

Use of salt : NaCl @ 120 kg/ha (mine origin) may be used for effective weed control measure in upland rice. Two sprays of salt one after sowing and another at active tillering stage is recommended.

Water management

Continuous submergence of water (5 cm) is required up to the flowering of rice in no till condition in Sikkim.

Diseases

Blast (*Pyricularia grisea*)

Symptoms

- This disease affects all the aerial parts of the plants like leaf, culm, neck and grains.
- Spindle-shaped spots with dark brown margin and grey centre on leaves.
- Several spots coalesce and lead to big irregular spots.



Management

- Field sanitation and burning of straw and stubbles in the field.
- Seed treatment with *Pseudomonas fluorescens* @ 6 g/kg of seed.
- Spray three times *Pseudomonas fluorescens* talc formulation @ 0.5 per cent from 45 days after transplanting at 10 day intervals.
- Use of Blitox-50 @ 0.3 per cent.

Sheath blight (*Rhizoctonia solani*)

Symptoms

- Early symptoms include oval sheath spots (lesions) at or just above the water line, often at the junction of the leaf and sheath.
- Early lesions are pale green to off-white with a narrow purple-brown or brown border, usually 2" or less wide and 1-2" long on most varieties.



Management

- Burning of previous crop residue.
- Crop rotation with oil seeds and pulses.
- Application of neem cake @ 150 kg/ha as basal dose.
- Spray neem oil @ 3 per cent and NSKE @ 5 per cent.
- Foliar spray of *P. fluorescens* @ 0.2 per cent at boot leaf stage and 10 days later.
- Soil application of *P. fluorescens* @ 2.5 kg/ha mixed with 50 kg FYM after 30 days of transplanting.

Harvesting

Rice attains maturity at around 30 days for early and 40 days for medium to late maturing varieties after 50 per cent flowering (heading stage) in low and mid altitude areas. In high altitude areas, it may take more time to attain maturity. Harvesting is done at the yellow ripening stage to avoid shattering loss in the field. Harvesting should be done when 80 per cent grains mature.

Yield

A well-managed transplanted crop yields about 4.0-4.5 tonnes/ha.

Published by :

Dr. R. K. Avasthe, Joint Director
ICAR Research Complex for NEH Region
Sikkim Centre, Tadong, Gangtok-737 102, Sikkim

For further details please contact to :

Dr. S. V. Ngachan, Director
ICAR Research Complex for NEH Region
Umiam - 793 103, Meghalaya

SKM/EF/2015/02

NO TILL ORGANIC RICE PRODUCTION TECHNOLOGY



National Initiative on Climate Resilient Agriculture



Authors

Raghavendra Singh, Subhash Babu
R.K. Avasthe and R. Gopi



ICAR Research Complex for NEH Region
Sikkim Centre, Tadong, Gangtok-737 102

E-mail: jdsikkim.icar@gmail.com



Rice (Oryza sativa L) is an indispensable diet ingredient for the people of north eastern Himalayan states. The average productivity of rice in the region is very low (1.6 t/ha) as compared to national average, leading to about 1.77 million tonnes deficit of rice. The north east region of India enjoys very intense rainfall during rainy season (June-September). Despite various problems, farmers usually adopt intensive tillage operations for rice with the main intention of controlling weeds, minimizing percolation rate of water and preparing soft bed for crop establishment. This system requires high energy consumption, drudgery of labour and high cost of cultivation. Contrary to this, reduced tillage and no till practices make some improvements in soil aggregation, creates higher micro-porosity and increases soil organic carbon (SOC) concentration. Hence, no till method of growing of rice in the region which are more efficient and less labour intensive need to be developed to enable farmers to produce more yields with less production cost.

Climatic requirement

Rice growing areas in Sikkim has sub-tropical, humid and wet Himalayan climate. Temperature is the most yield limiting factor in temperate regions. Temperature requirement of rice is different for different growth stages. Under Sikkim conditions, rice can be successfully cultivated at or above 20°C temperature which is the average day temperature during *Kharif* in Sikkim. Optimum temperature requirements for various growth stages of rice plant are given below.

- Germination 20-35°C
- Emergence and establishment 25-35°C
- Tillering 25-32°C
- Anthesis 30-33°C
- Ripening 20-25°C

Poor germination, stunted seedling, leaf discoloration, panicle tip degeneration, increase in spikelet sterility, delayed heading and irregular maturity are some of the adverse effects of low temperature. Spikelet sterility in rice is the major problem in Sikkim in those areas (high altitude areas) where temperature falls below 12°C. Proper solar radiation is also equally important for successful rice production. It is assumed that early and medium duration varieties are relatively more affected as compared to late maturity group, as late maturity group has sufficient recovery time.

Cultivation practices

Soils

Rice is grown under diverse soil conditions having good amount of organic matter content and pH values between 5.5 and 6.5 are ideal. In this context, the soils of Sikkim are ideal for rice cultivation because organic matter content in soil is about 2 per cent and pH values of most of the soils is below 6.5. There are two types of soil management system in Sikkim, dry soil management, in which land is prepared dry and the crop is seeded in the same manner like any other cereal crop popularly known as upland rice cultivation.

Seedbed preparation

All the weeds should be removed from the surface of the field before transplanting of seedlings. The field should be properly leveled for zero tillage. The bunds and irrigation channels should be repaired. In no tillage only the root zone is opened for placing manure and seed without disturbing the whole field. In the absence of mechanization, transplanting may be undertaken with metallic-end dibblers. Use 25-30 days old seedlings. Avoid use of very young seedlings. Manual/animal drawn furrow opener can be used for upland rice. At least 30 per cent residues should be maintained on the surface to get the benefits of no tillage.

Varieties

PD-10, 12, 14; Pusa Sugandh-2, Shasharang, VL Dhan-62, VL Dhan-82, KRH-2 and 4 (hybrid), Satyaranjan, Geetanjali, Rajendra Bhagawati and CAUR-1

Transplanting depth and spacing

Rice seedlings are transplanted at 2-4 cm depth with the help of dibbler (locally made). Modified SRI method should be used for transplanting in which 12-days old



single seedling/hill can be used. The spacing of plant to plant and row to row should be 20 cm x 20 cm, respectively.

Season and sowing time

The optimum time of transplanting for low and mid altitude is first fortnight of July. The time of transplanting may be adjusted to avoid low temperature stress during flowering especially at higher altitudes (above 1300 m). Hence, at high altitudes transplanting should be completed before 15th June.

Nutrient management

Adequate and timely supply of nutrients is necessary for obtaining sustainable rice production. The recommended dose for rice in Sikkim is 60 kg N/ha. Hence, application of FYM @ 6-8 t/ha and/or vermicompost @ 1-2 t/ha in combination is recommended for optimum yield. Biofertilizers such as Blue Green Algae, *Azolla* and Phosphobacteria help in minimizing the impacts of climate change in rice cultivation by nutrient supplementation, methane emission reduction and carbon sequestration and it is found that the judicious use of blue green algae could provide entire N for rice acreage of India.

Application methods of biofertilizers

A. *Azospirillum* and Phosphate solubilizers

(i) Seed treatment for direct-seeded rice

- Keep the seeds required for sowing one acre in a heap on a clean cemented floor or gunny bag.
- Prepare culture suspension by mixing one packet (200 g) each of *Azospirillum* and PSB biofertilizer in approx. 800 ml water (1:2).
- Sprinkle the culture suspension on the heap of the seeds and mix by hand so that thin coating is uniformly applied to the seeds.
- Spread the seeds under shade for some time for drying and then sow.
- In place of water, rice glue (*kanji*) can also be used for better results.

(ii) Seedling root dip method for transplanted rice

- Prepare a suspension by mixing 1 kg (5 packets) each of culture of *Azospirillum* and PSB in 15-20 litres of water.
- Collect rice seedlings required for one acre and make small bundles.
- Dip the seedling roots in the suspension for 8-10 h and transplant immediately.
- Generally, the ratio of inoculants and water is 1:10.

Alternative method

- Prepare a bed of size 2 m x 1.5 m x 0.15 m in the field.
- Suspend 2 kg each of *Azospirillum* and PSB culture required for one hectare and mix.
- Dip roots of rice seedling for 8-10 h and transplant.

B. *Cyanobacteria*

- Broadcast 10 kg soil based culture/ha 5-7 days after transplanting of rice seedlings.
- Maintain sufficient water (5-10 cm) for 15 days.
- Drain-off water and allow algal mat to settle

C. *Azolla*

- Incorporate as green manure before transplanting of rice (500 kg/ha).
- Dual culture with rice seven days after transplanting, allow to multiply and incorporate (500 kg/ha).

Weed management

The crop-weed competition period in rice crop is 15-45 DAT. Hand weeding is the only and most widely used weed control method in no till practice. In Indian conditions, two hand-weeding at 20 and 40 DAT is recommended for obtaining higher yield.

