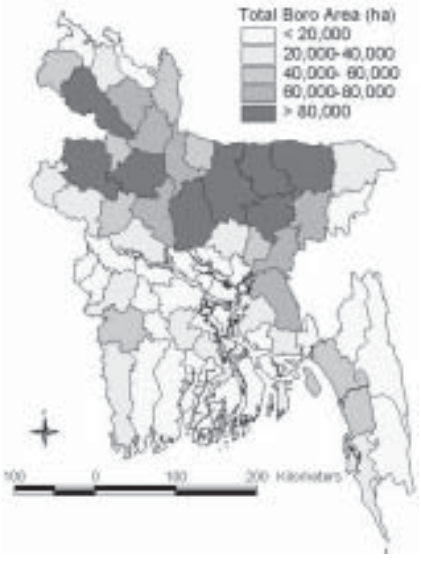
# **Boro Rice:** An Opportunity for Intensification




Boro rice is cultivated in waterlogged, low-lying or medium lands with irrigation during November to May. This type of rice has been cultivated traditionally in river basin deltas of Bangladesh and Eastern India including Eastern U.P., Bihar, West Bengal and Assam. In these regions, water accumulates during monsoon months and cannot be drained out in winter months. This practice is spreading even to those non-traditional areas where irrigation is available.

Boro rice system takes advantage of residual moisture after the harvest of *kharif* rice. Such areas with high moisture retention capacity are low-lying ditches where water is stored or gets accumulated, areas adjoining canals and roads, *Chaur*-lands/*Tal*-lands, etc. With the increase in irrigation facilities, boro crop is now being taken in areas outside its traditional boundaries and a new cropping system is emerging.

"Boro" is a Bengali language word derived from a Sanskrit word "BOROB". This means a special type of rice cultivation on residual or stored water in low-lying areas after the harvest of *kharif* rice.

**Boro rice in India**

| | |
|---|---|
| 1991 | 1.35 million ha |
| 1995 | 1.60 million ha |
| 2000 | 2.95 million ha |

Boro is a winter season, photo-insensitive, transplanted rice cultivated on supplemental irrigation. This gives the farmers a chance to grow a *rabi* season crop which normally they could not grow. Rapid expansion of boro rice cultivation has taken place in recent years in West Bengal and Bihar, it is likely to expand further to more areas in West Bengal, adjoining areas of Assam, parts of Eastern U.P., coastal areas of Orissa and Andhra Pradesh.

**Productivtiy of Boro Rice**

| State | Productivity (t/ha) |
|---|---|
| West Bengal | 3.5 |
| Orissa | 3.0 |
| Assam | 3.5 |
| Bihar | 3.0 |
| Eastern U.P. | 2.0 |
| **Average** | **3.0** |

## Advantages of Boro

Boro rice is known for high productivity (5-6 t/ha) in deepwater areas of Eastern India, where productivity has traditionally been very poor (<1 t/ha) during the *kharif*. This is mainly because boro is more manageable than *kharif* rice. For example, water management in boro is more systematic as it is an irrigated crop. Consequently, this crop responds well to higher doses of fertilizers resulting in higher production. Being a winter season crop, it is spared from insect-pest infestation.

**Major Areas Growing Boro Rice**

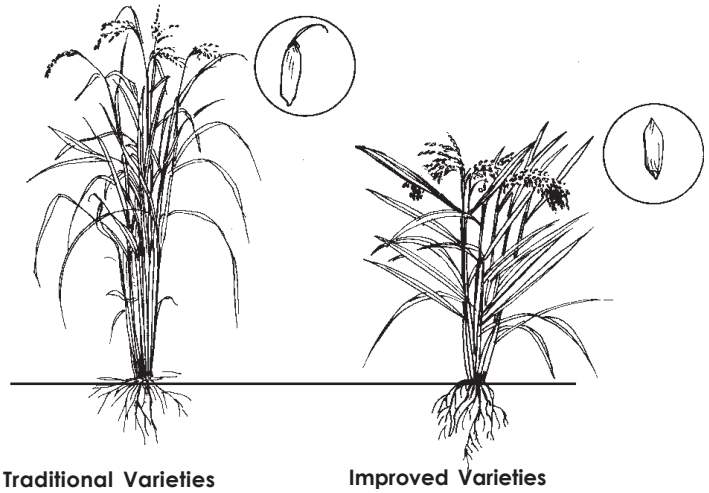
| State | Districts |
|---|---|
| Eastern U.P. | Ballia, Basti, Gorakhpur, Deoria, Gazipur (Lake, rivers, *nalahs,* etc.) |
| Bihar | Purnia, Katihar, Madhepura, Madhubani, Darbhanga, Saharsha (Low-lying *chaurs* and *chauri*) |
| West Bengal | Baredwan, 24-pargana, Nadia, Midnapur, Bhankurh |
| Orissa | Balasore, Bhadrak, Kendrapara (Low-lying areas of coastal belt) |
| Assam | Nawgaon, Karimganj (Lake areas) |

More important advantage is the lower winter temperature during the earlier crop growth. This facilitates the accumulation of photo-synthates, thereby increasing carbon: nitrogen ratio. During the ripening period, the temperature rises facilitating the process. Variations in these parameters explain variation in yields across the boro growing areas.

Increased adoption of boro rice cultivation, both within and outside its traditional boundaries, has helped in the emergence of many local cropping patterns. This has also helped in transforming the economy of the farmers.

## Agro-Technology for Boro Rice

Even a marginal increase in the productivity of boro rice in Eastern India will significantly increase the total rice production in the country. Therefore, a sustainable agro-technology for boro rice is imperative.



**Traditional Varieties**

- Tall
- Weak stemmed
- Awned
- Cold-tolerant
- Grain quality poor
- Low yield

**Improved Varieties**

- Early to mid-early in maturity
- Dwarf and sturdy
- High yield
- Better grain quality

## Desirable Traits for Boro Rice Cultivars

The boro rice cultivars have additional desirable traits over those of irrigated rice varieties grown during *kharif*. The cultivar has to be of short duration having physiological and plant type parameters to shorten the vegetative growth phase and more efficient dry matter accumulation. These would mean cold tolerance, lower loss of water due to transpiration, shade efficiency, less tillering and more effective tillers. Quick establishment capability after transplanting is also a desirable trait.

As boro rice seeds are sown in early winter, the seeds of the cultivar should be able to germinate at lower temperatures say, ranging between 12-14°C. The shape of vacuoles and thickness of mesophyle layer in the internal structure of the leaves need to be bigger enough to make the cultivar more cold-tolerant.

The cultivar needs to have low amylase content (20%-50%) in the grain. The expected yield level has to be 6-7 t/ha with harvest index of 0.50 to 0.55.

**Popular Varieties**

Gautam, Prabhat, IR 64, Krishna Hensa, IR-36, Joyamati, Vishnu Prasad, Jyoti Prasad, Chinsura *Hybrid-3* and some other varieties that do well under irrigated conditions.

**Cultural Practices**

**Nursery management**

- Nursery for boro crop is sown in the last week of October to mid-September before onset of the winter season.
- Prepare the seed bed in low-lying areas near the source of irrigation.
- Irrigate seed beds frequently.
- Dust the seedlings periodically with fuelwood ash, straw ash, cattle dung ash, etc.
- Cover the seedlings with a plastic sheet at night to avoid yellowing of seedlings.

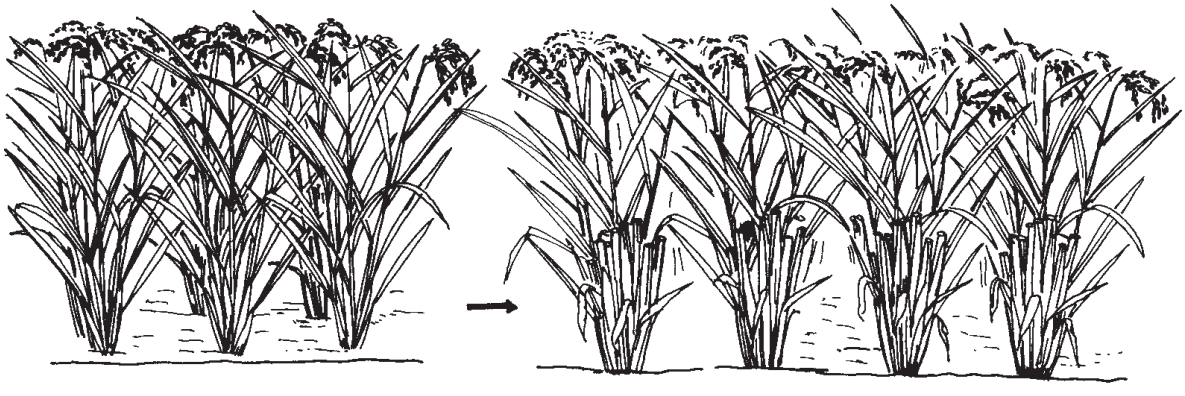
**Transplanting**

- The seedlings are transplanted in mid-January to February.
- Keep seedlings 18-20 cm high (75-85 days).
- Keep seedlings 5-6 cm in standing water.
- Place the seedlings 4-5 per hill at a spacing of 20x10-15 cm.
- Dense planting and/or higher number of seedlings are required to maintain the plant population.
- Depending upon the soil condition, apply 120-150 kg N, 60-75 kg $P_2O_5$ and 50-80 kg $K_2O$.
- Need-based irrigations are given from groundwater sources/canals/low-lying catchments.

## Boro-Boro Ratoon

Boro-ratoon refers to the crop which grows from the stalks left after the harvest of the main boro rice crop. Ratooning is possible only when boro rice is harvested before middle of May and field is not inundated up to June. Irrigation facility is an important pre-condition for taking a ratoon crop.

In this system, the main crop is harvested leaving stalks 30-45 cm high. Soon, new tillers re-grow and the boro ratoon crop is ready within five to six weeks.



## Constraints to Boro Rice Cultivation

Boro crop is a 190-200 days crop and may require more resources and care for a longer period. Moreover, improved varieties and agro-techniques are not available for boro rice cultivation. Lack of credit facilities and the small size of holdings are major challenges. Some of the environmental constraints are as follows:

**Weather fluctuations**

Low temperature at seedling stage can cause poor germination, slow and stunted seedling growth, yellowing of leaves, leaf spots, slow and delayed tillering and non-synchronous and delayed flowering. Dense fog, coupled with greater temperature fluctuation or high day temperature at flowering may cause sterility of flowers.

**Pre-monsoon rain**

If seed has no dormancy, early pre-monsoon rain may affect gemination. In coastal areas, it may cause grain shattering.

**Long cold spells**

Seedling mortality takes place during nursery stage due to long cold spells. Duration of panicle initiation and maturity period also increases. This increases expenditure on additional irrigation and care. Cold spell also restricts root growth delaying proper establishment of the seedlings. To compensate, the farmer has to do dense transplanting and use more number of seedlings/hill.

**Insect-pests and weeds**

Plant hoppers, leaf hopper, leaf folder, grass hopper, Gandhi bug and yellow stem borer are some of the major pests of boro rice. Bird damage is also common at the time of grain ripening. Major plant diseases are sheath blight and blasts which appear during ripening or maturity stage. Problematic weeds also grow.

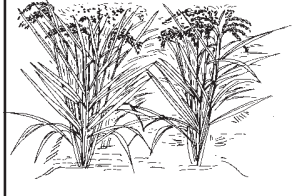
## Strategies for Increasing Boro Rice Production in Eastern India

**Characterize Boro Rice Agro-ecosystem**

Undertake agro-ecosystem analysis through rapid rural appraisal (RRA)/ participatory rural appraisal (PRA), system diagnosis, remote sensing and geographic information system (GIS) to prioritize the problems and issues faced by farmers and find out possible solutions.

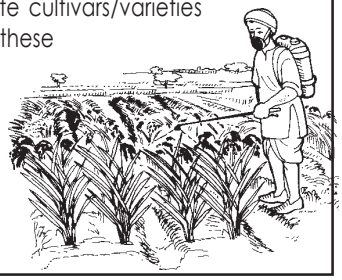
**Identify Appropriate Varieties**

This may be done through germplasm collection, evaluation, selection and varietal/cultivars testing.



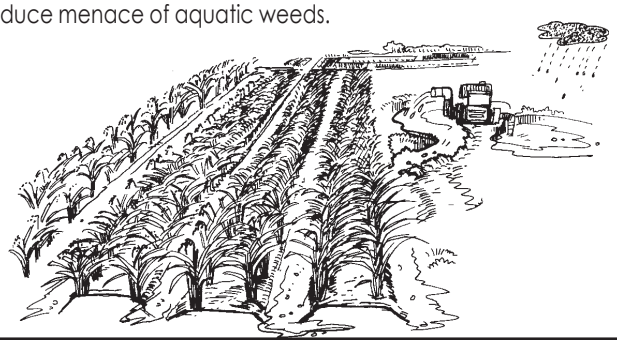
**Develop Crop Management Practices**

There is a need for a crop management package which may include nursery management, optimum planting time, plant population, planting geometry, fertilizer and irrigation requirements, weed management and integrated pest management (IPM). Evaluate cultivars/varieties in relation to these parameters.



**Develop Appropriate Water Management Techniques**

Such techniques for varying low-lying water bodies help in better land utilization. Management of groundwater is equally important in medium lands. Proper drainage and pumping water from central portion to establish the crop and irrigation reduce menace of aquatic weeds.



**Develop Rice-fish Culture**

Viable rice-fish culture enhances the income of poor farmers owning deepwater/low-lying waterlogged areas. Boro rice-fish culture technology package helps farmers in increasing their incomes.

**Encourage Farmers' Participatory Research**

Technology transfer is an important component of agricultural development. Technologies should be well-tested on the farmers' field before those are passed on to other farmers for adoption. This is better done by farmers' participatory approach including on-farm trials and demonstrations to test the technology's adaptability, compatibility and feedback information for refinement of technology according to farmers' needs.

**Adapted from:**

Singh, U.P. 2002. Boro Rice in Eastern India. Rice-Wheat Consortium Regional Technical Coordination Committee Meeting. 10-14 February 2002. Rice-Wheat Consortium for the Indo-Gangetic Plains, New Delhi, India.

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