QUARTERLY PROGRESS SUMMARY: January – March 2018

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 the tetraploid nucleus crop exceeded the threshold to proceed to commercial seed production. AR501 selections have exhibited improved tolerance to black beetle while further grass grub experiments are progressing. New seed increases have been established in autumn 2018.
- We started the 2018 facial eczema spore counting, hyphal biomass and alkaloid analyses from our field trials. Ryegrass plants inoculated with several new PGP-endophyte strains have also been tested for their ability to suppress facial eczema spores. We harvested new selections for improved endophyte transmission of our ARY endophyte at Lincoln, and testing for endophyte transmission is underway. Finally, sufficient ryegrass seed with ARY endophyte (>20 kg) has been produced at Lincoln for animal trials in the spring 2018.
- The next generation of material from our feed conversion efficiency project has been produced and screened in New Zealand. Testing in both New Zealand and USA has begun with nearly 5,500 progeny screened in New Zealand and 1,500 genotypes selected for more detailed analysis. Material has been sent to USA for more detailed testing.
- The strong performance of Pallaton raphno has been clearly demonstrated across regions of New Zealand that have experienced drought through spring and early summer 2017/18. Glucosinolates levels for both Pallaton raphno 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. Seed production results have been excellent with the target yields exceeded by ~30%. A Pallaton raphno essential grower toolkit has been updated with our learnings from this past summer.
- More than 3,000 ha of Firefly kale are currently being grown on-farm in New Zealand. Reports on performance to date have been excellent. Preparation for the cattle grazing trial of Firefly kale for winter 2018 has progressed well.

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. The tetraploid nucleus seed crop harvested in 2018 had 91% endophyte transmission and will be advanced for harvest in early 2019.
- 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. 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 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 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) 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 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 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 multiplications with AR501 will be monitored. These increases utilise the new knowledge generated on endophyte transmission.
- Further insect testing will be completed.
- We will continue to monitor the impact of our PGP endophyte on facial eczema in field trials. The facial eczema challenge this autumn has been higher than in 2017.
- Seed containing AR-Y harvested at Lincoln will be tested for endophyte transmission before new field trials and an animal grazing experiment established in Spring 2018.
- A new field trial for our improved feed conversion efficiency project will be planted in May 2018. Approximately 1500 will be screened for the key traits of interest.
- Wide-spread testing of both Pallaton raphno and Firefly Cleancrop kale across New Zealand will continue including a cattle grazing study in Canterbury.

Investment

Investment period	Industry contribution	MPI contribution	Total investment
During this Quarter	$304,537	$320,206	$624,743
Programme To Date	$6,242,426	$5,919,171	$12,161,597