

NBudget: a simple tool for farmers and advisors for N management in Australia’s northern grain cropping

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1. Introduction

Farmers and advisors need to make decisions about fertiliser N inputs, often without the benefit of soil nitrate values from deep soil testing. NBudget is a simple to use xls-based tool that estimates soil nitrate and water at sowing, yields and fertiliser N requirements of cereal and oilseed crops and yields and N₂ fixation of legume crops. NBudget was developed for Australia’s northern grains region; there are both winter (wheat, durum, barley, canola, chickpea, fababean) and summer versions (sorghum, sunflower, mungbean, soybean). The opening and output pages for the winter version are shown opposite.

2. NBudget

The major point of difference between NBudget and other N decision support (DS) tools is that soil testing either for water, nitrate or organic C is not required. Rather, NBudget contains rule-of-thumb values and algorithms for estimating soil water and nitrate at sowing and in-crop N mineralisation.

Data to develop NBudget was derived primarily from published and unpublished experiments conducted by the NSW and Qld agricultural agencies during the past 35 years. The logic and assumptions underlying NBudget are in Herridge (2013).

3. Using NBudget

Information to use NBudget includes a simple description of soil texture (clay, red-brown earth or sand/sandy loam), cultivation practice (no-tillage or cultivation) and an assessment of the paddock’s fertility status (see table opposite).

The user also selects from the drop-down menu the crop grown in the paddock two seasons ago to obtain a rough estimate of soil nitrate-N at sowing of the previous crop. Data are then chosen/inserted about the previous crop (type, grain protein and fertiliser N rate). An estimate of current soil nitrate-N is provided.

The soil nitrate value together with an estimate of soil water (from fallow rainfall, depth of wet soil or other sources) are then used to predict yields of the various crops and either their fertiliser N requirements (cereals, oilseeds) or N₂ fixation inputs (legumes).

The greatest value in NBudget, however, may be the estimates of sowing soil nitrate-N. The decision of how much fertiliser N to apply to a particular crop or paddock is a complex one, influenced by a number of factors including the farmer’s attitude to risk and the relative prices of grain and fertiliser. Having a reliable estimate of sowing soil nitrate-N can assist that decision.

4. Ground truthing NBudget estimates of soil nitrate-N

Predicted values were compared with observed values for soil nitrate-N from three independent data sets: Warra, Qld (Dalal et al. (1998), Nindigully, Qld (Thomas et al. (2007) and Cryon, NSW (Edwards 2000). Crops in the various sequences included wheat, barley, chickpea, canola and sorghum. The graph opposite shows that agreement was good between observed and predicted values with the line of best fit close to unity.

NBudget does not account for N losses from denitrification. In a second ground truthing study, predicted and observed soil nitrate-N values were close for only 1 or 7 sites following the extremely wet fallow/flooding of summer 2011-12.

5. Is NBudget readily available?

NBudget was a web-based tool on the NSW DPI CropMate™ website during 2012-13 but currently exists only as an xls file. Clearly, it would be more useful as a stand-alone app or web-based tool.

References

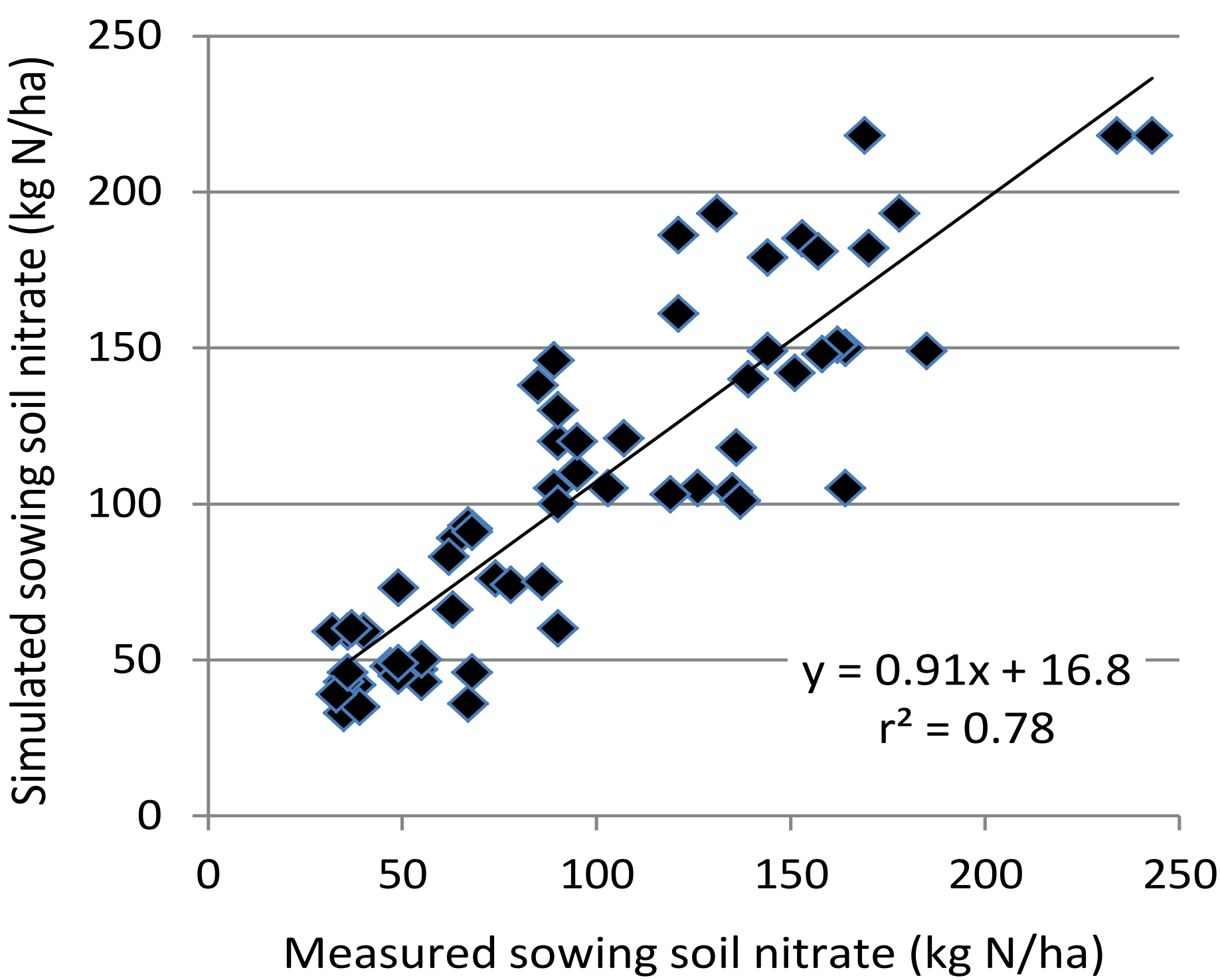
Herridge DF (2013) Managing legume and fertiliser N for northern grains cropping. GRDC, Canberra, 87 pp.
<https://grdc.com.au/~media/6E5659619C7C4063AB3C8E58A4DE39E7.pdf>

Dalal RC, et al. (1998) Australian Journal of Experimental Agriculture **38**, 489–501



Opening page (top) and output page (bottom) of NBudget

Soil fertility status	Description	Approx. equiv. in soil OC (%)
Very low	Long cropping history; negligible N inputs	0.4 – 0.8
Low-medium	Long cropping history; low-moderate N inputs	0.55 – 1.0
Medium	Short cropping history; moderate-high N inputs	0.7 – 1.3
High	High N inputs ; high level management	0.9 – 1.8



Measured and predicted sowing soil nitrates (0–1.2 m depth) from 3 sites in the northern grains region (n = 65)

Thomas GA et al. (2007) Australian Journal of Experimental Agriculture **47**, 965–975
Edwards J (2000) Western Farming Systems Project trial results 1996 - 1999. NSW Agriculture, Orange, NSW