



Delivery of Zinc Rice in Bangladesh

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Staple Food	Daily Per Capita Consumption (all age groups, grams/day) ¹	Total Annual Production (thousand metric tons) ²
Rice	438 g/d	33,889
Irish Potatoes	81 g/d	8,205
Wheat	44 g/d	995
	Daily Per Capita Consumption (grams/day) ³	Zinc Density
Rice	Children 3–4 years: 169 g/d Women: 422 g/d	Conventional Rice: 16 parts per million (ppm) Zinc Target Increment: +12 ppm Biofortified Rice Target: 28 ppm At the target level, biofortified rice provides about 75–90% of the Estimated Average Requirement (EAR).

¹FAO Stat 2009; ²FAO Stat 2012; ³HarvestPlus Surveys

Current Zinc Status

Prevalence of inadequate zinc intake (HarvestPlus study)	Children (2-4 years): 22% Women: 73%
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Varietal Release: A number of zinc rice advanced breeding lines for both Boro (irrigated) and T. Aman (rainfed) seasons are under development through a breeding program at the Bangladesh Rice Research Institute (BRRI). A zinc rice variety was recently approved by the National Seed Board of Bangladesh named BRRI dhan62 that contains 19 ppm of zinc and 9% protein and yields 4.2 tons per hectare (yield is similar to that of other popular, conventional varieties like BRRI dhan33 and BINA dhan7). Crop duration from seed to seed is 112–115 days for BINA dhan7 and BRRI dhan33 while BRRI dhan62 can be harvested within 100 days, which is the shortest duration T. Aman variety in the country. BRRI dhan62 can also escape terminal drought because of its short duration.

A multi-location trial was conducted with 3 zinc leading breeding lines in 80 locations throughout the country. The potential high-zinc lines had a comparable yield with popular variety BRRI dhan28, but zinc content was higher (22.8–25.5 mg/kg while BRRI dhan28 had 16.3 mg/kg), close to 100% of the target level. Among these three lines, at least one will be released for cultivation in the Boro season.

Average Performances of Zinc Rice in Multi-location Trials, Boro, 2013–2014

Designation	Plant Height (cm)	Growth Duration (days)	Grain Yield (t/ha)	Grain Zinc Content* (mg/kg)
BR7840-54-3-1	102	147	6.2	23.3 (+7.0)
BR7840-54-1-2-5	107	148	6.1	25.5 (+9.2)
BR7840-54-2-5-1	104	148	6.1	22.8 (+6.5)
BRRI dhan28 (check)	100	145	6.2	16.3

* Grain zinc content in polished rice was analyzed using XRF

Strategic Factors Driving Delivery: In Bangladesh, rice breeding is mainly in the public sector and conducted by BRRI. In the absence of profitable commercial markets—rice is a notified crop in Bangladesh—the seed industry is reluctant to engage in breeding; furthermore, it currently also lacks the breeding capacity. This situation may change once hybrid rice becomes a commercial opportunity.

Seed Commercialization: HarvestPlus is capitalizing on existing seed networks and partnering with both public and private sector seed producers in zinc rice seed production and marketing. Currently, 12 nongovernmental

organizations (NGOs) and two seed producer associations comprising 250 small- and medium-scale seed producers are involved in zinc rice seed production and delivery. Breeder seed production began in the 2013/14 Boro season. During 2013–14, 1,000 farm demonstrations are underway, distribution of minikits (seed packets) is ongoing, and sales training and marketing efforts are taking place.

Marketing: HarvestPlus will initially focus on seed production, but with increasing market presence after 2016, they will initiate demand creation activities for zinc rice. Demand for zinc rice is created by educating household decision makers, through extension agents, community health workers, and teachers, on the health benefits associated with zinc rice. Building product acceptance is further facilitated by the agronomic superiority of the high-zinc lines in testing compared to older varieties currently farmed. Village participatory selection trials will allow farmers to evaluate the attributes of candidate varieties under their own production conditions, and on-farm demonstration plots initiated in the 2013/14 Boro season will give farmers additional opportunities to observe zinc rice cultivation.

Stakeholders: HarvestPlus works closely with key government agencies such as the Seed Wing of the Ministry of Agriculture (MoA), BRRRI and its SeedNet, Department of Agricultural Extension, and Bangladesh Agricultural Development Cooperation. Collaborators from the University of California-Davis and the International Centre for Diarrheal Disease Research, Bangladesh (ICDDR,B) carry out background food and nutrition surveys.

Potential Impact: By 2016, 500,000 households will be reached through commercialized seed sales. The long-term objective is to develop sustainable markets for zinc seed and grain, reaching a market share of >3% of rice by 2018.

Cost: HarvestPlus will spend an estimated total of US\$10 million for zinc rice delivery activities, 2013–2018.

Delivery Challenges and Recommendations:

- According to government seed regulations, breeder seed can only be produced once official release is granted. This impedes bulking-up of seed for a product launch after a variety is released.
- During milling, different varieties are usually bulked with paddy from similar grain types to produce a commercial grade of grain. This holds a potential risk of adulteration by combining other rice varieties with zinc rice.
- It is recommended to breed several zinc rice varieties for different growing seasons with popular attributes like higher yield, resistance to major diseases and insect pests, and consumers' preferred quality to replace existing mega varieties for both Boro and T. Aman seasons.