QUARTERLY PROGRESS SUMMARY: April – June 2018

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

Summary of progress during this quarter

- New seed increases of our diploid and tetraploid perennial ryegrasses with AR501 have been successfully established. AR501 selections have exhibited improved tolerance to black beetle while further grass grub experiments have been completed but we are awaiting analysis. A new grazing trial established in Spring 2017 has 93% AR501 viability in plants following the summer.
- The 2018 facial eczema spore counting, hyphal biomass and alkaloid analyses from our field trials was progressed. There was a higher facial eczema challenge in autumn 2018 than the previous year. Final analysis of the 2017 trial results show that our PGP-endophyte was able to reduce facial eczema spore counts on ryegrass to levels similar to those observed in tall fescue. Ryegrass plants inoculated with several new PGP-endophyte strains have also been tested for their ability to suppress facial eczema spores. We have selected plants with superior ARY endophyte transmission for the seed increase in 2018/19.
- The next generation of material from our feed conversion efficiency project has been produced and screened in New Zealand. Testing of the best 1,500 plants from nearly 5,500 progeny in New Zealand has identified families that have mean trait expression in the target range. A new field trial has been established for more detailed analysis.
- A new herbicide tolerant raphanobrassica selection has been produced and is entering field testing.
- We have continued monitoring ~3,000 ha of Firefly kale and ~4,500 ha of Pallaton raphno being grown on-farm in New Zealand. Reports on performance to date have been excellent. We also began the cattle grazing trial of Firefly kale for winter 2018 in North Canterbury.

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 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.
- Draft seed production management guidelines have been completed based on seed production trials.
- The effect of PGP-endophytes on facial eczema spore counts have been assessed under field conditions, demonstrating at least a 30% reduction in P. chartarum spore counts under severe infection conditions over the past 2-years. Furthermore, this level provides similarly low levels of facial eczema challenge as those observed with tall fescue – the best current forage option. 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 ARY in perennial ryegrass. We have produced sufficient seed of our new PGP-endophyte to proceed with an animal safety trial this year. Several new PGP-endophytes with bioactivity against facial eczema have been identified and are in the development pipeline.

- 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) from Pallaton raphanobrassica 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 was produced in early 2016 with further crops harvested in Canterbury in early 2017 and 2018. The seed yields have exceeded the target by at least 30%. This product is now fully commercial with approximately 4,500 ha of Pallaton sown across NZ in 2017/18 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 2017/18.
- Firefly Cleancrop Kale has proven 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 with nucleus crops harvested in early 2018. Pre-commercial testing of Cleancrop Firefly kale across ~3,000 ha is underway across New Zealand. A Plant variety rights application is in its 2nd year.
- Glucosinolates levels for both Pallaton raphnobrassica and Firefly kale have been measured at two locations. The levels of three key glucosinolates were very low compared to both Regal and Sovereign kales. This should improve animal health outcomes for New Zealand livestock systems.
- 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 multiplications with AR501 will continue to be monitored. These increases utilise the new knowledge generated on endophyte transmission.
- Insect test results will be analysed and reported.
- Field trial results on the impact of our PGP endophyte on facial eczema will be analysed and reported.
- Seed containing ARY harvested at Lincoln will be tested for endophyte transmission before new field trials and an animal grazing experiment established in Spring 2018.
- The new field trial for our improved feed conversion efficiency project will be monitored and the elite parents from amongst ~1,500 plants screened for the key traits of interest will be used for further crossing.
- The Firefly Cleancrop kale cattle grazing study in Canterbury will be completed.

Investment

Investment period	Industry contribution	MPI contribution	Total investment
During this Quarter	$304,537	$446,154	$750,691
Programme To Date	$6,546,963	$6,365,325	$12,912,288