

### Longer term effects

As time progressed the differences became less as the effects of the fertiliser declined. However, during the eight months of the second growing season, from the end of winter 2010 to April 27, 2011, the additional growth in N fertilised plots ranged from 2,956 to 5,097kg DM per hectare, or an additional 101 and 403 AU grazing days. The N120 pasture produced the greatest dry matter increase of 1,212kg DM/ha during the final growth phase.

Cultivating the soil to a depth of 5-7cm in the non-fertilised plot had little effect on pasture growth.

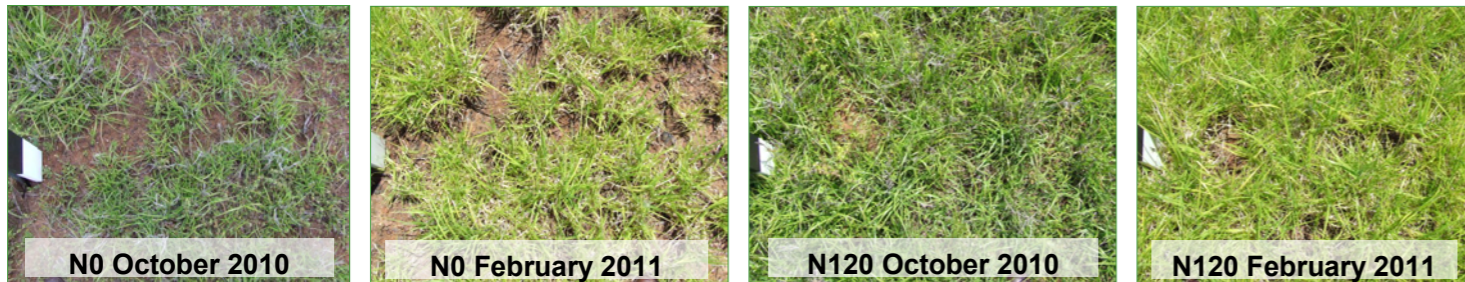
The pastures responded strongly to the second application of fertiliser after 12 months, producing from 1532 to 3841kg of extra DM/ha during the 4½ month period to April 27, compared with the non-fertilised control plots. This equates to an additional 12 and 157 AU grazing days, respectively.

Phosphorus had little effect on pasture growth. However, phosphorus did increase the number of seed heads of buffel grass, especially where N fertiliser was also applied. Reduced seed production is one of the first indicators of pasture rundown, so it is likely that both phosphorus and nitrogen were affecting the growth physiology of the plants and were therefore both involved in the run-down process.

### Groundcover

With regard to groundcover, Dr Cook observed that nitrogen fertiliser increased groundcover by an average 21% over that in non-fertilised plots. This difference increased to almost 27% in areas re-fertilised in December 2010, demonstrating the importance of fertility decline in reducing groundcover.

The series of photographs below illustrates the impact of nitrogen fertiliser on groundcover; significantly higher percentages can be seen in the plots with the treatment of nitrogen at 120kg/ha.



**This Landcare Sustainable Practices project aims to deliver increased Landholder engagement and adoption of sustainable and innovative Natural Resource Management, (NRM) practices by primary producers.**

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### Where to from here?

While preliminary results for this trial are promising, the timeframe is too short to draw definite conclusions. Continuing treatment applications and monitoring will answer common landholder questions including “how long will the fertiliser response last” and “would I have to apply fertiliser every year”.

“Tregona has seen one of the highest rainfall periods in many years while we have been conducting the trial so conditions have been great for improved pasture growth. It will be interesting now to see whether the fertiliser helps these paddocks stand up to the next dry spell,” Mac Plant said.

At CSIRO’s former Narayan Research Station near Mundubbera in Queensland, pastures in an old grazing trial fertilised with 100kg N/ha for 15 years are still showing large yield and botanical composition advantages 25 years after the last application of fertiliser. In May 2011, pastures that had received N fertiliser yielded 9,995kg DM/ha while those receiving no fertiliser yielded 2,661kg DM/ha, demonstrating nitrogen fertiliser can have both short and long-lasting benefits.

It is important to continue implementing and monitoring the QMDC trial to measure the sustainability of fertiliser application, considering the economics of the practice as well as broader environmental impacts of reduced groundcover, such as erosion and weed invasion.

Meanwhile the Plants aim to further subdivide their property, using fencing and water placement, to manage grazing pressure on different land types and allow pasture spelling, particularly during phase one growing. They hope this will increase pasture diversity and groundcover to provide them with a resistant and resilient operation.



## The proof is in the pasture—addressing fertility rundown

**Fertility rundown in sown grass pastures is a widespread problem in Queensland, with an estimated cost to industry of more than \$17 billion during the next 30 years. It results in less vigorous, less productive pastures with a lower basal groundcover and increased bare ground, leading to increased run-off and soil erosion. The decline in vigour of the pasture also results in lower competitive ability and the subsequent invasion by unproductive grasses and weeds.**

**Goal: To demonstrate the importance of nutrients on the health, groundcover and production of rundown pastures to local landholders in the Maranoa-Balonne.**

### The issue

Research has shown that fertility rundown in long term sown grass pastures is caused by nitrogen and other nutrients becoming tied up in soil organic matter, roots and crowns of old grass plants. The decline in production contributes to over grazing, a reduction in crown size and overall cover of the grasses, leading to reduced resilience and often death during drought. If allowed to continue, scalds can develop on soils that surface seal or are hard setting allowing both wind and water erosion to occur, leading to subsequent land degradation.

A number of methods have been used to lessen the impact of sown pasture rundown on productivity, including feeding dietary supplements to animals, chisel or blade ploughing, introducing legumes and simply reducing stocking rates. Results have been variable.



Drilling the trial plots with urea.

**This project is supported through funding from the Australian Government’s Caring for our Country initiative and contributes to the sustainable farm practices national priority area.**

*“Working together—healthy landscapes, viable communities”*

### Producers

Mac & Loy, Bill & Louise Plant

### Location

Meandarra, Qld

### Property area

2,833 hectares

### Enterprise

Mixed cropping and grazing

### Pastures

Predominantly buffel grass

### Soil types

Brigalow Uplands, Western residuals and Poplar Box red soils

### Annual rainfall

560mm

### Catchment

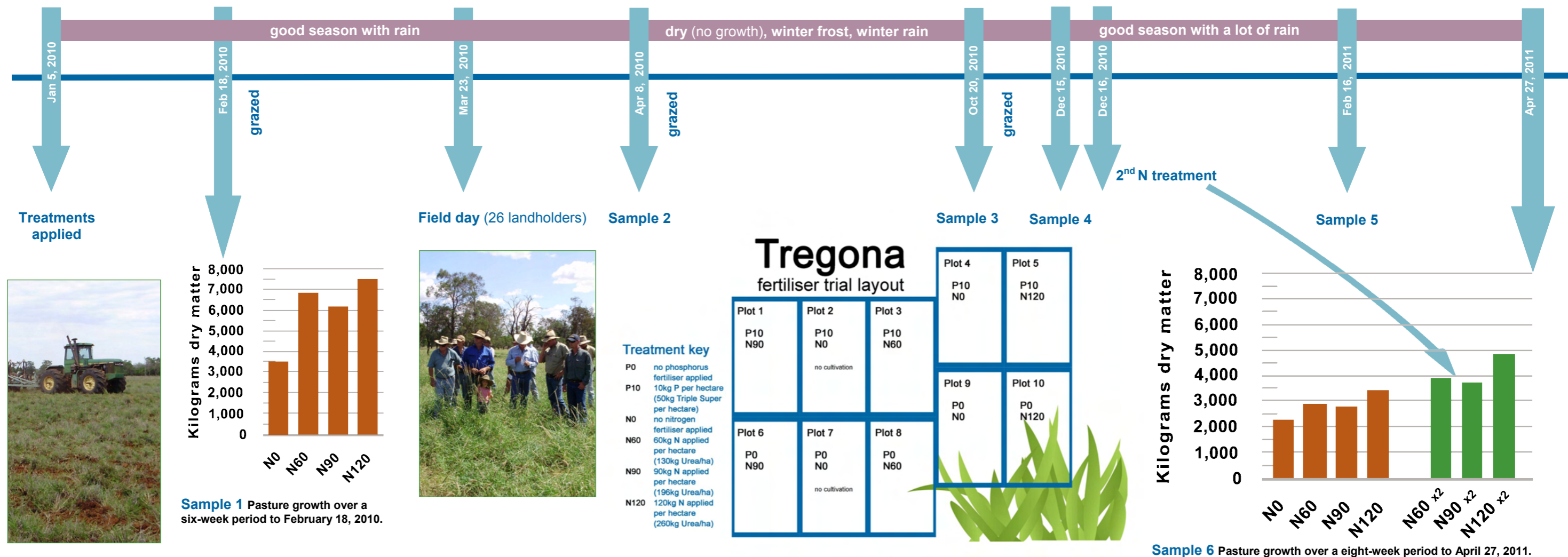
Maranoa-Balonne



The role of plant nutrients in pasture rundown is not well understood by landholders and little is known about the effect of using fertiliser to maintain the production and health of pastures in the Maranoa-Balonne.

The rundown of grass pastures has reduced the productivity of sown grass pastures at the Plant family’s property “Tregona”, located 60km south of Glenmorgan. Since the early 90s they have noticed their pastures growing less vigorously leading to a decline in their carrying capacity, particularly in dry periods.





## The "Tregona" trial

When the opportunity arose, the Plants were keen to investigate the impact of nutrients on the productivity of their run-down pastures. They hoped it would answer some of the questions relating to the amounts of N required for sustainable production, as well as investigating whether phosphorus played any role in the rundown of buffel grass pastures. "The rundown of our pastures has impacted on our cattle numbers and left the paddocks in no fit state to handle drought. When the funding became available to do this trial we decided it was a good way to use our existing equipment to test a potential solution that could help a number of landholders with the same problem," Mac Plant said.

## The strategy

The Plants have worked with Dr Sid Cook, Grazing Lands Management Officer with the Queensland Murray-Darling Committee, to develop a five hectare trial site on "Tregona". This involved extensive and regular monitoring as well as field days to share observations and learning with neighbouring landholders. Designed late in 2009, the trial has been conducted throughout 2010-2011.

The design of the trial incorporated the application of both nitrogen and phosphorus fertilisers at varying rates and repetitions, including:

- four levels of nitrogen fertiliser — 0kg N/ha; 60kg N/ha; 90kg N/ha and 120kg N/ha
- all plots had a single fertiliser application in January 2010
- a second application of nitrogen fertiliser was applied to half of each N-fertilised plot in December 2010
- two levels of phosphorus fertiliser — no phosphate and 10kg P/ha, applied once.

The phosphorus was applied in the form of Triple Superphosphate (20.7% P, 14.7% Ca, 1.5% S) and was spread on the surface of the soil prior to applying the nitrogen. Nitrogen was applied in the form of urea (46% N), which was drilled into the soil at a depth of about 5-7cm with a chisel plough fitted with narrow points.

As this process involves tillage, which can result in some nitrogen being released from the soil, one of the plots with zero nitrogen was also cultivated to identify if tillage alone has an effect on pasture growth.

The pastures were grazed periodically and uniformly to simulate 'real life' on a cattle producing enterprise.

## The outcomes

The trial was successfully established with machinery, resources and many dedicated hours from Mac, Bill and Loy Plant. Dr Cook conducted a number of site visits to work on plot layout, help establish the trial site and undertake monitoring in order to answer the questions posed by the project. The measurements taken to assess the change in pasture condition under the different treatments were the average yield of the standing dry matter and the percentage groundcover.

## Pasture growth

Aided by good summer rainfall from the time the fertiliser treatments were first applied, the pastures responded strongly to the application of nitrogen fertiliser. Between January and April 2010 nitrogen-fertilised plots produced between 5,083 and 7,887kg of dry matter (DM) more than the non-fertilised control plots. When allowances are made for wastage and a minimum residual of 1,000kg DM/ha, this equates to an extra 234 and 410 AU grazing days, respectively.