

Increase or Decrease of Rice Yield as Affected by Weather, Cultivation and Management Practices

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The growth and development of rice plant considerably influenced by weather, soil characteristics and availability of nutrients, diseases and insects infestation, cultivation and management practices etc. Rice yield can be increased to a great extent by (a) escaping the stress conditions through transplanting of rice seedlings at an optimum time period and (b) achieving proper growth and development of rice plants by appropriate management and intercultural operations. Using balanced dose of plant nutrients can increase the rice yield and can maintain the soil fertility. Yield reduction due to disease and insect infestation can also be mitigated by appropriate control and management practices. In addition to these, appropriate rice post harvest technologies may help to combat the losses during different post harvest operations. These yield influencing factors are described below:

- 1) **Temperature:**
 - (a) **Low Temperature:** Temperature below 18⁰ celsius for more than two days during panicle initiation stage and booting stage may cause spikelet sterility, resulting to a total (100 %) loss of rice yield.
 - (b) **High Temperature:** Prevailing temperature at or above 35⁰ celsius during flowering stage can enhance spikelet sterility, which may cause a total loss (100%) of rice yield.
- 2) **Natural Calamities:** Storm, hail storm, flood, drought etc natural calamities can damage (drying or rotting the plant, spikelets sterility, shattering of rice grain etc.) the rice plant at different growth stages and reduce the rice yield up to 100%.
- 3) **Diseases infestation:** Diseases may reduce the rice yield by 10-15%, which may reach up to 100% at severe condition.

Disease	Pathogen	Extent of yield loss	Measures to be taken
a) Bakanae	Fungus	Up to 30%	Seed treatment by 3 gm Bavistin/Noin in 1 liter water kg ⁻¹ seed
b) Leaf Blight / bacterial blight	Bacteria	20-30% Max. up to 70%	Field should be kept dry for 7 - 10 days.
c) Blast (leaf, Node and neck blast)	Fungus	Up to 80%	Field should be irrigated and kept with standing water.
d) Sheath Blight	Fungus	Up to 70%	Alternate drying and irrigating the plot
e) Ufra	Worm	40 to 100%	Spreading Furadan5G @ 2.5-3 Kg bigha ⁻¹ . After rice harvest, straw burning is beneficial.
f) Tungro	Virus	25-100% of the attacked plant	Uprooting and destroying the attacked plant, controlling GLH by light trap or spraying insecticides.

- 4) **Insect infestation:** Yield loss may be occurred due to insect infestation during Boro, Aus and Aman seasons are 13, 24 and 18% respectively, on an average, the loss is about 18%.
- 5) **Rat damage:** Yield reduction in the field may varies from 5 to 7 % and in stored crops by 3 - 5%.
- 6) **Duck/Poultry/Birds:** Due to these factors the damage are 4 - 50% in seed bed, 3 - 15% at field after transplanting and 8 - 12% at ripening stage.
- 7) **Balanced fertilizer use:** Application of balanced dose of fertilizers can help increase rice yield by 15 - 20%
- 8) **Use of pure, well filled, good and inset-disease free seed:** Increase rice yield by 10 - 20% (National Seed Policy, 1999).
- 9) **Proper period and care of hatching seed:** After soaking the rice seed for one day and then put for hatching for 4-5 days during Boro season and 3-4 days during Aus and Aman seasons can sprout the rice seed, but for proper sprouting appropriate cares, e.g. everyday checking, taking seeds out of the sacks and gently moving up and down, aeration, moistening and sunning, etc. is necessary. Keeping seeds for hatching continuously for 3-5 days without any care may damage 40 - 70% seed by rotting and heat damage of the seed in the inner side and drying of seed at the outer side of the sacks.
- 10) **Seed bed preparation:** Ideal seed bed measures 1.0 -1.5 meter wide with 30 cm drain in between two beds, top of the beds are well leveled, 60 - 80 gms of sprouted seed is seeded per square meter seed bed. This type of seed bed can be well managed and strong, stout and healthy seedlings are produced.

Disadvantages of traditionally prepared seed beds in a bigger plot are (a) seed can't be distributed evenly, (b) improper leveling of the seed bed causes some seeds dropping in the high and/or low pockets of the bed and thus 20 - 40% seed is damaged due to drying or rotting, (c) taking proper care is not possible that tended seedlings to be weak and sick.

It was observed that seedlings produced on an ideal seed beds from 2-3 kg seeds were sufficient to transplant a Bigha of main field with 1-2 strong seedling per hill, while produced on traditionally prepared seedbed, farmers require seedlings of about 10 - 12 kg rice seeds to transplant one bigha of field, with 5 - 10 weak seedlings hill⁻¹.
- 11) **Optimum Seedling Age:** Seedling age of 20 - 25 days in Aus season, 30 - 35 days in Aman season and 40 - 45 days in Boro season are optimum. It was observed that, seedling age more than 45 days during Boro season caused a yield loss of 20-25 kg ha⁻¹ for each day increase of seedling age.
- 12) **Timely transplanting of seedling:** Ideal transplanting time is from 15 December to 15 January (Poush) for Boro season, the month of August (15 Srabon to 15 Bhadra) for T. aman season. It was found that for each day delay of transplanting after 31st January, the yield is reduced by 50-60 kg ha⁻¹. Yield of T. Aman rice is also reduced if transplanted after 15th September (30th Bhadra).
- 13) **Transplanting in rows:** Yield increase is 15 - 20%, Intercultural operations become easier and lesser cost is involved.
- 14) **Use of Urea Super Granules (USG):** Nitrogen fertilizer use efficiency is increased to 20 - 25%, 30% of Urea fertilizer can be saved, rice yield may be increased by 15 - 20%.
- 15) **Use of Leaf Colour Chart (LCC):** 23 - 25% of Urea fertilizer can be saved, rice yield may be increased by 5 - 7% through using LCC.
- 16) **Weed management:** If plots remain un-weeded, then loss of rice yield may be incurred by 20 to 70% in direct seeded plots and 30 to 40% in transplanted plots. Rice fields

should be kept weed free for 30-40 days after transplanting (DAT) during Aus and Aman seasons and for 40 - 45 DAT during Boro season. Weed seeds contamination may reduce the seed quality of rice.

- 17) **Perching:** Birds may sit in the bamboo sticks or plant stems pegged in the field and control harmful insects by catching and eating, which helps the rice yield increase by 5 to 7%.
- 18) **Light Trap:** Many harmful insects like Stem borers, Green leaf hopper (GLH), Brown plant hopper (BPH), Grass hoppers and Leaf folders are attracted by light at night and are killed by trapping and thus rice yield loss may be reduced up to 18%.
- 19) **Using Drum Seeder:** utilization of drum seeder can save 40 to 45% seed, rice yield may be increased by 10-15%, Rice plant matures 10-15 days earlier than that of transplanted method.
- 20) **Irrigation Management:** 3 days drying before a complete irrigation do not cause any yield variation, but 30% water can be saved, intensity of infestation of many diseases like Sheath Blight, Sheath Rot, Bacterial Foot Rot and Bacterial Leaf Blight (BLB) is reduced. Intensity of Brown Plant Hopper (BPH) attack may be controlled. The intensity of Blast and Rice Grain Spot diseases may increase in fields those remain dry.
- 21) **Use of Rubber or PVC pipe for field irrigation:** water loss is reduced and thus 40% more land can be irrigated than irrigating through kachcha drains.
- 22) **Harvesting rice in time:** Rice should be harvested when 80% of the grains become golden coloured and thus yield loss may be reduced by 3 to 7%.
- 23) **Proper way of rice harvesting, storing and post harvest processing:** Rice yield loss may be reduced by 13 - 17%.

Causes of yield loss	Intensity
(a) Keeping rice plants in the field after maturity -	0.26 - 0.49 %
(b) Shattering of rice grains at harvesting and carrying -	1.14 - 2.50 %
(c) Keeping rice plants in the field after harvesting -	0.58 - 0.80 %
(d) Threshing -	0.77 - 0.98 %
(e) Drying -	1.63 - 2.84 %
(f) Parboiling -	1.93 - 2.75 %
(g) Milling in the rice mills -	3.28 - 4.54 %
(h) Storing -	0.30 - 1.20 %

It is hoped that the food self sufficiency of the country can easily be attained by increasing rice yield through managing the above yield influencing factors by appropriate measures taken in time.

References:

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