

## SOIL NITROGEN DECISION AID PUTS FARMERS IN CONTROL

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*Summary.* Queensland farmer groups are now assessing their soil nitrogen status and considering the best nitrogen strategies for their own paddocks with the help of a new soil nitrogen decision aid. The decision aid combined on-farm soil tests and worksheets allowing farmers to individually calculate pre-plant crop nitrogen requirements. The workshops provided both answers and learning - each farmer used their own soil tests to see how much extra nitrogen their crop needed, whilst learning about nitrogen and how to make better nitrogen decisions in future. An evaluation (with a response rate of 81%) showed that the workshop's impact was high, influencing the 1995 winter crop nutrition decisions of 82% of respondents. In fact, 46% of respondents said they had used the worksheets again since the workshops. The decision aid, described as *embarrassingly simple* by one farmer, shows it is possible to simplify a complex issue like nitrogen and help make it meaningful to farmers.

### INTRODUCTION

Nitrogen management has been the focus of much agricultural research and extension over many years. Soil fertility decline is now widely recognised however, a recent review of nitrogen suggested that research has only provided basic *awareness* information which is not perceived (by farmers) as very helpful in decision making relating to how much fertiliser to apply, or at what time ley pasture rotations should be introduced (2).

Nitrogen (N) fertiliser rates and recommendations, such as those in the Department of Primary Industries' Crop Management Notes (3), have traditionally been based on a series of recipes taking into account the age of the soil and the previous crop. In time, farmers have developed their own rules-of-thumb for N rates and stuck to them, tending to apply the same amount of N following legume or cereal crops (2).

Operation Quality Wheat (OQW) has spent considerable effort since 1988 raising the awareness of soil fertility decline, the need to better address N management and developing new ways to make the best N decisions for specific crop situations. The soils capacity to mineralise N and the development of N budgets were the mainstays of the OQW approach (1). However, producers still perceived a need for *package style* information which answers specific questions like *how do I modify my fertiliser rate given a particular scenario?* (2).

In 1995, the DPI tested a new decision aid and workshop series to help producers with their N management. The *Nitrogen in '95* decision aid and workshop process were designed to help people understand basic soil N processes and provide tools to make better N decisions in future. The process was designed to take people past the awareness generated by OQW, and help them apply the principles to their own farm. Main thrusts of the *Nitrogen in '95* initiative were to empower people to make better N decisions for themselves, reduce their dependence on guesswork or rules-of-thumb, and to improve their understanding of the basis for recommendations from others.

### MATERIALS AND METHODS

Basic information on N budgeting for cereal crops was compiled into a series of worksheets for use at the workshops. Each worksheets was designed to be completed by producers and to emphasise one key issue and step of N budgeting only. The step-by-step worksheets included:

1. expected yield
1. expected N removal in grain harvested
1. N needed in the soil
1. soil N available (from soil tests)
1. extra N required for the expected yield
1. estimating soil N available (from yields and grain protein)
1. estimating in-crop mineralisation of N.

Soil samples were taken from one paddock on each producers farm, 2 to 3 weeks before the workshop and the results (soil nitrate at 3 depths to 90 cm, bicarbonate phosphorus for 0-10 cm) provided on the day of the workshop. The workshop ran for 3 to 4 hours. Initially each person was asked to describe their paddock for the benefit of other participants and to nominate their current expected N strategy for the coming crop. This was followed with a background discussion of the N cycle and the processes of soil fertility build-up and decline.

Each person then used the prepared worksheets and soil tests to calculate how much N was needed by their expected crop and how much N was currently available down to 90 cm in their soil. Each person then assessed the N status of their own paddock for the expected crop. After a coffee break, each person then used some of their own past crop yields and grain proteins to see how to estimate their soils capacity to provide N without soil tests. Situations in which yields and grain proteins were suitable, and the times when soil tests were vital were explained and discussed. Finally, long term N strategies were outlined and discussed.

Follow-up meetings after harvest are planned to review crop performance and to reflect on the value of the process with participants. Any problems with the decision aid and the influence of seasonal conditions on results will be discussed.

The initial testing of *Nitrogen in '95* was for the winter crop with 70 farmers in eight groups located from Warwick in the east to Taroom in the west during April 1995. Worksheets and the workshop process have been modified between workshops as required. A mail survey of participants was also conducted three months after the workshops to assess the on-farm impact of the *Nitrogen in '95* project. A second series of workshops, this time for the spring sorghum crop was being conducted at the time of writing (September 1995) with 100 farmers (11 groups).

## RESULTS AND DISCUSSION

The workshops were attended by people from 62 of the 70 properties on which soil samples were taken. People who missed the workshops were followed up by a local contact to ensure the materials were properly explained. The worksheets were not intended to be a stand alone product, but to be supported by activities to develop an improved understanding of N processes in farming systems.

Interest and involvement during the workshops were very high, with people obviously enjoying discovering how to apply the theories of N to their own farms. People from areas that regularly use fertilisers appeared to see the workshops as a way to objectively decide fertiliser rates, whereas people from more marginal areas were most interested in being able to determine how much N their soil was able to supply to crops and decide when ley pasture systems should be used.

Eighty-one percent of workshop attendees returned the mail-out evaluation survey, a high response rate for a mail survey. Participants responses revealed how successful the worksheets and workshops were.

Ninety-eight percent of respondents agreed (40% strongly) that *the Nitrogen in '95 workshop was very useful*. Ninety-eight percent of respondents also agreed (34% strongly) that *the workshop really helped me better understand N in the soil*, indicating the acceptance and learning that the workshop and worksheets achieved.

Ninety-two percent of respondents disagreed (34% strongly) that *the workshop was too complex*. This response, and the description of the worksheets as *embarrassingly simple*, show that it is possible to simplify a complex issue like N and help make it meaningful to farmers.

In the eastern areas where fertilisers were regularly used, the workshop suggested that 50% of people could reduce their intended N fertiliser rates for the 1995 winter crop and save money. Another 20% required more N than they intended to use. Only 30% of participants were within 5 kg N/ha of the suggested rates calculated at the workshops.

While quoting financial savings made by individual people can be impressive, it was the impact of the workshop process on peoples decisions that was of most interest. A good decision on N before planting may actually give a poor result if the season is extremely dry or extremely wet. Follow-up meetings after harvest will be extremely important in ensuring participants recognise the difference between the best possible decision prior to planting and the final yield and income in any single year. It is hoped that the extra involvement and assumed responsibility of individuals for their own N decisions will help them better assess the quality of the decision and its result.

Eighty-two percent of respondents said that the workshops influenced their decisions for the winter crop. The decisions people said were influenced included: crop choice, ie. whether to plant wheat, barley or chickpeas (28%); fertiliser type, ie. whether to use N, phosphorus or zinc fertilisers (50%); and what rate of N fertiliser to use (46%).

Forty-six percent of people said they had used the worksheets since the workshop; 32% to redo the calculations with different yields, 22% to check recommendations from agronomists, 12% to interpret soil tests done since the workshop and 18% used the worksheets in other ways. Sixteen percent of respondents had more soil tests done after the workshops.

The workshops were intended to provide people with answers to specific questions such as *How much N fertiliser do I need?*, but also to help them develop their understanding and knowledge of N in their farming systems. Most importantly, people were given an opportunity to use and build their confidence with a process for making future N decisions. The relevance of the approach was made obvious by helping people apply the process to their own farms. All respondents said that they *Would like to see the DPI provide more of this type of activity in the future*.

The *Nitrogen in '95* workshops also gained support from community based Landcare co-ordinators in the region. Feedback from co-ordinators was summarised in correspondence, *All landholders have commented that they thought the whole process was one of the most useful learning exercises they have experienced in recent times. I would be eager to see other packages developed along similar lines to cover a whole range of agricultural production issues.* (J. Kirchner, pers. commun.).

## CONCLUSIONS

*Nitrogen in '95* has successfully helped empower people to make better N decisions for themselves and reduce their dependence on guesswork, rules-of-thumb or recommendations from others. The workshops provided both answers and learning - each farmer was able to use their own soil tests to see how much extra N their crop needed, whilst learning about N and how to assess their individual requirements. The workshop's impact was high, influencing the nutrition decisions of 82% of participants. The acceptance of the materials used has been clearly demonstrated with nearly half the workshop participants having since used the worksheets without further assistance.

## ACKNOWLEDGEMENTS

*Nitrogen in '95* has drawn widely on past research and extension materials from throughout the northern grain region. In particular, *Nitrogen in '95* has built on the ideas and awareness generated by Operation Quality Wheat. The project would not have been possible without the assistance of local DPI and Landcare officers, and the rapid analysis of soil samples courtesy of Dr. John Standley and staff at the Queensland Wheat Research Institute.

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