**Improving Nitrogen Application Decisions For Barley**

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Barley growers in Queensland are faced with extreme rainfall variability. Two options are available to calculate fertiliser nitrogen (N) requirement which have advantages depending upon the season type. During wet years, grain protein concentration of previous crops is a reliable indicator of the sufficiency of N supply (3) and the WHEATMAN *plus* BARLEYPLAN program (4) can be used to estimate N requirements. However, following a dry period, soil testing and N *budgeting* can also be useful to estimate fertiliser N requirements.

MATERIALS AND METHODS

A series of replicated N fertiliser trials were conducted on the Darling Downs, Queensland (1, 2) which measured the grain yield and protein response of barley under different soil N and water conditions. Table 1 shows data from yield-responsive sites.

RESULTS AND DISCUSSION

Table 1. Observed responses of barley to N fertiliser and estimated N requirement using *N budgeting* method.

| Observed field data | | | | | | 'N budget' |
|---|---|---|---|---|---|---|
| Site Type | $ANFR_g$[1] % | Relative yield with $N_{opt}$[2] | Incrop mineralisation kg/ha | Grain protein with $N_{opt}$ % dry | Observed Optimum N kg/ha | Fertiliser N req't using budget kg/ha |
| Low yielding | 35 | 0.80 | 20 | 11.7 | 46 | 42 |
| Moderate yielding | 40 | 0.90 | 37 | 11.7 | 82 | 72 |
| High yielding | 50 | 1.00 | 66 | 10.4 | 97 | 95 |

**[1]$AFNR_g$ = apparent N fertiliser uptake to grain [2]$N_{opt}$ = N rate for optimum economic grain yield**

The observed field data indicate that with high soil water, growers should supply sufficient N to maximise the grain yield (relative yield=1.0) and can budget on an apparent N fertiliser uptake ($ANFR_g$) of 50%. Under dry conditions, whilst less N will be required, less of the applied N will appear in the grain ($ANFR_g$ = 35%). N fertiliser rates up to $N_{opt}$ resulted in grain protein concentrations less than maximum cut-off level for malt grade.

Using target yields of 1.8, 3.4 and 5.8 t/ha for low, medium and high yielding sites respectively, the estimated fertiliser N requirement using N budgeting, was found to be similar to the observed optimum N rate ($N_{opt}$). Thus, when N budgeting is used for calculating N fertiliser requirements, the recommendation can be improved if an estimation of N mineralisation during crop growth is included. N budgeting for malt barley will require sampling for soil N and water prior to sowing.

REFERENCES

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