughter of farmer Anil Kumar Dubey, Faizabad, Uttar Pradesh

2018 scholarship recipient



Medical education is an expensive proposition and a distant dream for a family like ours. Thanks to the financial support from A for Arize®, I can now comfortably complete my BAMS course and realise my dream of being a doctor."

Better Rice, Better Life.

In the past 25 years, there have been several instances where Arize® has improved the lives of millions of farmers and their families, strengthening India's rural communities. Of the 2.6 million farmers across 17 states, many farmers have turned their farms into successful commercial ventures.



Improved Resilience:

Arize® hybrids are more resilient to climatic stresses thanks to a robust root system that can draw more nutrients and water from the soil. They are also better adapted to direct seeding techniques that use less water and labour leading to lower methane emissions.



Improved Incomes:

An average Arize® farmer reaps a yield advantage of 20-35% of rice. Short crop duration of some Arize® varieties allow farmers to multicrop with vegetables and other crops, which add to their income and also helps them improve soil quality.



Realising Aspirations:

Higher yields and incomes allow farmers not only to attain self-sufficiency but also enhance their quality of life. Income stability has also reduced migration of farm labour and made agriculture a more sustainable livelihood option.



Size of farm holding: Majority farmers are smallholders with less than 2 hectares



Rice cultivation process: Adapted to Direct Seeded Rice (DSR) technique



Fertiliser/ Pesticide: Controlled use of chemicals



Soil type: Can be grown in loamy, sandy or clayey soil



Yield advantage of 20-35%*



Crop cycle: Short crop cycles allow multicropping

*The figures are for, Arize 6444 Gold and comparisons are with other Open Pollinated Varieties(OPVs)

From Subsistence Farming Towards Income Surplus

Cultivation of Arize® has undoubtedly increased incomes of farmers. It has increased farm productivity and helped achieve surplus income. Many have been enabled to buy more land, afford good education, build off farm assets, meet contingency expenses far more comfortably than before.



₹6,000

of additional income per acre of Arize® compared to conventional rice varieties



1.3mn tonnes

of annual incremental production, pan-India with Arize® compared to conventional rice varieties



Pan-India Incremental yield with Arize® translates to

₹17.4bn (1,740cr)

additional annual income for farmers

In Kharif 2019, Bayer Prayas Foundation conducted a three-week-long capacity building initiative across **1,765 villages** in Jharkhand, Chhattisgarh and Odisha, aimed at introducing advanced agricultural technologies to over **100,000 rice smallholder farmers** in collaboration with **16 local NGOs**. Taking a step further, Bayer platform “Better Life Farming” through its dedicated extension team is actively engaged in round the year capacity building & forward linkage program to extend the benefits of hybrid rice to resource poor small holder farmers cultivating rice in these challenging ecologies and helping them to increase their incomes and improving their livelihood.



Santhi Devi

A progressive rice farmer who multicrops Arize® with vegetables in Bhondra, Jharkhand



I have been growing Arize® for over eight years now. The input costs in terms of seeds and fertilizers are a little higher than traditional varieties, but the yield is consistently more, even in a bad cropping season.”

Santhi has been steadily improving her income. She says she is able to meet healthcare and education expenses for her children without relying on loans. She aims to construct a pucca roof on her house with the surplus income from the coming harvest.*

* niiti consulting analysis

Progressing towards more Sustainable Practices



Arize® hybrids have had a positive environmental impact through lower water use and reduced methane emissions.

Saving water

Short duration hybrid (Arize 6129) saved 189 mm irrigation water as compared to medium duration varieties (PR 116 and PAU 201) and 258 mm as compared to long duration variety (PR 118)⁴



Disease and pest tolerance

BLB tolerance: Arize 6444 Gold, 6129 Gold, Tej Gold, Swift Gold, Diamond
BPH + BLB tolerance: Arize AZ 8433 DT



Submergence tolerance

Arize AZ 7006

- Bacterial Leaf Blight (BLB) is a disease that severely afflicts rice fields during the rainy season for which there is no chemical cure currently available. Having access to a BLB tolerant variety significantly improves the farmer's ability to secure the crop. Vagaries of climate and heavy downpours have affected rice production over the years. In eastern India, rice production has not been traditionally attractive due to low yields caused by regular flooding. Arize® offers rice farmers an opportunity to improve crop productivity even during flash floods. Many varieties of Arize® are better resilient to biotic stresses and are better adapted to direct seeding techniques.
- Brown Plant Hopper (BPH) is a pest that infects the rice plant, depleting its plant sap causing wilting and drying, which is called "hopper-burn". BPH also acts as the vector of several viral diseases.



Pramod Maurya

Chhattisgarh smallholder farmer who paid off rent on his leased land thanks to Arize®



Two years back, my paddy crop was infested by the Brown Plant Hopper. Despite four rounds of pesticide spray, the crop could not be protected. I was unable to pay rent for the additional land that I had leased. I was advised to try the new Arize® variety 8433 DT that was known to be resistant to both Brown Plant Hopper and Bacterial Leaf Blight disease. The bumper harvest helped me pay off my debts."

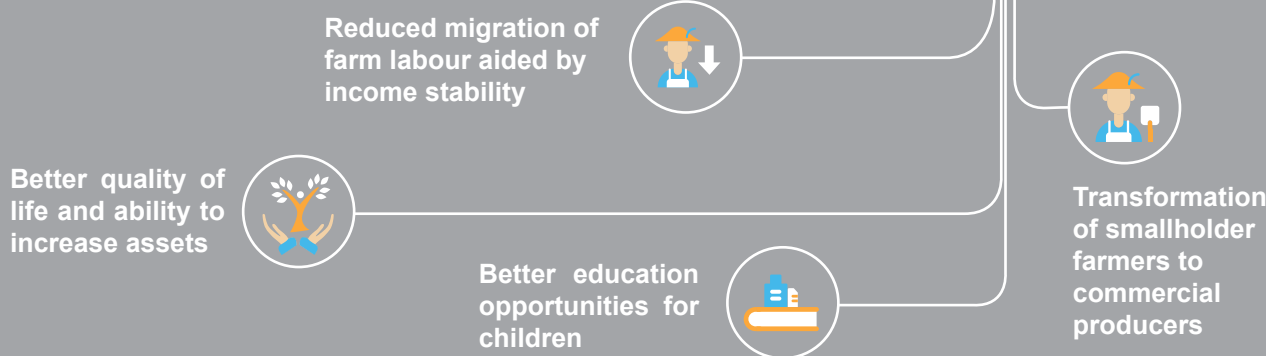
Pramod harvests paddy twice a year. He also grows vegetables, earnings from which are usually enough to meet his household expenses. He is saving the money that he earns from Arize® for meeting big family expenditures!*

* niiti consulting analysis

⁴ Improving water productivity in rice in relation to evaporative demand and cultivar duration" by Singh, C. B., & Sekhon, N. K.; Crop Improvement, 2012

From Limited Dreams to Unlocked Aspirations

Arize® cultivation has had a positive socio-economic impact through increasing incomes and improved assets.



The growth story of Arize® has been one of inclusion since it has positively impacted farmers even in some of the most socio-economically disadvantaged states of India over the last 25 years. Low incomes and unpredictability of agriculture as a livelihood have been major factors that have contributed towards high migration of small farmers to other regions. Better and more predictable incomes have helped reduce migration of small farmers, even enabling many to transform into big commercial farmers. Arize® has enabled several small farmers to pursue a new avenue of income growth by transforming them into Arize® seed producers. Currently, over 20,000 seed producer farmers (using an area of approximately 35,000 acres) benefit from being part of the Arize® supply chain.



Ram Mohan Reddy

Satisfied commercial seed producer despite early apprehensions

“It wasn’t an easy decision for me to convert from a regular farmer to be a commercial seed producer for a private company. I felt it was risky, lest the company refuses to buy back the seeds. But I am a satisfied man now. Bayer payment cycles are short and I get all the support I need to maximise my earnings. I was able to afford a higher education for my son in the US thanks to Arize®.”

Ram Mohan believes the additional earnings have prevented his farm labour from migrating to Gulf countries in search of additional income. He believes that thanks to this new avenue of solvency, many seed producers like himself have entered a new trajectory of living and development.*



Balak Mahato

Transformed from a single crop growing smallholder farmer to a multicrop growing large farmer

“We would earlier grow traditional rice in our small farm. We experimented with growing Arize® Tez and the productivity was phenomenal (60 quintals per hectare). Since then, there has been no turning back. Today, I have 15 acres of land on which I grow wheat, pulses and vegetables and have invested in drip irrigation systems, two tractors, threshers, and the latest spraying machinery.”

Mahato had to discontinue his schooling owing to financial constraints. He is happy that he has been able to afford higher education for his son and daughters.*

The data for this report was compiled and analysed by niiti consulting. Farmers and stakeholders were interviewed in the states of Uttar Pradesh, Jharkhand, Chhattisgarh, Maharashtra and Telangana during primary research.



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