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Production Technologies and Integrated Crop Management of Raikia Bean in Kandhamal District of Odisha

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Introduction

Raikia bean (*Phaseolus vulgaris* L.) is an indigenous runner-type bean extensively cultivated in the high-altitude tribal regions of Kandhamal district, Odisha. Originating from Raikia block, it is renowned for its tender, fleshy, low-fibre green pods and excellent cooking quality, making it highly popular among consumers and traders. The crop has emerged as one of the most remunerative vegetable enterprises, contributing significantly to the livelihood of tribal farmers.

The district Kandhamal, located in the North Eastern Ghat Agro-Climatic Zone of Odisha, provides ideal conditions for Raikia bean cultivation with an elevation of 500–1,000 m above mean sea level, annual rainfall of 1,300–1,500 mm and predominantly red lateritic and yellowish-brown forest soils. The crop is grown during both Kharif and Rabi seasons, with the major area under Rabi cultivation in the blocks of Raikia, Daringibadi, G. Udayagiri and Tikabali.

Raikia bean occupies approximately 2500 ha in Kandhamal district with a productivity of 120–145 q/ha under improved management practices. Owing to its superior pod quality, it commands premium prices in markets such as Raikia, Daringibadi, Phulbani, Berhampur, Bhubaneswar and Cuttack. However, productivity at farmers' fields remains low due to the use of farmer-saved seed, soil acidity, imbalanced nutrient management, traditional bamboo staking, high labour requirements and inadequate adoption of scientific crop management practices.

To address these constraints, Krishi Vigyan Kendra (KVK), Kandhamal has promoted Integrated Crop Management (ICM) incorporating Integrated Nutrient Management (INM) and the Nylon-Net Trellis System through frontline demonstrations. These interventions have improved pod yield, quality, labour efficiency and profitability by integrating balanced nutrient management, biofertilizers, organic manures, improved trellising and integrated pest management.

With increasing market demand and favourable agro-climatic conditions, Raikia bean has excellent potential for commercial cultivation in Odisha. Wider adoption of improved production technologies, value addition, branding and collective marketing through Farmer Producer Organizations (FPOs) can further enhance farmers' income and strengthen the vegetable economy of Kandhamal district.

Agro-climatic Requirements

Climate

Raikia bean performs best under cool and humid climatic conditions. Kandhamal district provides an ideal environment because of its moderate temperatures and high-altitude location.

Optimum Climatic Requirements

Parameter	Optimum Range
Temperature	18–25°C
Germination	20–25°C
Flowering	18–22°C
Relative Humidity	60–80%
Annual Rainfall	1,300–1,500 mm
Altitude	500–1,000 m above MSL
Sunshine	6–8 hours/day

Heavy rainfall during flowering and prolonged cloudy weather should be avoided as these conditions favour disease development and flower drop.

Soil

Raikia bean grows well in fertile, well-drained soils rich in organic matter.

Suitable Soil Characteristics

Parameter	Recommended
Soil Type	Sandy loam to clay loam
Drainage	Well drained
Organic Carbon	High
Soil pH	5.5–6.8
EC	<1.0 dS/m

Improved Varieties

The traditional Raikia bean cultivar is still preferred because of its excellent pod quality and consumer demand. Farmers generally conserve their own seed, while KVK promotes improved crop management practices rather than replacing the local cultivar. Seed treatment, line sowing, balanced nutrition and integrated crop management have significantly improved productivity.

Seed Selection

- Select healthy, bold and disease-free seeds.
- Avoid shrivelled and damaged seeds.
- Seed should be obtained from healthy plants or certified sources wherever available.
- Maintain varietal purity during seed selection.

Seed Rate

Purpose	Seed Rate
Vegetable production	25–30 kg/ha
Seed production	20–25 kg/ha

Seed Treatment

Seed treatment improves germination and protects seedlings against seed- and soil-borne diseases.

Recommended Seed Treatment

Material	Dose
Carbendazim or Thiram	2–3 g/kg seed
Trichoderma viride	10 g/kg seed
<i>Rhizobium</i> culture	25 g/kg seed
<i>PSB</i> culture	25 g/kg seed

Seed should be shade dried before sowing.

Time of Sowing

Kharif Crop

- June–July

Rabi Crop

- October–November

Timely sowing is essential to obtain maximum flowering and pod production.

Method of Sowing

- Prepare fine tilth.
- Form raised beds or ridges.
- Sow seeds manually.
- Maintain uniform depth of 3–5 cm.
- Ensure good drainage.

Spacing

Row × Plant : 150 × 45 cm

Proper spacing ensures:

- Better aeration
- Reduced disease incidence
- Improved light interception
- Easy intercultural operations

Nutrient Management

Scientific nutrient management is one of the most critical factors determining productivity.

Organic Manure

Input	Dose
FYM/Compost	20–25 t/ha
Vermicompost	2–3 t/ha

Chemical Fertilizer

Nutrient	Recommended
Nitrogen (N)	40
Phosphorus (P ₂ O ₅)	60
Potassium (K ₂ O)	50

Apply:

- Entire FYM during land preparation.
- Full phosphorus and potassium as basal dose.
- Half nitrogen as basal and the remaining half at 30–35 days after sowing.

Micronutrient Recommendation

Nutrient	Dose	Method
Boron	10 kg Borax/ha	Basal
Zinc	25 kg Zinc Sulphate/ha	Basal
Sulphur	20–25 kg S/ha	Basal

• Foliar spray of 0.5% micronutrient mixture may be applied during flowering if deficiency symptoms are observed.

Irrigation Management

Critical stages include:

- Germination
- Flower initiation
- Pod formation
- Pod development

Avoid waterlogging

Generally:

- Irrigate every 7–10 days during winter.
- Increase irrigation frequency during dry spells.

Weed Management

Manual

- First weeding: 20–25 DAS
- Second weeding: 40–45 DAS

Cultural

- Earthing up
- Mulching
- Intercultivation

Integrated weed management reduces weed competition and improves nutrient-use efficiency.

Intercultural Operations

- Gap filling
- Earthing up
- Vine training
- Removal of diseased plants
- Removal of dried leaves

These practices improve plant vigour and reduce disease incidence.

Trellis (Staking)

Raikia bean is a climbing crop requiring proper support.

- Traditional System
- Bamboo poles
- Wooden sticks

Limitations

- High labour requirement
- Poor air circulation
- Lodging
- Difficult harvesting
- Smaller pod size

Improved Nylon Net Trellis

KVK Kandhamal recommends:

- Nylon net
- GI wire
- RCC/Bamboo poles

Advantages

- Better vine support
- Improved light penetration
- Better air circulation
- Reduced disease incidence
- Uniform pod development
- Easy harvesting
- Lower labour cost
- Higher marketable yield

This technology forms a key component of the KVK's Integrated Crop Management demonstration.

Plant Protection

Major Diseases

- Bacterial leaf blight
- Anthracnose

- Powdery mildew
- Rust

Major Insect Pests

- Aphids
- Pod borers
- Whiteflies
- Leaf miners

Adopt Integrated Pest Management (IPM):

- Healthy seed
- Seed treatment
- Field sanitation
- Need-based plant protection
- Biological control

Recommended pesticides only when economic threshold levels are reached

Harvesting

- First harvest: 55–65 days after sowing.
- Harvest at tender green pod stage.
- Harvest every 2–3 days.
- Avoid harvesting during rain.
- Regular harvesting promotes continuous flowering and higher pod yield.

Yield

Average yield 120–145 q/ha

Post-Harvest Handling

Immediately after harvest:

- Remove damaged pods
- Grade according to size
- Wash if necessary
- Air dry
- Pack carefully

Packaging

Recommended containers:

- Plastic crates
- Bamboo baskets with lining
- Corrugated fibreboard boxes for distant markets
- Avoid gunny bags to reduce mechanical damage.

Storage

Fresh pods should be stored under cool conditions.

Marketing

Major marketing centres include:

- Raikia
- Daringibadi
- Phulbani
- Berhampur
- Bhubaneswar
- Cuttack

Raikia bean commands a premium price because of its:

- Tender pods
- Fleshy texture
- Sweet taste
- Low fibre content
- Excellent cooking quality
- High consumer preference

Key Recommendations

- Use healthy seed and treat it before sowing.
- Follow line sowing with recommended spacing.
- Apply FYM and balanced fertilizers based on soil-test recommendations.
- Adopt Integrated Nutrient Management (INM).
- Install nylon-net trellis for better crop growth and easier harvesting.
- Monitor pests and diseases regularly and follow IPM practices
- Harvest pods at the tender stage and market immediately for maximum returns

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