



Nitrogen Natters

Partner Newsletter

July 2018

Edition 6

More Profit from Nitrogen: enhancing the nutrient use efficiency of intensive cropping and pasture systems is supported by funding from the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit program.

2018 MPfN Program Partner Forum- a highly valued knowledge exchange opportunity

The 2018 MPfN Program Partner Forum was successfully held in Darwin from July 2nd to 4th with 95% of attendees rating the event as very good to excellent. Thirty-six team members made the journey to participate over three days and evaluation of the event revealed it successfully delivered upon its purpose to "increase collaboration on Nitrogen Use Efficiency (NUE) research efforts". Eighty-eight per cent (88%) of attendees rated the event as very to extremely effective at facilitating cross-project and industry information exchange and understanding. Given the opportunity to share what worked well, it seems that the balance of formal and informal sessions to discuss project methodology and findings with colleagues was appreciated as was the mix of in-room and field based sessions. Whilst quite a long day to commence proceedings, direct delivery of project updates from team members was highly valued and stimulated common/shared topic project discussion and identification of collaboration opportunities to further explore over the next two days. Non-leadership roles (ie. research team members and research partners) expressed that the event provided excellent exposure to the other research projects and a wealth of research expertise, giving them greater knowledge, understanding and appreciation for the complexity of NUE science and management considerations across sectors. Feedback on integration of the Food Futures Conference was mixed- some greatly appreciated the exposure to northern Australia agriculture more broadly and the presentation on precision ag, whilst others felt it was perhaps not immediately relevant to their work.

At the pre-forum Program Management Committee meeting, a decision was made to explore timing next year's event to align with a key fertiliser industry conference as engagement with, and extension out to, this sector will become integral as the MPfN Program science findings progress into outputs such as BMPs, tools and guidelines which will need industry advisors to provide a direct route to the farmer end-user. This opportunity will be investigated and an update on the location and timing of the 2019 MPfN Program Partner Forum should be available by the next edition of *Nitrogen Natters*.

This is a condensed edition of *Nitrogen Natters* this quarter given many team members were recently involved in the forum. For those who could not attend, an overview of where you can source the information that was exchanged, and a summary of discussions and outcomes, is provided.



2018 MPfN Program Partner Forum (Day 3)

MPfN Reminders

2017/2018 Finance Reports

All reports due on July 31st! Project leaders please check with your finance departments that these have been submitted to Megan

Baker at CRDC via grants@crdc.com.au.

Milestone 5 Reports

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Due 30th November

Project specific templates will be emailed to Project Leaders mid-October.

Partner Contacts

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The recent survey of research team members indicated the staff database is considered a useful information exchange resource but there was acknowledgement increased use should be considered.

MPfN offers an opportunity for ongoing interaction between ALL research team members. Click [Here](#) to access the MPfN Team Information Database for up to date contact details.

2018 MPfN Program Booklet

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Include it as a link in your all communications! The work has been done for you!

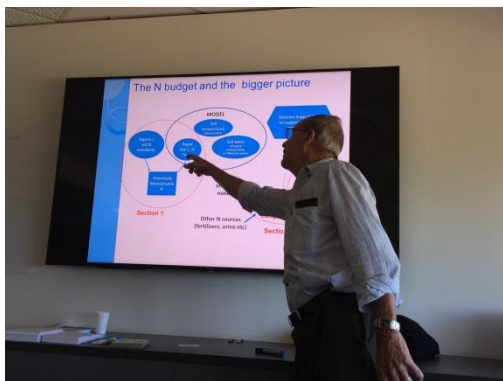
[2018 MPfN Program Booklet](#)

2018 MPfN Program Partner Forum

Click link for the full [2018 MPfN Program Partner Forum Drop-Box](#) containing the program, available presentations and photographs.



The three day program included project update sessions followed by Q&A, facilitated by the industry RDC representatives, collaboration sessions, the welcome function at Parliament House for the Food Futures Conference, a field trip to inspiring tropical fruit growers and the Coastal Plains Research Farm where the NT DPIR / QUT Mango research is conducted.



Mid-term Evaluation

Qualitative Evaluation

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The MPfN Program's qualitative mid-term evaluation process has just been completed by consultants Coutts J.R. Thank-you to all team members who were interviewed, or completed the written survey, and assisted in preparing the stakeholder interviewee list. The report is currently being prepared and will provide valuable insight into how the MPfN Program is tracking against its three main objectives and if the structure & processes in place are adequately supporting project partners to deliver the desired outcomes. It will be a good opportunity for the PMC and partners to take stock of what is working well and what adjustments could contribute to increased success in the second half of the Program.

MPfN Templates

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The MPfN Program suite of standard templates has recently been updated to incorporate CRDC's new logo. Please ensure you are using these latest versions for all Power Point presentations, promoting events, preparing media releases, registering participants at activities and evaluating events. The DAWR has pre-approved these templates but a reminder that all communications are to be reviewed by Marguerite prior to release.

**USE OF THE EVENT
EVALUATION IS ESSENTIAL
PLEASE!**

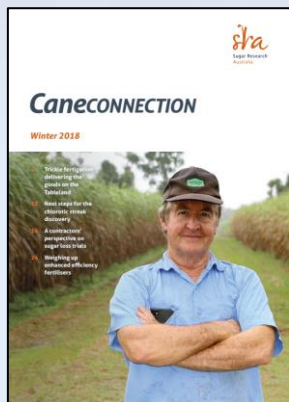
Click [HERE](#)

Snapshot on communications

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NSW DPI's Sugar project was featured in SRA's Caneconnection Magazine winter edition (pg 26)

Click the front cover to read!



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UoM's whole-farm-systems dairy modelling project presented the research which underpins recent updates to the industry's Fert\$mart N Guidelines in the winter edition of the Australian Dairyfarmer. Click [Here](#) for a copy of the article

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The MPfN Program has worked in partnership with the Department of Agriculture and Water Resources to prepare a case study video on the project as an example of the success of the Rural R&D for Profit program. Filming of researchers and farmers involved in northern NSW, as part of DPI NSW's Sugar project and QUT's dairy project, was undertaken in late June. MPfN will also feature heavily in a flagship video. It is understood that the videos will have a Ministerial launch in October.



NSW DPI's Dr Lukas Van Zwieten is interviewed for the Mpfn Case Study.

Forum Q&A sessions highlight shared and industry specific NUE research challenges.

Post project update Q&A sessions, facilitated by the industry RDC representatives, resulted in cumulated industry topics requiring further cross-project investigation and action in the next year of field research. These are outlined.

DAIRY

- Industry research still needs to address accounting for N mining in cut trials versus grazed trials.
- Completing the autumn N story: Where does autumn N end-up?
- Mineralisations and immobilisation of N is still not truly understood so further effort required in this area.
- Knowing soil water availability is extremely important and therefore research site monitoring is key to investigating N & water interactions.

SUGAR

- N modelling/ algorithm needed for crop N requirement (NUE in the crop) which factors soil N mineralization and capacity to supply.
- Need for increased understanding of synchrony of supply using PCU to be addressed & performance of different micro-plastic characteristics.
- Zero (control) plots which have a solid history of N application are not ideal for research purposes as there may be too much N "in the bank" and therefore the origins of N supplied by mineralization is difficult to definitively predict/ measure.
- Area (or zone) of inhibitor influence in the soil still not clearly understood.
- Sensing technology: There is still ongoing work required in spectral bands, remote & proximal methods and the impact of cane varieties upon findings. Collaborative work also needed on communicating the use of this technology to the industry- accuracy, research v practical application.

HORTICULTURE

- Litter enrichment tracking in tropical climates needs to be a focus in the coming 12 months.
- An analysis technique for DON (extracted into KCL) needs further investigation.
- Industry seeking high rainfall options other than PCU from collaborators.

COTTON

- N & P interaction is emerging as an area requiring further investigation for industry- will increased P rates lead to better N responsiveness? Links with root architecture and soil structure are part of this story.
- Displacement/ Priming:
 - Does this effect N rate? Non-linear due to N₂O emissions.
 - Is it affected by application method?
 - What is the impact of roots given exclusion tubes have been used in the research?
 - Importance of overall nutrition ie. K

Intra-industry follow-up

Each industry sector has agreed to work collaboratively to address specific industry issues in coming months and integrate, where possible, these challenges into this year's body of research work. Dairy have been the first to respond with a joint meeting of all the projects held on July 30th in Melbourne.

Demonstration on how projects should consider “custom fitting” their systems into a partial N budget using standardised NUE indicators.

Dr Phil Moody, of the Queensland Government's Department of Environment and Science (QDES), presented on how a common N budget framework, using key NUE indicators, may be used by the MPfN Program as a part of the collaboration session on Day 2 of the 2018 MPfN Program Partner Forum. He argued that the partial N budget concept could assist the Program to communicate an overview statement on differences and commonalities, across all industries, of the challenges and opportunities for improving N fertiliser management.

Although NUE is measured in many different ways, and an indicator that is useful in one agricultural system may not be relevant in another, Dr Moody presented the common principles underpinning all indicators. One key component of any NUE indicator is the contribution of in-season soil N mineralisation to plant uptake. The result of a recent collaboration effort involving seven of MPfN's research projects, to supply soil samples for soil N mineralisation analyses conducted by QDES, was presented to demonstrate how the results may be used for this purpose, along with a number of case studies of NUE indicator interpretation.

Dr Moody discussed the various indicators of NUE that can be used to measure “improved efficiency”, commencing with the simple, farmer friendly, Apparent Fertiliser NUE (AppNUE) which does not account for yield produced without applied N. He went on to explain the importance of using Agronomic Efficiency of Nitrogen (AE_N), disaggregated into Fertiliser N Uptake Efficiency ($NU_{pEFFERT}$) and N Utilisation Efficiency ($NUtE$). In summary, he argued that AppNUE allows for benchmarking of current N fertiliser management efficiency, however, calculating AE_N informs how management practices might improve NUE, resulting in demonstration of profitability, productivity and environmental benefits.

THE CHALLENGE SET

Attendees of the forum agreed to work collaboratively within industries to clearly articulate, by November 30th, that necessary data are available to input into the partial N budget concept and demonstrate capability to measure NUE improvements using the AE_N disaggregated calculation or an adjusted calculation which can be justified within the general partial N budget concept.. As a result, the MPfN Program will be better positioned to demonstrate/ communicate cross-program research outcomes on improved NUE and profitability using a common N budget framework, NUE indicators and terminology.

All projects should review Dr Phil Moody's presentation [HERE](#) and can seek assistance by contacting Phil via email: phil.moody@des.qld.gov.au. A full report on the results and analyses of the MPfN Soil N mineralisation program will be prepared once the results from the last submitted samples are available. This report will be disseminated via project leaders.

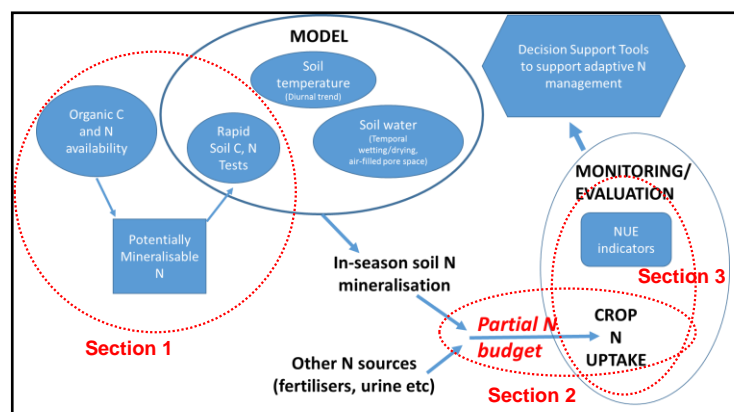


Figure 1- Dr Phil Moody's diagram demonstrates that data inputs derived from MPfN research projects have potential to inform a standardised approach to measuring NUE improvement.

Snapshot on events

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UOM's Dr Helen Suter presented at a national Incitec Pivot workshop in July on the topic of "Nitrogen mineralisation and impacts on fertiliser efficiency in pastures." Excellent engagement opportunity with industry!

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Australian Fertiliser Services Association (AFSA) Conference October 9th – 11th, 2018

Fertiliser Australia contacted the MPfN Program for speakers at this major industry focused event. Dr Graeme Schwenke & Dr Helen Suter will be presenting on their respective cotton and dairy MPfN research. UoM is also preparing an interactive display at the "Machinery Field Day" on remote sensing technologies used in N research. Again, an excellent engagement opportunity with industry!

[AFSA Conference Information](#)

National Soil Conference 2018 18th- 23rd November, Canberra

Five MPfN research projects have submitted six oral presentation abstracts for Session 8- "Soil nutrients – Balancing N, P and other nutrients' availability and environmental risk". Abstracts are currently being assessed.

Click: [Soils Conference](#)

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NSW DPI's (Cotton) Dr Graeme Schwenke, project leader, will present a webinar on August 2nd for the Department's **Soil Network of Knowledge**. You can register for the event by clicking [Here](#)

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UOM "Advanced technologies" project researcher, Dr Oxana Belyaeva, will be presenting a paper at the World Soils Congress 2018, Brazil, during August. Her oral presentation is titled: "Impact of urease and nitrification inhibitors on ryegrass productivity in the high rainfall zone of southern Australia"

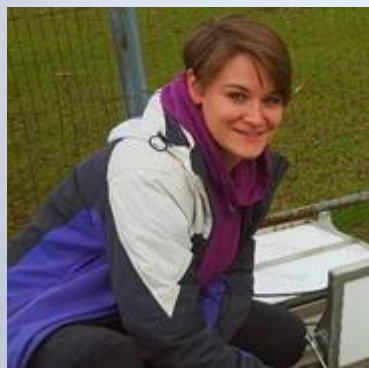
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Meet one of the team...

Karina Marsden, Bangor University to join the dairy MPfN team

The dairy MPfN team were successful in securing a Marie Skłodowska Curie Global fellowship from the EU in collaboration with Prof Dave Chadwick, Bangor University, UK. This Horizon 2020 fellowship will fund Dr Karina Marsden, to spend 2 years as a post-doctoral fellow working at the various MPfN dairy sites of the three projects. Karina will specifically work with the MPfN dairy team, adding molecular ecology, stable isotope methods and whole-farm system analyses to the current research.

Karina completed her PhD in Soil and Environmental Science at Bangor University, under the supervision of Prof. Dave Chadwick. Her thesis title was "Sheep urine patch nitrous oxide emissions: Measurement and mitigation". She has since been working as post-doctoral researcher on the Uplands-N2O project, investigating nitrous oxide emissions from extensively grazed systems.



The TARGET-N₂O project aims to establish the potential for the nitrification inhibitor, DMPP, to be utilised as a targeted N₂O mitigation strategy within areas of intensive dairy farms which receive a high frequency of livestock visitation. These farm hot spots have been found to emit large proportions of total farm N₂O emissions. For example, a recent study in New Zealand found that gateways contributed 9.4% of the total farm N₂O emissions, whilst only occupying 3.2% of the farm area. These N₂O emission hot-spots could be economically attractive areas for targeted nitrification inhibitor application, due to the potential to apply the inhibitor over a relatively small area, minimising costs associated with quantity of product required and labour associated with application. However, factors controlling the effectiveness of DMPP to reduce N losses, and the relative agronomic efficacy of its use in such areas, remains unestablished. The study will include microbiological techniques in soil N cycling, stable isotope methods to quantify N losses and farm system and N cycle modelling to determine cost-benefit analysis of targeted DMPP applications to case-study intensive dairy farms in both southern and northern hemispheres.

"More Profit" certainly not priority for increased NUE in the European context

Andrew Smith of The University of Melbourne's whole-farm-systems dairy modelling project is forgiven for not attending the recent forum in Darwin. He was busy presenting at the t20th Nitrogen Workshop in Rennes, Britany, France in late June. The Nitrogen Workshop is a biennial event bringing together specialists in nitrogen cycling from all over the world. The theme of the workshop this year was "Coupling C-N-P-S cycles" and was heartily attended by around 300 people. The programme included presentations of research at the landscape, regional, local process and farming system scales as well as a healthy dose of Breton hospitality. A side event addressed nutrient management and decision support systems, and it was also interesting to understand how technology, modelling, and data are being integrated primarily for research and environmental compliance.

Andrew presented a paper on "Fertilizer strategies to improve nitrogen use efficiency in grazed dairy pastures" and also presented a rapid poster presentation on "More profit from nitrogen in Australian agriculture", resulting from a joint abstract submission with MPfN Science Coordinator, Marguerite White. Both presentations were well received by the Europeans despite obvious differences in the political and economic context in which agriculture occurs in Australia. But Andrew reports it was our faithful MPfN correspondent's observation that this was the only time profit or gross margin were mentioned in the 3-day period. The next workshop in two years' time will be in Madrid, Spain.



The "More Profit from Nitrogen" program was presented to international researchers at the 20th Nitrogen Workshop held in June, Rennes, France.

Review, learn and make plans...

The research projects of MPfN have been actively working in teams to collate and analyse 2017/2018 data. Armed with this information, there has been a big effort to adjust and make plans for locating and designing 2018/2019 trial sites and experiments. In early June the NSW DPI Cotton project conducted a 2 day team review and planning session at NSW DPI in Tamworth. The three dairy projects worked collectively at a joint meeting on the 30th of July at The University of Melbourne and the QDES Sugar Project, led by Dr Weijin Wang, has rallied its extensive regional partners to attend a project meeting on August 21st at the Ecosciences Precinct in Brisbane.

Update on MPfN scientific journal papers

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Smith, A. P., Christie, K. M., Rawnsley, R. P., & Eckard, R. J. (2018). Fertiliser strategies for improving nitrogen use efficiency in grazed dairy pastures. *Agricultural Systems*, 165, 274-282. DOI: <https://doi.org/10.1016/j.agsy.2018.06.017>

Pittaway, P. A., Melland, A. R., Antille, D. L., Marchuk, S. (2018). Dissolved organic carbon in leachate after application of granular and liquid N-P-K fertilizers to a sugarcane soil. *Journal of Environmental Quality* (Section: Vadose Zone Processes and Chemical Transport) 47(3): 522-529. DOI: 10.2134/jeq2017.11.0433.

Christie, K. M., Smith, A. P., Rawnsley, R. P., Harrison, M. T., & Eckard, R. J. (2018). Simulated seasonal responses of grazed dairy pastures to nitrogen fertilizer in SE Australia: Pasture production. *Agricultural Systems*, 166, 36-47. DOI: <https://doi.org/10.1016/j.agsy.2018.07.010>

Christie, K. M., Smith, A. P., Rawnsley, R. P., Harrison, M. T., & Eckard, R. J. (2018). Simulated seasonal responses of grazed dairy pastures to nitrogen fertilizer in SE Australia: N loss and recovery. *Agricultural Systems*, (in review)

Smith, A.P., Beale, P., Eckard, R.J. (2018) Nitrogen management in mixed kikuyu/ annual ryegrass subtropical dairy systems for production and profit. *Agricultural Systems* (in submission).

Chin A, Schmidt S, Buckley S, Pirie R, Redding M, Laycock B, Luckman P, Batstone DJ, Robinson N, Brackin R (2018) Sorbents can tailor nitrogen release from organic wastes to match the uptake capacity of crops . *Science of the Total Environment* (in submission).

Friedl J., Rowlings D. (2018). Dissimilatory nitrate reduction to ammonium (DNRA), not denitrification dominates nitrate reduction in subtropical pasture soils upon rewetting. *Soil Biology and biochemistry* (in press).

Mumford, M., Rowlings D. (2018) Effect of irrigation cycles on nitrous oxide emissions in intensively managed pastures . *Agriculture Ecosystems and Environment* (in review).

MPfN provides opportunity for career pathway

We all know Jon Baird, of NSW DPI's MPfN cotton team, as the project's Research and Development Agronomist but recently he also commenced a PhD study with the University of Melbourne. Dr Helen Suter (UoM) will be Jon's principal supervisor, while he will be supervised by Dr Graeme Schwenke, Dr Ben Macdonald and Dr Greg Constable. Jon will be studying his PhD part time while he continues to work with NSW DPI.

The study will investigate improving nitrogen use efficiency in cotton through greater understanding of the interaction of irrigation management and nitrogen uptake by cotton plants. The study is beginning August 2018 and field trials will be co-located in the MPfN cotton research sites.

Jon and NSW DPI colleague, Guna Nachimuthu, will be presenting three minute thesis on their MPfN research to the Australian Cotton Conference to be held on the Gold Coast in August



Pictured: Jon presenting on research to cotton growers in February as part of CottonInfo's Researcher Tour

"Nitrogen Matters" is an activity of the MPfN Program, a cross-sector collaboration between Australia's four major intensive users of nitrogenous fertilisers: cotton, dairy, sugar and horticulture, managed by the CRDC. The Program is delivering outcomes from 10 research projects led by 8 research partners and involving twenty-three collaborating research and industry organisations. The [MPfN Website Page](#) provides a full overview of all participating partners.

This publication is prepared by Marguerite White, MPfN Science Coordinator.

Contributions are welcomed throughout the year from all team members, partner organisations and industry programs. Please email mwhite@icdprojectservices.com.au or phone 0447 500 415.



Australian Government
Department of Agriculture
and Water Resources

