Assessment of Nitrogen Nutrition Index from biophysical variables obtained by remote sensing.

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Precision agriculture's goal of matching nitrogen supply with crop requirements at any point in a field requires spatial information on the nitrogen status of the crop. Some operational methods (e.g. JUBIL®, Hydro N-Tester) have been developed at a field level but their implementation at a within-field level with a high spatial resolution is not conceivable. Remote sensing techniques combine with the inversion of reflectance models allow to estimate the values of leaf chlorophyll content on an leaf area basis (CHL_{La} : g chlorophyll/m² leaf), Leaf Area Index (LAI : m² leaf/m²soil) and, with a greater precision, the product of both, that is to say total canopy chlorophyll content ($CHL_{La} \times LAI$: g chlorophyll/m² soil) (Jacquemoud *et al.* 1995). Since nitrogen has not a direct effect on reflectance (Baret and Fourty 1997), we aim to determine nitrogen status of the crop thanks to these variables. A reference index, the Nitrogen Nutrition Index (NNI), has been defined (Lemaire & Gastal 1997) in order to determine the nitrogen status of the crop by comparing its real nitrogen content (N_r) and a critical nitrogen content (N_c) : $NNI = N_r/N_c$. The latter is determined by the dilution curve and is a function of the aerial dry mass (W). This index has already been linked to CHL_{La} determined by remote sensing among several varieties (Gate 2000). The aim of this study was thus to determine different ways to calculate NNI from CHL_{La}, LAI or $CHL_{La} \times LAI$ and to evaluate their reliability.

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