QUARTERLY PROGRESS SUMMARY: October - December 2017

A New Vision for Pastoral Agriculture through Seed and Nutritional Technology Development

Summary of progress during this quarter

- Seed increases of our diploid and tetraploid perennial ryegrasses with AR501 have progressed well and will be harvested in the next quarter. AR501 selections have exhibited improved tolerance to black beetle while grass grub experiments have been completed and the results are being analysed. Draft seed production management guidelines have been completed based on seed production trial in 2016/17.
- Evaluation of the agronomic performance of our first PGP-endophyte (ARY) has continued under field conditions. We have also continued testing ARY for viability following seed storage under normal storage conditions. The seed increase of our best PGP-endophyte for evaluation and animal safety testing at Lincoln remains on track. A series of new PGP endophytes have been inoculated into elite perennial ryegrasses in preparation for facial eczema screening.
- The next generation of material for our feed conversion efficiency project has been produced and this will be screened in both New Zealand and USA in 2018. We completed our first field trial in USA in the last quarter and the results have been used to influence the direction of our breeding programme. We have also confirmed that there are no adverse effects on nitrogen fixation
- The improved water use efficiency of Pallaton raphno has been clearly demonstrated across regions of New Zealand that have experienced drought through spring and early summer. Glucosinolates levels for both Pallaton raphno and Firefly kale have been measured at two locations. The levels of three glucosinolates were very low compared to both Regal and Sovereign kales.
- The 2nd product to be released from our PGP, Firefly kale, has been sown on over 3000 ha across New Zealand. This will help finalise recommendations for farmers on management and use within NZ farming systems. An animal safety trial has been established this quarter in Canterbury.
- We have made good progress on identifying new sources of clubroot resistance and on the genetics underpinning this resistance.

Key highlights and achievements

- Our elite perennial ryegrass selections with AR501 endophyte have improved bioactivity against insect pests and excellent agronomic performance, outperforming more than 100 other entries across 8 locations in New Zealand. Our first selection has been entered in the official National Forage Variety Trials. A series of animal safety trials have shown strong animal performance results without any adverse animal health problems demonstrating the animal safety of this endophyte. The nucleus seed crop harvested in 2017 had 88% endophyte transmission and will not be advanced. However, the genetic control of our AR501 endophyte transmission has been determined and the optimal method for progressing this to a commercial product in both diploid and tetraploid perennial ryegrass is underway.
- New diploid and tetraploid AR501 selections are being multiplied for harvest in January 2018. Draft seed production management guidelines have been completed based on seed production trial in 2016/17.
- The effect of PGP-endophytes on facial eczema spore counts have been assessed under field conditions, demonstrating a 30% reduction in *P. chartarum* spore counts under severe infection conditions. The histology and haematology results from our first animal toxicology study have shown

no adverse effects of these endophytes in small animal studies. Selection has improved transmission of AR-Y in perennial ryegrass.

- We have demonstrated improved water-use efficiency (+38%), aphid tolerance (+32%), clubroot resistance (100%), lower glucosinolate levels (-80%), excellent seed yield potential and improved agronomic performance (+14% DM yield) of our new hybrid brassica compared to Goliath rape across a range of regional sites. Furthermore our cattle grazing trial resulted in ~30% higher liveweight gain per hectare without any increase in brassica associated liver disease. Initial on-farm studies have also shown strong improvements in lamb finishing systems with >$2,000/ha profitability gains compared with forage rape and grass pasture.
- A nucleus crop of Pallaton raphanobrassica in early 2016 and two further crops grown in Canterbury in 2017 were successfully harvested with yields exceeding the target of 1500 kg/ha. Approximately 1,200 ha of Pallaton were sown across NZ in 2016/17 and DM yield and liveweight gains to date have been very encouraging. A stand at the national field days at Mystery Creek highlighted the knowledge we have developed from on-farm use of this project over the past year. Pallaton is in its 2nd year of Plant Variety Rights examination. Strong performance of Pallaton has been reported across regions of New Zealand that experienced severe drought stress in spring and early summer 2017.
- HT-C Kale (Firefly) is proving tolerant to Telar herbicide under worst case scenarios and has shown good agronomic performance at regional evaluation sites. A pre-nucleus seed increase was harvested in Canterbury in early 2017 and pre-commercial testing of Cleancrop Firefly kale across ~3,000 ha is underway across New Zealand. A Plant Variety Rights application has been submitted.
- Several new interspecific brassica hybrids have been developed and are beginning evaluation and several potential new sources of clubroot tolerance have been confirmed.

Upcoming

- New diploid and tetraploid perennial ryegrass synthetics with AR501 will be harvested in the next quarter. These increases are utilising the new knowledge generated on endophyte transmission from last summer.
- We will begin to monitor the impact of our PGP endophyte on facial eczema in 2nd year plots. The predicted hot and humid condition indicate we will have high facial eczema challenge next autumn.
- New seed increases with AR-Y will be harvested at Lincoln and the seed used to establish new field trials and an animal grazing experiment.
- A new field trial for our improved feed conversion efficiency project will be planned and material prepared for sowing. Progeny of ~250 crosses of our elite parents will sown for testing in 2018.
- Wide-spread testing of both Pallaton raphno and Firefly Cleancrop kale across New Zealand will continue, including preparation for a cattle grazing study in Canterbury.

Investment

Investment period	Industry contribution	MPI contribution	Total investment
During this Quarter	$304,537	$218,656	$523,193
Programme To Date	$5,937,889	$5,598,965	$11,536,854