

Technical Bulletin #89:

## Use of Leaf Color Chart (LCC)

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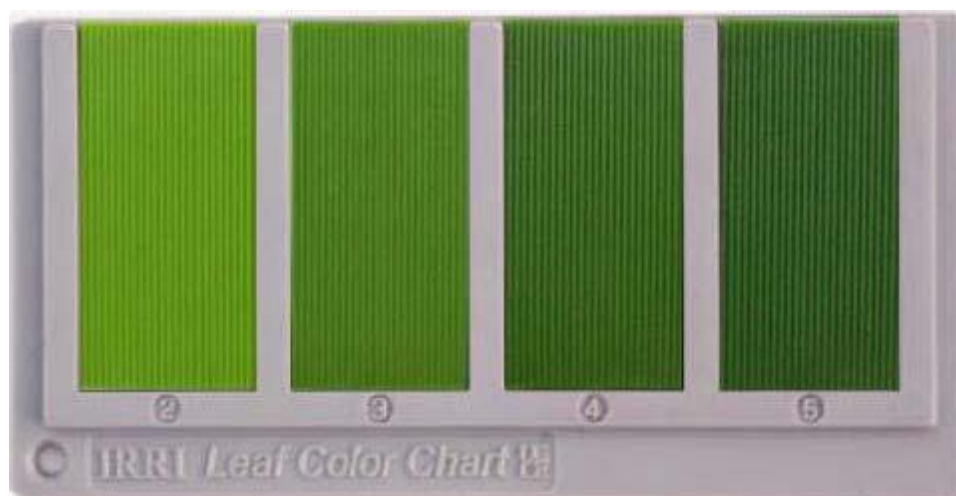
### Using the Leaf Color Chart (LCC) for Fertilizer N Management in Rice

The leaf color chart (LCC) is an easy-to-use and inexpensive diagnostic tool for monitoring the relative greenness of a rice leaf as an indicator of the plant N status.

Leaf N status of rice is closely related to photosynthetic rate and biomass production, and it is a sensitive indicator of changes in crop N demand within a growing season. A tool to rapidly assess leaf N status and thereby guide the application of fertilizer N to maintain an optimal leaf N content can consequently be vital for achieving high rice yield with effective N management.

The leaf color chart (LCC) is a plastic, ruler-shaped strip containing four panels that range in color from yellowish green to dark green.

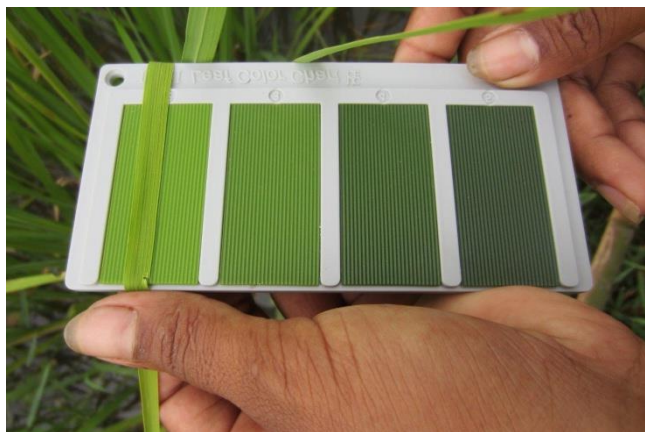
The LCC is used to monitor leaf N status from tillering to panicle initiation or later, by either of two equally effective options. The decision on which option to use can be based on farmers' preferences and location-specific factors, such as frequency of visits by farmers to their fields and their knowledge of critical growth stages for N application. The fixed-time/adjustable-dose option saves time, and is thus preferred by farmers who have gainful alternative activities. The real-time option is generally preferred when farmers lack sufficient understanding of the critical stages for optimal timing of fertilizer N.



### Fixed time/adjustable-dose N management option

With this option, farmers measure leaf color before applying N at active tillering and panicle initiation. If mean leaf color is intermediate between 3 and 4, apply a standard rate of fertilizer N. If the mean leaf color

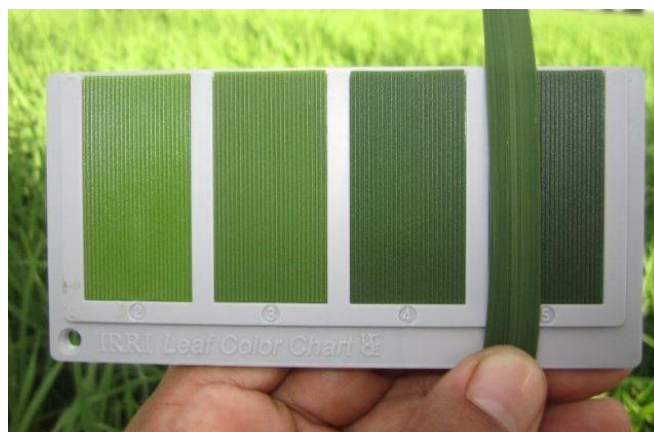
is higher (for example  $\geq 4$ ), apply less fertilizer N than the recommended rate. If the mean leaf color is lower (for example  $\leq 3$ ), apply more fertilizer N than the recommended rate. Such adjustments in N doses at active tillering and panicle initiation ensure application of more N in fields and years with high plant demand for N, and application of less N in fields and years with low demand for N.



Apply high N dose



Apply baseline N dose



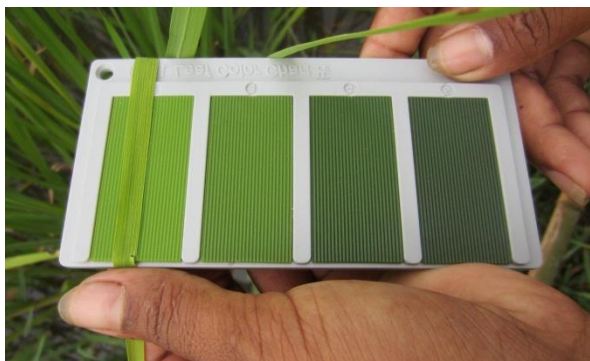
Apply little or no N

### Real-time N management option

With this more complicated option, farmers monitor the rice leaf color at 7- to 10-day intervals from tillering to about 5–10 days after panicle initiation. Farmers apply fertilizer N whenever the leaves become more yellowish-green than a critical threshold value indicated on the LCC.

Leaf color is typically monitored a total of four to six times per cycle. The effective use of real-time N management requires the selection of an N dose and a critical threshold LCC color that ensure 2–3 N applications in an average yielding field or year. In fields and years with above average growth and crop N demand, rice leaves will turn yellow more rapidly, resulting in more N applications and hence more fertilizer N use. In fields and years with below average growth and crop N demand, the rice will require less N and leaves will remain greener longer, resulting in fewer N applications and less fertilizer N use.

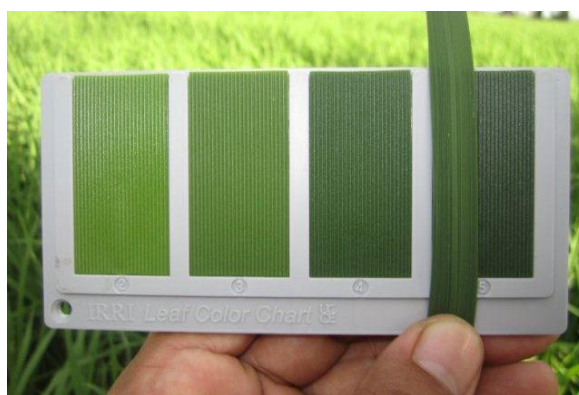
The critical threshold value can be adjusted for cultivars and crop establishment method. Thresholds for cultivars with inherently yellowish leaves should be more yellowish green than for cultivars with inherently dark green leaves.



Immediately apply N



Apply N very soon



Do not apply N

### How to use the LCC

1. Randomly select at least 10 disease-free rice plants or hills in a field with uniform plant population.
2. Select the topmost fully expanded leaf from each hill or plant. Place the middle part of the leaf on a chart and compare the leaf color with the color panels of the LCC. Do not detach or destroy the leaf.
3. Measure the leaf color under the shade of your body, because direct sunlight affects leaf color readings. If possible, the same person should take LCC readings at the same time of the day every time.
4. Determine the average LCC reading for the selected leaves.

Plants without N application are yellowish. Nitrogen deficiency is confirmed when the LCC reading is between panels 2 and 3. At lower fertilizer N rates in photos the plants look better, but the low LCC reading still indicates N deficiency. At higher fertilizer N rates the plants look well developed and the canopy is closed. The LCC reading is between panels 3 and 4, which is the critical range for most transplanted rice. In plants with a high N rate, leaves are dark green. Leaf color is darker than the LCC panel no. 4 indicating a surplus of fertilizer N.

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