

Utilising learning theory to focus nutrition extension activity

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Abstract. The More Profit from Crop Nutrition (MPCN) initiative (2012-2015) involved 35 nutrition research projects and three extension projects. These projects created and delivered both strategic and tactical soil fertility and plant nutrition knowledge. Strategic activities involve decisions made well ahead of time focussing on long-term profitability and sustainability. Tactical activities focus on short-term, in-season goals that guarantee current production (and support strategic goals). To address both these goals, an effective extension program requires extensive market research, comprehensive planning to contextualise what is being delivered and flexible multi-faceted delivery mechanisms over time. This paper reports on learnings from the MPCN northern region extension project, which engaged with over 7000 researchers, growers, advisors and industry representatives. The project achieved knowledge transfer and practice change by aligning information delivery of the right type, to the right people, at the right time, and in the right way.

Keywords: intervention, engagement, knowledge, research, strategic, responsive

Introduction

Aligning extension projects with active research projects is not common and becomes a synergistic relationship. However, establishing linkages between projects requires relevant research results, and a degree of trust between the teams. In the More Profit from Crop Nutrition (MPCN) initiative, the three regional extension teams were either directly involved in nutrition research, part of an agency conducting the research or an independent grower-focused group. These associations, along with local organisations and established networks within the regional areas, changed the type and delivery method of the information. For instance, extension staff who conducted research could capitalise on local trials and colleagues for expertise compared with external extension parties who had to utilise independent research organisations and contract local expertise.

Early in the initiative, extension teams conducted market research to determine how nutrient decisions were made on-farm including influential persons, growers and advisor information preferences and subject matter. It was found that:

Growers ranked crop nutrition issues highly but:

- Rely heavily on their advisors to help them make the strategic and tactical decisions, in light of their own experiences, financial and natural resource constraints. Further investigation revealed the ratio of growers to advisors in each of the agro-ecological zones across the northern region. Subsequent extension efforts leveraged off these findings (e.g. advisor workshops versus grower soil pit field days).
- Commodity prices play a big part in the allocation of finances to fertilisers. While growers are more focused on long-term return on investment in fertiliser, logistics often dictate when and what can be applied.
- Don't wish to be overloaded with the science behind interpreting soil tests and all the nutrient management options. However, they are keenly aware of negative (mining) nutrient balances and critical values, and will ask advisors how to identify and manage nutrient rundown.

Advisors ranked crop nutrition issues highly but:

- Length of service will affect ability to understand local issues and contribute to more strategic planning. If unsure, an advisor will give advice that is risk-averse in terms of potential financial loss. Long-service staff are more likely to be able to provide planning, integration and a focus on the financial benefits of a strategy.
- Their employment type (sales agronomist, company advisor, private consultant) may influence time spent on tactical versus strategic issues. Retail sales agronomy support is mostly used for tactical issues whereas consultants are more likely to be engaged in strategic decisions, particularly when contracted to provide detailed seasonal planning and review services. The type of decision support tools used will also differ between types of advisors. Soil testing and interpretation/recommendation software platforms tend to be used for tactical decisions by retail agronomists, whilst soil nutrient monitoring and nutrient budgeting is more common amongst consultants.

- Are often focused on yield benefits and may not focus on return on investment if focusing on tactical issues.

All nutrition training and extension teams were expected to deliver research outcomes from the MPCN initiative. These activities included, but weren't limited to, distributing tangible archival information, conducting workshops, seminars, field days and webinars for both advisors and growers, and producing publications in line with known and emerging nutrition research outcomes. Activities conducted were open invitation and spread across a large geographical footprint. Retail agronomic services have high contact frequency with the largest number of growers hence can be a key group in driving practice change based on recommendations from new research. In this project, retail agronomists were targeted in early workshops so they were able to provide support for growers to practically implement practice change on their farms. This was reinforced by having growers invite their agronomic advisers and consultants to grower-based workshops to ensure continuity of messaging and three-way discussions (presenter – grower - adviser).

As well as across the retail sector, the extension teams developed strong relationships with nutrition researchers involved in MPCN both regionally and nationally, in addition to fertiliser industry representatives (IPNI, IPL, CSBP, Summit Fertilizers, and Fertiliser Australia). The significance of these relationships means the feedback mechanism was seamless between the research, industry and on-farm adoption.

Methods and learnings

The right type of information

In the first couple of years of the initiative, events held across the northern region were general in nature, involving a mix of tactical and strategic topics, building a platform onto which knowledge could be added as research outcomes were realised. Over time and upon reflection of project impact, effective extension came about through better knowing the audience (including company structures), the local farming system and associated challenges and opportunities. Also apparent was the need to be aware of prior learnings, experience and influences in a region. Complex analysis of what was needed by target audiences led to presentations, publications and on-farm visits. designed to enhance audiences understanding in key learning areas. Furthermore, activities became more diverse, with the content dictating the means of engaging audiences.

Subject matter was often broader than just MPCN research projects. Table 1 illustrates where MPCN research findings were integrated and adapted for audiences' key learning areas. The type of content was necessarily a mixture of tactical and strategic issues in order to ensure timeliness but also address 'bigger-picture' issues.

Over the course of five years, it became obvious where improvements could be made, some of which include:

- More regionally focused market research to tease out components to address and if or why best practice was not adopted.
- Ascertaining what was the most appropriate pitch for the technical content via background research (often difficult with short timeframes).
- Shift from the technical aspects of nutrition to an economic analysis of fertiliser strategies.
- Better integration of nutrient strategies with variable soil water, rainfall and grain yield.
- More problem solving that reflects on best practice conducted in outdoor environments to facilitate peer group learning.
- Recognising value in past research for the tactical, 'need-it-now' advice, rather than drawing on the latest research work which may not be adequately validated in a wide range of conditions, localities or seasons.

Mixed messages and 'white noise' can occur if activities are not well coordinated (on ground or online) or the extension leader does not act as a filter of the information. Similarly, research results that are released too early can be misleading. Growers and advisors can be flooded with information (sometimes by choice via social media) but there is a balance between providing the latest information and providing information that can drive change or at least drive further enquiry.

Table 1. Knowledge extended to growers and advisors during the northern extension training program 2012-2017

Key Learning Area	Content detail	MPCN Research output (* not under MPCN initiative)
Soil and plant testing	Soil types and tests, what tests for what nutrient and what it means, critical values, tissue testing	Better Fertiliser Decision for Cropping (BFDC), Micronutrient deficiencies
Nutrients	Roles and behaviour of macro and micro elements, loss pathways, mineralisation, calculating nutrient use efficiency	Volatilisation and denitrification of N, placement of immobile and trace elements and subsequent nutrient acquisition by crop species
Understanding fertiliser products	Traditional and slow release fertilisers, foliar fertilisers, alternative products, manure	Root proliferations etc., rate by placement, banding to get roots to take up nutrient
Soil biology	Role of mycorrhizae, factors affecting N-fixation, crop sequence and N from residues	Impacts of extreme weather events on soil biota, effects of tillage and herbicide on soil biota
Pastures/legumes/farming systems	SOM build up, low residue crops, crop/pasture enterprise mix, inoculation strategies, inoculant formulations, N contribution from pulses	Pulse agronomy,* Farming systems investigation*
Local constraints and opportunities	Local trials run by grower groups (N placement and timing, liming, stubble retention).	Contracted local speakers where appropriate*
Budgeting	Nutrient removal across crop sequences, mine-build-replace nutrients, using precision agriculture, strategic planning of fertiliser application	Variation around grain nutrient concentration
Decision support tools	Propriety software and Government developed tools	Deep P calculator, BFDC, NitrogenARM,* CropARM*

The right people to target and involve

The right type of information should go to the right type of people. When it comes to nutrition information, grower and advisor needs are similar. However, advisors tend to focus on the 'nitty gritty' in order to use the underlying soil fertility or crop nutrition principles across diverse soil, weather and logistical variables. Conversely, growers require a more practical version, focused on what will work on their farm, what are the costs (and returns), logistical challenges and known risks.

With the objective of influencing nutrient management practices on farm, barriers to change need to be identified. Knowing this, targeted extension to the right people will be more effective compared to a general media or on-ground campaign. One example is the need for deep placement of phosphorus fertiliser in response to an identified phosphorus deficiency at depth in the soil. Growers are thinking about what machine they might use and at what time of the year they should place P bands; however, the advisor is keen to understand the frequency of crop response to added P, before he will recommend growers do it. Unless these questions are addressed separately, it is unlikely practice change will occur.

Bringing the right people together or targeting groups of people can be more powerful than just extending ideas to many people at the same time. It is imperative to understand the internal workings of groups before embarking on any engagement with them. When it comes to advisors, commercial teams or the same "coloured shirts" in a room means better investigation and sharing of knowledge and ideas, and similarly, a group of growers who know each other, share equipment, meet socially or have the same advisor can achieve the same degree of interaction and discussion.

To establish rapport with the target audience it is helpful to engage key growers and advisors from the local region. Engaging the most influential or respected people when setting agendas or outlining a scope of works brings respect early and opens communication lines. At events, local people can set the scene by vocalising local issues or practices, creating a positive atmosphere for the subsequent speakers.

Bringing a keynote speaker from outside the region into an area can often help engage target audiences. If they are a grower, researcher or industry specialist they can offer new perspectives and perhaps insights into possible production hurdles, otherwise not well explored in the region. They can also bring wisdom from other areas; even hold controversial viewpoints that challenge locally held views to stimulate learnings amongst target audiences.

The right way

The right type of information should go to the right people in the right way to facilitate learning. However, information transfer and learning can be hindered or helped by the way in which it is delivered. The project team has learnt there are some differences between growers and advisor with regards to how they learn (Table 2).

Table 2. Ways growers and advisors engage in learning opportunities

	Growers	Advisors
GRDC updates	Agenda targets seasonal tactical content and/or business focus.	Strategic and emerging research information. Is a major source of information but lacks opportunity to 'workshop' ideas.
Field days/special interest days (machinery, demonstrations, soil pits etc.)	Like to hear from peers and other respected personnel in a relaxed environment.	Often attend grower field days, to hear what other growers (clients) are doing.
In-crop field days during the season	Network building, preparedness for upcoming issues. A local influential person may encourage flow-on of information and facilitation of additional activities.	Contact with growers.
Workshops	Must be hands-on activity linked with on-ground activity (not a classroom). Better group dynamic if growers have a common thread.	Sessions conducted with staff from the same company increases interaction and conversation. Time commitment is always uppermost in the mind of advisors and they will choose carefully the workshops they attend. For a retail agronomist, time away from their clients can be lost revenue and their managers may impose restrictions.
On-farm trials	Walk through on farm research trial sites with technical specialists, trusted advisors and researchers. Looking for 'rules-of-thumb'.	A group of non-competing consultants often like to work directly with researchers and may discuss innovative technologies or strategies that may be added-to with exchange of ideas.
Published research data	Need the data and the activity to be local and personalized for local conditions.	Can want too much information (senior advisors) or alternatively an overly simple answer within very complex systems or research issues (less senior or sales-oriented staff).
Multi media platforms	Farmer age will influence the use of social media platforms and information sources such as podcasts and perhaps, search engines generally.	Webinars, videos offer convenience. Care needed in selecting appropriate level of technical complexity where audience may have wide diversity of experience.
Decision support systems	Generally low on the priority list of information sources.	Carefully scrutinized for ease-of-use and perceived benefit. If used, the learnings are absorbed then re-applied in association with experience and 'gut-feel'. Advisors return to DSS when unusual conditions are encountered.

The right time of the year and when they need it

The right time of year to engage or extend knowledge depends on the type of information. Strategic information can be best suited to 'slower times' during a calendar of operations, whilst

responsive 'need-it-now' information is best applied at a relevant point in time or when a disaster occurs or is imminent.

A strategy that is rolled out over time and involves multiple outlets will add to the success of the extension effort. However, growers and advisors are very time poor, and often a number of events will be held on the same day. If face-to-face is the best way of engaging with target audiences, joining forces with similar disciplines at convenient locations may help alleviate clashes. Combining this with online media can add value to the learnings, be at suitable times and act as a follow-up reference. It was a logical and efficient step for eXtensionAUS Crop Nutrition, an e-extension model for delivering research outcomes, to collaborate with MPCN and explore the benefits of coordinated delivery of extension through face-to-face and online delivery. The website eXtensionAUS Crop Nutrition, also served to provide links to information before and after face-to-face events, thus reinforcing key messages.

The website site eXtensionAUS uses online tools and platforms to communicate and interact with a target audience. It harnesses the power of social media to enable frequent interaction and to drive the audience to online content. It also provides a platform and mechanisms for experts and researchers to collaborate, and respond to issues as they arise. Successful e-extension relies on a model for delivery that links experts and researchers, manages effort and coordinates delivery to the target audience. Publishing information that is both relevant to current seasonal conditions, and to the stage in the season, helps to overcome the 'white noise'.

What eXtensionAUS offered was a means to reach the audience rapidly and constantly, and allowed the target audience 24 hour access to reliable, credible information. This may be in the form of a 140 character tweet such as 'phosphorus applied in one year is being accessed by the next few crops- it's not lost Mike McLaughlin #MPCN', which received 4555 tweet impressions (potential views), or in the form of a 500 word article, or a three minute video, or all of the above.

Conclusion

The success of the project has been positively influenced by building trust across the whole network through delivering on issues identified in the regions, and vigorously pursuing and acting on feedback. The outcome has been that approximately 7000 growers and advisors have been reached with regionally relevant content using the most appropriate delivery mechanism to achieve engagement and practice change. The projects' clients have appreciated the combination of delivering valuable nutrition information at the appropriate time via a time-efficient medium.

In five years (2012-2017), much has been learnt about delivering the 'right' information with the 'right' people in the 'right' way at the 'right' time. For a topic as complex as tactical and strategic crop nutrition, knowledge and extension techniques will be constantly re-evaluated. However, there are some core principles that were learned: understand local issues and identify if there is an R, D or E need for that locality, and involve respected local identities and researchers in any planning and delivery efforts. Use paddock settings, especially for grower-focused days. Distil complex information to suit the audience and offer 'rules-of-thumb' where appropriate. Seek to eliminate inconsistent messages wherever possible. Present information in ways that minimizes the time commitment of the audience but maximizes the impact. Webinars and videos are looked upon favourably at the moment. However, too many sources of information can produce an overload and create 'white noise'. Carefully evaluate the potential to use electronic media because it is constantly changing. During the MPCN Initiative, the project, eXtensionAUS Crop Nutrition, provided a reliable and credible information source.