



Leaf colour chart (LCC), a tool for nitrogen management

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Nutrient management is a major component of a soil and crop management system. Increase in fertilizer nutrient input, especially N fertilizer, has contributed significantly to the improvement of crop yields in the world. Knowing the required nutrients for all stages of growth and understanding the soil's ability to supply those needed nutrients is critical to profitable crop production. Nitrogen is the major nutrient limiting the high yield potential of rice cultivars. Farmers generally apply fertilizer N in several split applications, but the number of splits, amount of N applied per split and the time of applications vary substantially. The apparent flexibility of rice farmers in adjusting the time and amount of fertilizer application offers potential to synchronize nitrogen application with the real-time demand of the rice crop.

The optimum use of N can be achieved by matching N supply with crop demand. Farmers generally use leaf colour as a visual and subjective indicator of the rice crop's nitrogen status and need for N fertilizer application. Leaf colour intensity is directly related to leaf chlorophyll content which, in turn, is related to leaf N status. One of the recently introduced N management approach was estimating the leaf N concentration by the measurement of leaf greenness. Among the different tools available to measure the leaf greenness, the non-destructive measurement of leaf green colour intensity using leaf green colour charts are gaining importance. A potential solution has been tried to regulate the timing of nitrogen application in rice using a leaf colour chart to determine the plant nitrogen.

About leaf colour chart (LCC) : The LCC had been jointly developed by International Rice Research Institute (IRRI) and Philippines Rice Research Institute from a Japanese prototype, to measure green colour intensity of rice leaves, serves as cheaper tool to assess the nitrogen requirement and thereby to get a maximum productivity.

Leaf colour chart (LCC) is made of high quality plastic material (8"×3"). It consist of six colour shades ranging from light yellowish green to dark green colour strips fabricated with veins resembling those of rice leaves. The LCCs used in Asia are typically a durable plastic strip

about 7 cm wide and 13 to 20 cm long, containing four to six panels that range in colour from yellowish green to dark green.

LCC is an ideal tool to optimize N use in rice/maize at high yield levels, irrespective of the source of N applied, viz., organic manure, biologically fixed N, or chemical fertilizers. Thus, it is an eco-friendly tool in the hands of farmers. LCC is provided with water-proof laminated instruction sticker in the required regional language.

The LCC is also suitable for maize and wheat providing farmers with a good diagnostic tool for detecting N deficiency. The LCCs relevant to use for sugarcane, potato, cotton, cassava, etc. are under Research and Development in order to maximize the yield of these crops.

Purpose of using LCC : Purpose of using LCC is to apply adequate amount of nitrogen and avoid application of fertilizer more than required. Use of LCC helps to

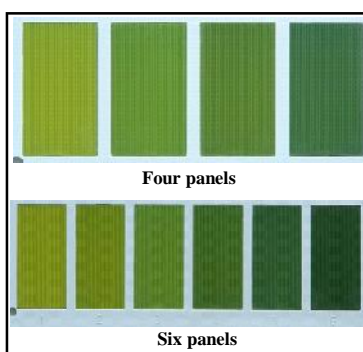
determine nitrogen demand of the crop and guide right time of fertilizer nitrogen application so as to prevent unwanted nitrogen losses and their serious impacts on the ecosystem. Farmers generally apply too much N (and little P and K and other nutrients) that results in high pest and disease incidence and serious lodging. The consequence of high N application is high pesticide use to control pests, more expenditure on pesticides and reduced yield

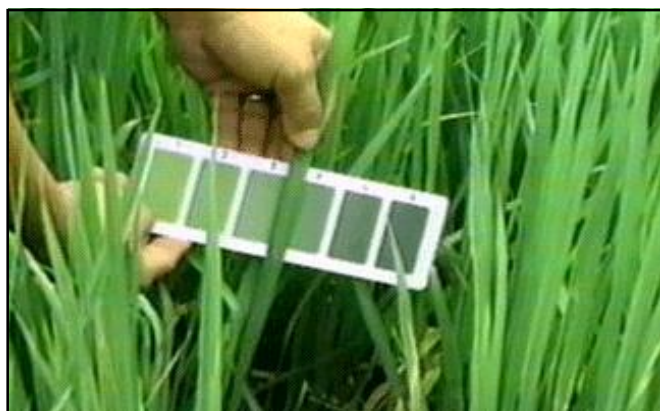
and poor grain quality due to lodging. Also nitrates trickle down the earth with use of excessive urea. If it reaches 10 milligram or more in per liter water then water becomes unfit for human consumption.

Site-specific nutrient management (SSNM) approach for fertilizer N management : Site-specific nutrient management (SSNM) enables rice/maize farmers to optimally supply their crops with essential nutrients. The SSNM approach aims to apply nutrients at optimal rates and times to achieve high yield and high efficiency of nutrient use by the rice/maize crop, leading to high cash value of the harvest per unit of fertilizer invested.

How to use LCC in rice?

– At 14 days after transplanting (DAT) or 21 days after direct wet seeding (DAS), randomly select 10 healthy plants.





LCC in rice



LCC in maize

- Compare the topmost, fully expanded and healthy leaf of each of the 10 plants with the LCC. Place the middle part of the leaf on top of the LCC's colour strips for comparison. Do not detach the leaf. Take readings at same time of the day (8-10 AM). Do not expose the LCC to direct sunlight during reading s.
- If six (6) or more of the 10 leaves have readings below the critical LCC value, apply N as given below.
- For wet season (*Khariif*) non-basmati rice, use LCC critical value 4 and apply 28 kg N/ha or 1.25 bag urea per hectare.
- For wet season (*Khariif*) basmati rice, use LCC critical value 3 and apply 23 kg N/ha or 1 bag urea per hectare.
- For direct-seeded rice, apply 23 kg N/ha as basal, then use LCC critical value 3 and apply 23 kg N/ha or 1 bag urea per hectare.
- For Boro rice, apply 23 kg N/ha as basal, then use LCC critical value 4 and apply 35 kg N/ha or 1.5 bags of urea per hectare.
- Repeat LCC readings every 7 days for 110-130-day rice crops and every 10 days for more than 130-day crops until first heading. Different sets of 10 leaves can be used for each weekly or 10-day reading.
- If basal fertilizer with N (DAP or NPK compound) is applied 0-14 DAT or 0-14 DAS, the first LCC reading is done at 21-25 DAT or 28-30 DAS instead of 14 DAT or 21 DAS.

How to use the LCC in maize?

- Apply 25 kg Urea per acre at the time of sowing of maize.
- Take readings of ten randomly selected maize plants, by matching the colour of the first fully exposed leaf from the top with the leaf colour chart (LCC) starting from 21 days after sowing of maize till initiation of silking at 10 day interval.
- Match the colour of maize leaves with LCC shade 5. If 6 or more leaves out of 10 leaves are lighter than

the specified threshold, apply 25 kg urea per acre. When colour of 5 or more leaves is equal to or darker than the specified threshold no urea should be applied.

Use of LCC should be discontinued after silking in maize and no urea should be applied afterwards.

How to use LCC in Wheat?

- Apply basal dose 55 kg Di-Ammonium phosphate (DAP) per acre.
- Apply 40 kg urea per acre for timely sown wheat and 25 kg urea per acre for late sown wheat with first irrigation.
- Match leaf colour of youngest fully exposed leaf from the 10 randomly selected insect/disease free wheat plants from each field with LCC before 2nd irrigation.
- If the greenness of 6 or more out of 10 leaves is less than shade 4 on LCC, broadcast 40 kg urea per acre for timely sown wheat and 25 kg urea per acre for late sown wheat with second irrigation.
- If greenness is equal to or more than shade 4 on LCC apply only 25 kg urea per acre for timely sown wheat and 15 kg urea per acre for late sown wheat with second irrigation.

Note: Always compare colour of the leaf with LCC under shade of your body.

Conclusion : Nitrogen application should coincide with crop growth and its requirement. The leaf colour 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 colour chart is a low cost tool to assist farmers and effective in improving nitrogen fertilizer management. The LCC is used at critical growth stages to decide whether the recommended standard nitrogen rate needs to be adjusted up or down based on the leaf colour. Using LCC will help farmers to estimate plant nitrogen demand, to produce high rice yields.

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