Tools for GRDC project evaluation: ADOPT and BENEFIT

Summary

GRDC was seeking quantitative and objective means by which to assess ex-ante the proposed benefits of projects before they are funded. This project has developed two tools to assist in project evaluation, planning and development at the regional level. The Adoption and Diffusion Outcome Prediction Tool Version 1.0 (ADOPT) - at: www.csiro.au/adopt - has been substantially improved and developed from its initial Beta version and estimates the rate and final extent of adoption of new practices or technologies within grower populations. The C-Farm Options tool has been developed to help quantify the impact of a change in farm practices or technologies on whole-farm profit and natural resource outcomes.

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The information contained in these older reports is now several years old, and may have been wholly or partially superseded or built upon in subsequent work funded by GRDC or others. Readers should be aware that more recent research may be more useful for their needs. Findings related to agricultural chemical use are also potentially out of date and are not to be taken as a recommendation for their use.

Conclusions
The project has developed two tools with greatly improved features to assist GRDC apply more quantitative and objective assessment of the proposed benefits of projects:

1. ADOPT Version 1.0 is the first publicly available version of this tool since the original Beta evaluation version released in 2011.

ADOPT has been developed to assist those involved with agricultural research, development and extension (RD&E) to apply and understand factors that are likely to affect innovation adoptability. It predicts adoption levels based on a structured application of well-established understanding of the socio-economic factors influencing adoption of agricultural innovations.

ADOPT has been designed to achieve three aims:
- Predict the likely peak level of adoption of a technology and the time taken to reach peak adoption level;
- Inform users about the factors that affect adoption and diffusion and encourage them to consider these factors at the time that projects are designed, rather than once a technology has been developed;
- Engage users by making adoptability knowledge and considerations more transparent and understandable.

2. C-Farm Options: A bio-economic, whole-farm analysis tool for evaluating the effect of practice change to mixed farms and crop specialist farms across Southern, Western and Northern GRDC regions.

The C-Farm Options tool has been developed as a bio-economic tool to assess the efficiency and impact of changes in practices and inputs to these complex systems. The tool allows the user to set up an existing (or example) farm structure, allocate crops and pastures or crop/pasture rotations to different paddocks, or land use systems, and include different animal enterprises (breeding or trading) using sheep and/or cattle. Alternative scenarios for various farm practices, animal enterprises, crop rotations, etc, can be assessed against the existing, or baseline, scenario in biological terms of total biomass and grain production, animal production, feed supply and water use efficiency (WUE). This is done in economic terms of gross margins and profitability and in environmental terms of cover, runoff and drainage.

Recommendations
The project has developed two tools for GRDC that are intended to increase the capacity to understand and estimate the likely impact of a project's activities and innovations. Together they can be used to provide estimates of the potential impact of a practice change and the factors likely to be important in determining the impact. At the end of projects, the tools could also be used to check if the anticipated impacts were realised.

ADOPT is already readily available and widely used. There is the potential for C-Farm Options to be made more widely available as a decision support tool for those dealing with mixed farming systems RD&E. It will have initial application in existing GRDC projects, such as Grain & Graze. As a GRDC tool, wider availability and use will require a delivery plan by the GRDC.
Although initially developed for GRDC purposes, it is recommended that an avenue be developed for C-Farm Options to be made broadly available to potential users. Together with the supporting materials, it has potential to facilitate valuable assessment and consideration of the potential impact of practice changes at a whole-farm level.

Outcomes

This project has developed two tools, at the request of GRDC, that are now more user-friendly and readily adaptable to grains industry scenarios than previous versions. The potential for use of the tools in project planning, developing project priorities and evaluation was demonstrated in GRDC’s Grain & Graze II program. This has been documented in Kuehne G, Nicholson C, Robertson M, Llewellyn R, McDonald C 2012. Engaging project proponents in ex-ante R&D evaluation using bio-economic and socio-economic tools. Agricultural Systems 108: 94-103. This approach was seen at the time as a leading example of how GRDC wanted to plan large investments.

The feedback gained by the users of the tools at the time was used to improve the two tools. The outcome will be more defensible decisions around investment decisions made by GRDC, particularly in large programs, where the anticipated benefits are difficult to estimate and benefits come from a consistent and structured approach to considering likely impacts.

The tools have been designed in a way to be accessible, relatively simple and user-friendly, with the expectation that they will have ongoing use and applicability for those developing and evaluating the potential for new practices. An important outcome will also be greater understanding from project proponents of the possible drivers of profitability and adoptability from proposed practice changes in grain production and grazing systems.

Achievements/Benefits

The project has brought together multi-disciplinary skills to develop two tools with greatly improved features for GRDC use:

1. ADOPT Version 1.0: the first publicly available version of ADOPT since the original Beta evaluation version released in 2011.
2. C-Farm Options: A bio-economic, whole-farm analysis tool for evaluating the effect of practice change on mixed farms and crop specialist farms across Southern, Western and Northern GRDC regions.

Improved versions of ADOPT have been developed and provided to GRDC with the publicly-released Version 1.0 now available from: www.csiro.au/ADOPT. This version had several improvements compared to the publicly-available Beta version and greater compatibility across a range of computer operating and security systems.

Changes have been made to ADOPT in response to additional calibration and validation exercises using Australian agricultural innovation adoption data and workshops. In addition to changes to the model's performance, improvements to the layout of the interface have been made to improve usability of the tool. The purpose of ADOPT remains unchanged and is focused on:

- Predicting the likely peak level of adoption of a technology and the time taken to reach peak adoption level;
- Informing users about the factors that affect adoption and diffusion and encourage them to consider these factors at the time that projects are designed, rather than once a technology has been developed;
- Engaging users by making adoptability knowledge and considerations more transparent and understandable.

C-Farm Options is a tool that captures the purpose and approach of the original tool used in Grain & Graze II (BENEFIT) and applies the same WUE framework, but addresses the main opportunities for improvement that were provided in feedback from Grain & Graze II users. These were a more user friendly interface and a shift from MS Excel for greater stability. A decision was made to build on the preliminary software developed for future use in the Northern region by the Queensland Grain & Graze team.

To develop C-Farm Options for use across all GRDC regions required substantial input from tool developers and farming systems specialists (including Eric Zurcher, Andrew Zull, Cam McDonald and Cam Nicholson). Developing the livestock component, in particular, required substantial re-modelling. The C-Farm tool has been developed as a bio-economic tool to assess the efficiency and impact of changes in practices and inputs to complex farming systems. This tool allows the user to...
set up an existing (or example) farm structure, allocate crops and pastures or crop/pasture rotations to different paddocks or land use systems - and include different animal enterprises (breeding or trading) using sheep and/or cattle.

Alternative scenarios of various farm practices, animal enterprises and crop rotations, etc, can be assessed against the existing, or baseline, scenario in biological terms of total biomass and grain production, animal production and feed supply, and WUE, in economic terms of gross margins and profitability and in environmental terms of cover, runoff and drainage. The model uses monthly rainfall and evaporation data to calculate crop and pasture growth using transpiration efficiency coefficients provided by the user. Animal growth calculations are based on the potential intake of the animal type and the available feed supply.

Sheep needed to be added as a grazing option, as well as a range of southern crop options. Many improvements for usability across a wide range of agri-ecological zones and scenarios are now included in C-Farm Options. C-Farm Options now includes weather files for over 40 localities, template farm parameters for use with Grain & Graze scenarios across GRDC Regional Cropping Solutions (RCS and RCS Networks, or RCSN) regions and the ability to more readily develop and evaluate new farm scenarios. Importantly, a detailed User Guide has been developed.

Other research
Both tools can be expected to benefit from ongoing development and improvement. Neither are fully validated tools. As the tools are used in more scenarios and by more end-users, there is the potential for valuable calibration and validation exercises and gathering of feedback for improved usability. There is also substantial opportunity to further evaluate their use, influence and value in the project development, funding and evaluation cycle.

Although initially developed specifically for GRDC purposes, it is recommended that an avenue be developed for C-Farm Options to be made broadly available to potential users. Together with the supporting materials, it has potential to facilitate valuable assessment and consideration of the potential impact of practice changes at a whole-farm level. There is also potential to make ADOPT more readily available and manageable by transferring the program to an online format.

Intellectual property summary
These are not commercial products. ADOPT is made publicly available by CSIRO. C-Farm Options will be held by GRDC.

Additional information
Papers

