

Aerobic rice is a new system of growing high yielding rice without standing water, on non-puddled soils under less irrigation with unsaturated (aerobic) soil. It is just like any irrigated dryland crops such as wheat or maize. Aerobic rice's yield varies from 4.5 to 7 tons ha<sup>-1</sup>. Aerobic rice system provides effective use of rainfall on the farmer's field and offers efficient utilization of all available farm resources.

Aerobic Rice system development started in 1980s in China. International Rice Research Institute (IRRI), Philippines took it up in 2001. Many Aerobic rice varieties have been released in India by SAUs and ICAR institutes. Aerobic rice variety and cultivation system is required because of increasing water scarcity. In traditional wetland rice cultivation, fields are flooded from planting to harvest, using about 2½ times the water needed to grow wheat or maize.

KisanKraft's aerobic rice variety "KK-Akshat-A1" has medium slender grains, with low threshing losses and good cooking quality for home consumption. It is a medium duration variety, taking 115-120 days to harvest.

### Advantages of Aerobic rice:

- Direct seeded: nursery and transplantation not required
- Puddling or other wetland activities not required
- Standing water not required
- Normal rainfall is enough to grow aerobic rice like other crops such as Maize
- Requires 15-17 Kg/hectare seeds compared to 62-65 Kg/hectare in wetland rice ecosystem
- Reduction in pesticide and fertilizer usage
- Saves more than 50% water compared with traditional wetland rice cultivation
- Reduces labor cost dramatically
- Reduces total cost of cultivation
- Tolerates drought-prone conditions for sufficiently longer duration
- Eco-friendly: Reduces the emission of green-house gases like Methane and nitrous oxide.
- Intercropping or mixed cropping and crop rotation is possible, with any pulses.

Aerobic rice varieties are a boon to farmers in the water-scarce agricultural scenarios.

**Land Selection:** Aerobic rice, can be grown in soils with better drainage e.g. red soils, clay soils with sand content and to certain extent, it can be grown in black soils. Aerobic rice cannot be grown in areas with higher rainfall, salinity, soils with poor drainage and in areas where temperatures drops below 15 °C. Some examples of land types are given below:

Favorable uplands, where the land is flat, and where rainfall (sometimes with supplemental irrigation) is enough to frequently bring the soil water content close to 100% field capacity.

Upper slopes or terraces in undulating, rainfed lowlands, where soils maybe coarse-textured and well-drained, so that ponding of water occurs only briefly or not at all during the growing season.

Short irrigated lowlands, where farmers do not have access to enough water to keep rice fields flooded for a substantial period.

**Land Preparation:** Before onset of monsoon, land should be deeply (20-30cm) dry ploughed using MB plough or disc plough. Next, 5 tons ha<sup>-1</sup> of farm yard manure should be incorporated into the soil. After that, use cultivators and rotavator, to get a fine tilth, like dryland crops like Maize, Sorghum, Wheat, Ragi and Pulses, etc.

**Seasons:** Aerobic rice can be grown in *Kharif* and *Summer* seasons. It is not suggested to grow Aerobic rice during *Rabi*, since the temperature maybe less than 15 °C.

**Seed Rate:** 15-17.50 Kg of seed is enough for 1 hectare.

**Sowing:** Direct dry-sowing maybe done by seed drill or manually on a plough furrow. Sowing should not be done on wet soils. Recommended spacing is 30cm between rows and 10cm between plants. Initially two seeds can be sown for every hill.

Please sow a handful of seeds in 1-2 corners of the field, to be used for gap filling, if needed.

**Nutrient Management:** NPK @ 100:50:50 Kg ha<sup>-1</sup> is recommended with N in 4 splits, as per **any of the combination** given below:

	Growth Stages (Dosage per ha)				
	During Sowing	(~15DAS)	Tillering (~30 DAS)	Panicle Initiation (~50 DAS)	Flowering (~70 -75 DAS)
1	SSP: 313 Kg MOP: 83 Kg	Urea: 44 Kg	Urea: 66 Kg	Urea: 66 Kg	Urea: 44 Kg
2	DAP: 109 Kg MOP: 83 Kg	Urea: 35 Kg	Urea: 53 Kg	Urea: 53 Kg	Urea: 35 Kg
3	Rock Phosphate: 250 Kg MOP: 83 Kg	Urea: 44 Kg	Urea: 66 Kg	Urea: 66 Kg	Urea: 44 Kg
4	10:26:26: 192 Kg	Urea: 35 Kg	Urea: 53 Kg	Urea: 53 Kg	Urea: 35 Kg
5	20:20:0: 250 Kg MOP: 83 Kg		Urea: 38 Kg	Urea: 38 Kg	Urea: 32 Kg
6	17:17:17: 294 Kg		Urea: 38 Kg	Urea: 38 Kg	Urea: 32 Kg
<b>Note-1:</b> If zinc and iron deficiency are noted, basal application (at sowing time) of ZnSO <sub>4</sub> at 25 Kg ha <sup>-1</sup> and FeSO <sub>4</sub> at 50 Kg ha <sup>-1</sup> is desirable.					
<b>Note-2:</b> Need based foliar application of 0.5% ZnSO <sub>4</sub> and 1% FeSO <sub>4</sub> may be taken up at Tillering and Panicle initiation stages.					

**Thinning & Gap filling:** Thinning out of excess seedlings to achieve appropriate spacing is done at 21 days after sowing (DAS). Gap filling is also done at this time to maintain plant population.

**Irrigation:** After direct dry-sowing, immediate life-saving irrigation should be given to saturate the soil. Soil should be kept moist until proper seedling emergence (10-15 days).

Then, after soil dries and starts to hairline cracking, field should be irrigated again to bring soil moisture back to 100% field capacity. This maybe done weekly depending on rainfall and soil moisture level.

Irrigation maybe skipped in the event of rainfall. Sprinkler irrigation should be adapted instead of surface irrigation to save water.

*There is no need of flooding or water stagnation at any stage of crop growth.*

**Weed Management:** 2-3 days after sowing, an application of pre-emergence herbicide, like Pendimethalin @ 3 liters ha<sup>-1</sup>, helps in controlling weeds for 2-3 weeks.

Since the spacing is 30cm, mechanical weeding can be easily done using cono / rotary weeder / Blade Harrow. Mechanical weeding also loosens the soil.

Post emergence application of Bispyripac Sodium (e.g. NOMINEE GOLD 10% SC) at **2-3 leaf stage of weeds** (usually 5-10 DAS) with the dosage of 200 ml. ha<sup>-1</sup> and thereafter, can be combined with inter-cultural practices.

15-20 DAS, mechanical/manual weeding or inter-cultural operations can be done. It also aerates soil.

Next, 45 DAS mechanical/manual weeding or Inter-cultural operations can be repeated.

**Crop Management:** While incidence of pests and diseases in this variety is lesser than wetland rice, major pests, diseases and its control measures are as follows.

Pest	Symptoms	Insecticide	Dosage (ha <sup>-1</sup> )
Stemborer <i>Scirpophaga incertulas</i>	Caterpillars enter the stem and feed on the growing shoot. The incidence is mild in the season June to September, but it is intensified from October to February. As a result, the central shoot dries up and produces the symptom of <b>dead heart</b> . The tillers may get affected at different stages. When they are affected at the time of flowering the ear heads become chaffy and are known as <b>white ear</b> .  The insect may start attacking the plants in first 15 days.	Carbofuran 3G	25 Kg
		Phorate 10G	10 Kg
		Cartap 4G	25 Kg
		Fipronil 0.3G	10 Kg
		Spray quinalphos 25 EC	1600 ml
		Monocrotophos 36 WSC	1100 ml
Thrips <i>(Stenchaetothrips biformis)</i>	1. Leaf shows discoloration and rolling 2. Yellow (or) silvery streaks on the leaves of young seedlings 3. Terminal rolling and drying of leaves from tip to base 4. Leaf tips wither off when severely infested Unfilled grains at panicle stage	Chloropyriphos 20 EC	1250 ml
		Quinolphos 25 EC	1250 ml
		Monocrotophos 36 SL	1250 ml
		Phosphamidon 40 SL	1250 ml
		Chloropyriphos 20 EC	1250 ml
Leaf folder <i>(Cnaphalocrocis medinalis)</i>	The larvae feed by scraping the green mesophyll resulting in linear pale white stripe damage. Starting with the late second instar, when larvae regularly roll up leaves they become solitary. The general vigor and photosynthetic ability of an infested plant is greatly reduced.  1. Leaves fold longitudinally or transversely with silk and scrapped patches in such places. 2. In cases of severe infestation, the leaf margins and tips are dried up entirely and the crop gives a whitish appearance	Monocrotophos 36 WSC	850 ml
		Chlorpyriphos 20 EC	1500 ml
		Cartap 50 WP	600 g
		Acephate 50 WP	700 g

Disease	Symptoms	Cultural methods:	
<b>Blast</b> ( <i>Pyricularia grisea</i> )	<ol style="list-style-type: none"> <li>Disease can infect paddy at all growth stages and all aerial parts of plant (Leaf, neck and node).</li> <li>Infections are more severe among the three leaves and neck.</li> <li>Small specks originate on leaves - subsequently enlarge into spindle shaped spots (0.5 to 1.5cm length, 0.3 to 0.5cm width) with ashy center.</li> <li>Several spots with big irregular patches</li> </ol> <p><b>Leaf Blast:</b> Severe cases of infection - entire crop has a blasted or burnt appearance- hence the name "BLAST". In some severe cases - lodging of crop (after ear emergence) occurs.</p> <p><b>Neck Blast:</b> Neck region of panicle develops a black color and shrivels completely / partially grain set inhibited, panicle breaks at the neck and hangs</p> <p><b>Nodal Blast:</b> Nodes become black and break up</p>	<ul style="list-style-type: none"> <li>✓ Remove collateral weed hosts from bunds and channels</li> <li>✓ Avoid excess nitrogen</li> <li>✓ Apply N in 3 split doses as recommended</li> <li>✓ Use resistant variety like "KK-Akshat-A1"</li> </ul>	
		<b>Fungicide</b>	<b>Dosage (ha<sup>-1</sup>)</b>
		Carbendazim 50WP	500 g
		Tricyclozole 75 WP	500 g
		Metominostrobin 20 SC	500 ml
Azoxyastrobin 25 SC	500 ml		

	Symptoms	Nematicide
Rice Root-Knot Nematode ( <i>Meloidogyne graminicola</i> )	<p>It can be detected by uprooting the plants, as it causes swellings and galls throughout the root system.</p> <ol style="list-style-type: none"> <li>Infected root tips become swollen and hooked, a symptom which is especially characteristic of this nematode.</li> <li>In upland conditions and shallow intermittently flooded land it can cause severe growth reduction, unfilled spikelets, reduced tillering, chlorosis, wilting and poor yield. Symptoms often appear as patches in a field.</li> </ol>	<p><b>Cultural methods:</b></p> <ol style="list-style-type: none"> <li>Soil solarization (summer ploughing), bare fallow period has been reported to decrease nematodes.</li> <li>Rotation crop like marigold (<i>Tagetes sp.</i>) is also effective in lowering root knot nematode populations because of its nematicidal properties.</li> <li>Growing of green manuring crops such as Sunhemp/Diancha/Cowpea or planting cover crops such as sesame can also eliminate root knot nematodes.</li> <li>Soil incorporation of 250 Kg ha<sup>-1</sup> Neem cake is found effective for the root knot nematode in rice.</li> </ol> <p><b>Chemical Control:</b></p> <ul style="list-style-type: none"> <li>• Carbofuron 3G (33 Kg ha<sup>-1</sup>)</li> </ul>

**Harvesting:** KK-Akshat-A1 matures in 115-120 days. Harvesting can be done when grains turn golden yellow color. It can be done manually or by using mechanically by reapers, combined harvesters, etc.

**Grain Yield:** Yield depends many factors e.g. soil fertility, soil health, water availability and weather pattern etc. Grain yield ranges from 4.5-ton ha<sup>-1</sup>. to 7-ton ha<sup>-1</sup>. (under well-endowed and well managed conditions).

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**Success of any crop depends on seeds, soil-health, weather and crop management practices.**

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