

Cropping System

- > Follow appropriate crop rotation to check yield decline in the long run
- > Grow groundnut, cowpea or green gram during dry season at alternate year in sequence with dry season-wet season aerobic rice system: alternately, grow them at two years' interval in sequence with dry season aerobic rice

Production Economy

Aerobic rice is a water saving technology that has been developed keeping in view the optimum savings of water without any compromise with yield decline. Our study showed that water saving would be in the range of 35-40% by curtailing conventional irrigation water of 1700-1800 ha mm to 1000-1200 ha mm in aerobic rice; that results in water productivity of 0.45-0.50 g grain ltr⁻¹ of applied water compared with 0.25-0.30 g grain ltr⁻¹ of applied water in conventional system

Important considerations

- > Suitable aerobic rice varieties are Apo, Sahabhazi dhan and Annada
- > Improved crop management, especially water, nutrient and weed management is the key determinant to the success of aerobic rice
- > Adopting a location-specific suitable cropping system may avoid yield decline



AEROBIC RICE

- a water saving technology

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AEROBIC RICE

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Looming water crisis is evident in the changed climatic conditions. Unprecedented water scarcity during 2002 and 2009 severely affected rice production, particularly in the states of Odisha, Jharkhand, Chattisgarh and eastern Uttar Pradesh. Recent climate change estimates predict further deterioration in water deficit situation in the years to come. This would result in food insecurity particularly, in rice due to the increased vulnerability to the climate changes. Water crisis has also been reported from traditional irrigated areas like Punjab and Haryana. Here, the water level has been continuously decreasing due to over-exploitation of underground water resources for irrigation.

Aerobic rice has been developed as a promising technology for water-deficient regions with threatening underground water resources. It is basically managed like wheat and maize crops where soil would remain unpuddled, non-saturated and well drained. It is sown directly in dry soil at rainfed upper topo-sequence uplands, favourable banded upland, favourable shallow lowlands and irrigated medium lands. Together, these areas occupy nearly half of the total rice growing areas in India. Aerobic rice requires at least 30 per cent less water as compared to usual transplanted rice. Suitable variety as well as improved management is essential for a bountiful harvest in aerobic rice.

Varieties

- Use suitable varieties like Apo, Sahabhagi dhan and Annada which have yield potential of 4.5-5.0 t ha⁻¹
- These varieties are suitable for aerobic conditions possessing the drought-tolerance & weed competitiveness ability of upland rice and high yield potential of lowland rice



Apo



Sahabhagi dhan

Crop Establishment:

- Apply off-season/summer ploughing at least one month before final land preparation
- Sow seed at 50-60 kg ha⁻¹ manually directly within shallow dry soil furrow of 2-3 cm depth or using manual/bullock drawn seed drill, at a spacing of 15 x 20 cm in wet season and 15 x 15 cm in dry season
- The optimum time of sowing is 1st to 2nd week of June in wet season and 1st to 2nd week of December in dry season
- Apply well decomposed farmyard manure within furrows during sowing
- Apply light irrigation soon after sowing
- Depending upon the situation, follow stale bed sowing which has additional advantages

Crop Stand Management:

- Select suitable variety with faster initial growth (high early vegetative vigour) that could smother weed population effectively
- Apply two manual weeding at third and fifth week of crop growth for effective control of weeds
- Alternatively, apply pre-emergence herbicide, e.g., Pretilachlor at 1.0 ltr ha⁻¹ or Butachlor at 1.5 ltr ha⁻¹ within 2-3 days of sowing followed by manual weeding at fifth week of crop growth
- Use finger weeder/hand raker, preferably in moist soil after irrigation to keep soil loosen in addition to nip newer weed flush

Nutrient Management

- Maintain adequate soil nutrition as availability of all indigenous nutrients in aerobic soil is low
- Apply 375 kg SSP and 1000 kg MOP ha⁻¹ (at the rate of 60 kg P₂O₅ and K₂O ha⁻¹) at sowing
- Apply 43.5 kg Urea ha⁻¹ (at the rate of 20 kg N ha⁻¹) after 12 days of crop emergence

- Use 'Leaf Colour Chart' (LCC- Scale 4) and apply 65 kg Urea ha⁻¹ at each critical stage of N deficiency
- Apply zinc sulphate (ZnSO₄) at 20 kg N ha⁻¹ and ferrous sulphate (FeSO₄) at 30 kg ha⁻¹ at sowing in soils inherently deficient in zinc and iron
- Apply similar doses of zinc and iron in normal aerobic soils upon the occurrence of their deficiency symptom

Irrigation Management

- Maintain saturated soil moisture condition at active tillering, panicle initiation, flowering and grain filling stages
- Apply irrigation to soil saturation upon visible symptom of developing hair cracks on surface soil, or initiation of leaf tip 'rolling' as may be the case depending upon the situation
- Depending on soil conditions, groundwater level and rate of water losses, apply irrigation at 5-6 days interval
- Farmers may follow an index (table below) to prepare irrigation schedule depending on the availability of irrigation water

Productivity and water utilization in aerobic rice

Irrigation interval (days)	Grain yield (t ha ⁻¹)	Water productivity (g grain ltr ⁻¹ water applied) #	Water requirement (ha mm)	Water saving (%)*
0 day ⁺	4.50-5.25	0.25-0.30	1700-1800	--
4-5 days	4.35-4.90	0.35-0.40	1200-1300	29.0-30.0
6-7 days	4.40-4.95	0.45-0.55	900-1000	40.0-45.0
8-10 days	2.85-3.00	0.40-0.50	600-700	60.0-65.0

With respect to applied irrigation water, +Usual continuous ponding, *Water saving in comparison with continuous ponded situation

Plant Protection

- Aerobic rice on account of growing in a relatively warmer and drier environment is free from major insect pests and diseases
- Still, need based application of recommended dose of suitable pesticides is essential to prevent occasional occurrences of insect pests like termite, brown plant hopper & gundhi bug and diseases like blast, brown spot & root-knot nematode
- Apply Carbofuran 3G at 33 kg ha⁻¹ in soil to control rice root-knot nematode (*Meloidogyne graminicola*) effectively



Aerobic rice based cropping system