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Impact of Panama TR4 Disease on the Value Chain of Bananas

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Abstract

Bananas are a key horticultural market in Australia. This agricultural product not only outsells all other fruit and vegetables but also most other supermarket lines, making it one of the top selling products in major supermarkets (ABGC, 2020). However, this large value chain faces adversity in the form of Panama Tropical Race 4 (Panama TR4). This is a soil-borne disease that threatens to significantly reduce the supply of bananas throughout Australia. The disease could have devastating economic consequences throughout the value chain if not managed correctly. In this paper a value chain analysis is conducted to examine these potential consequences.

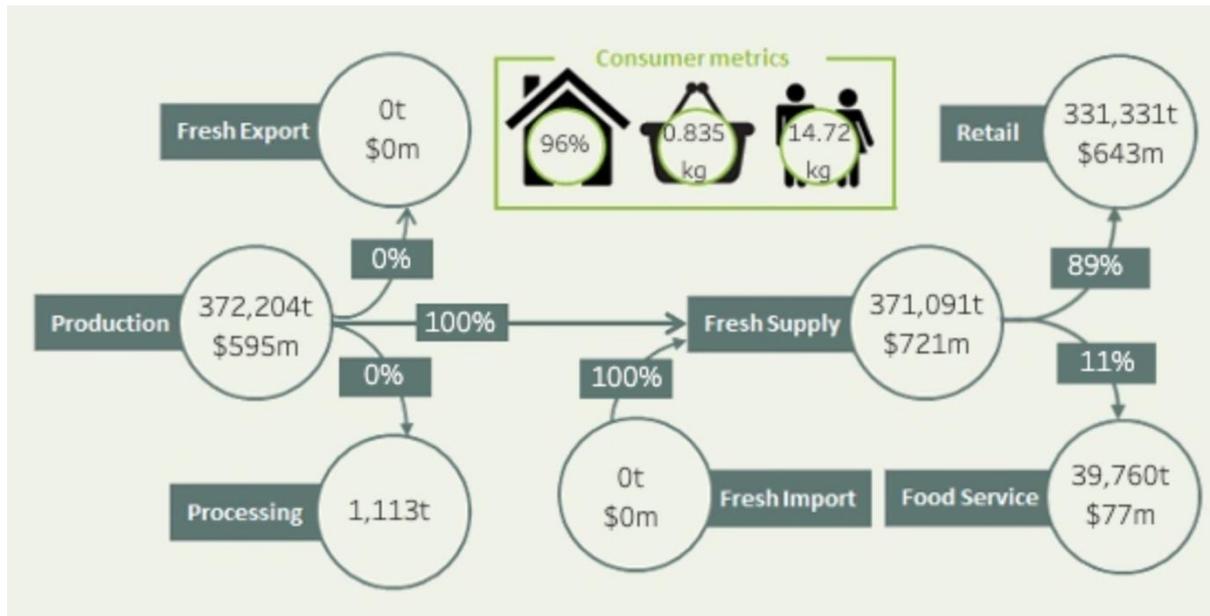
Key words: Panama TR4, value chain, disease management, banana, economic consequences

Banana Industry Overview

The banana industry contributes approximately \$1.3 billion to the economy annually, including levies paid to the representative body, the Australian Banana Growers' Council (ABGC) (ABGC, 2020). Furthermore, the industry supports more than 19,000 full-time and part-time employees (ABGC, 2020). The current value chain is focussed on fresh produce. This is because it has a higher value (approximately \$721 million in 2019) compared to processed products (Figure 1) (Hort Innovation, 2020). However, current high on-farm wastage and high transportation costs sees the industry needing to capture value from somewhere else along the value chain to maximise its efficiency. Another characteristic of the value chain is that bananas are neither imported nor exported. They are not imported because of plant pest and disease threats that would pose a problem to local farmers. There are currently no exports because the cost of production is too high in Australia compared to other banana-producing countries. This is because almost all global banana production occurs in emerging economies where labour is relatively lower in cost. As such, Australia cannot compete on price, which creates a barrier to entry into the global market.

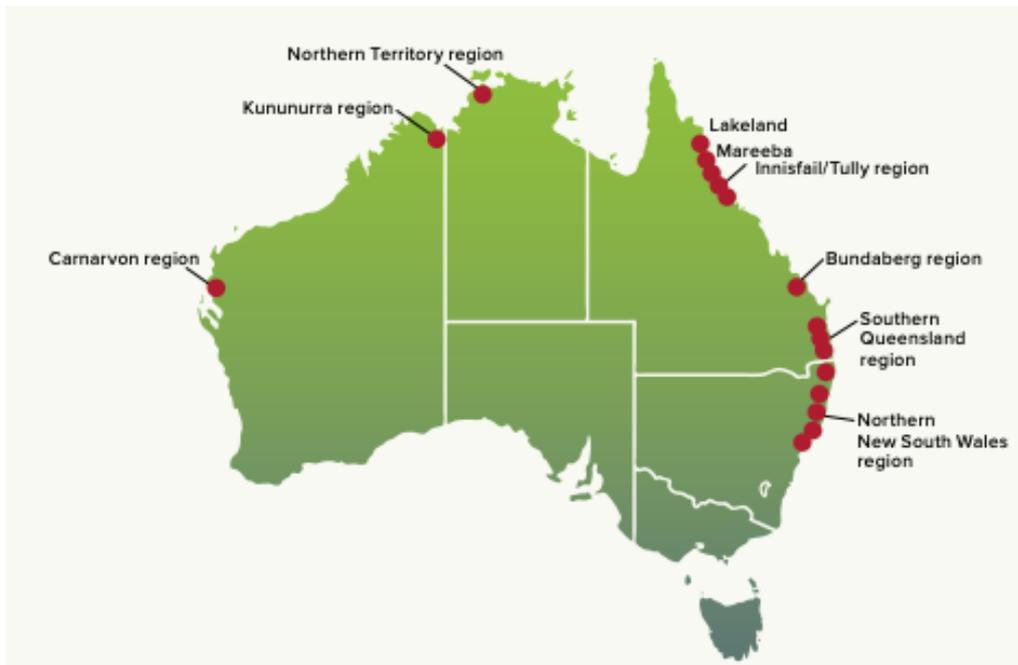
Bananas are grown in tropical and subtropical regions in Australia (Figure 2). This allows for geographical diversity. Tropical banana-growing regions are located in northern Queensland and Northern Territory (NT). Subtropical banana-growing regions are located in northern New South Wales (NSW) and southern Queensland. Queensland (mainly the tropical growing regions) account for 94 per cent of Australian banana production. Production in this area is centred around Tully, Innisfail, Kennedy, Atherton Tablelands and Lakeland. As such, the banana industry is the main

Figure 1. Banana value chain and consumer metrics, 2019



Source: Hort Innovation (2019)

Figure 2. Banana production regions



Source: Hort Innovation (2019)

economic driver and employer in these regions. Cavendish is the main variety produced. It accounts for 97 per cent of production (ABGC, 2020). Banana growers require well-planned plantations in order to maximise production. Furthermore, successful plantations will have rich organic matter and dark, fertile soil with stable soil moisture levels and air with minimal winds (Australian Bananas, 2020).

The marketing body is Australian Bananas and it is responsible for maintaining the high consumer demand for bananas. Through marketing, bananas have been positioned as nature's energy snack, which has allowed the product to adapt to new markets. This campaign allowed bananas to be transformed from just a commodity to a product that targets the consumers' desire for of a "quick and easy energy boost". This high demand is evident with 96 per cent of Australians eating bananas each year and 14.73kg of banana per capita being consumed (Hort Innovation, 2017). Australian Bananas is now aiming to increase the frequency of consumption amongst its target audience, which is families with children and people aged from 25 to 39 (ABGC, 2020). This will be done by focussing on the moments where consumers feel the need to snack. The campaign will show the benefit of "purposeful energy" that bananas have when eaten that is needed in current lifestyles of the target audience. Australian Bananas are a crucial driver for consumer demand.

Panama Tropical Race 4 (TR4) Disease

Panama TR4 is a "serious banana disease ... caused by fungus that lives in the soil. The fungus is not eradicable and can survive in the soil for decades without host plants." (Queensland Government, 2020). There are four races of Panama, with the fourth race being the greatest threat to farming. This is because it attacks all varieties of bananas, including the main commercial variety, Cavendish (Queensland Government, 2020). There is no way to detect the disease in the plant until external symptoms are visible. Therefore, as the bunch grows and requires additional nutrients and water, it promotes the appearance of symptoms (Figure 3). As the disease develops, the symptoms become more obvious. The disease is easily spread by people, vehicles, machinery and animals/pests. It can also be spread by the movement of infected banana plants and planting material, as well as contaminated soil and water. Whilst Panama TR4 is not the only issue that faces the banana industry, it poses the largest threat to the sustainability of the industry. Other issues in the value chain include pest and disease management, supply chain disruptions, cost of labour, etc.

The disease was first detected in Australia near Darwin in 1997. It caused a decline in production of 5,000 tonnes from 2000 to 2007 (ABGC, 2019). This has resulted in the NT contributing less than 1 per cent of production every year (ABGC, 2019). The disease has also been present in North Queensland in Tully since 2015. It is currently present in 17, including near neighbours such as Indonesia, mainland China, India, Vietnam and Taiwan. The disease has had devastating impacts across all the countries it has been detected in.

Panama TR4's Effect on the Value Chain

Direct effect

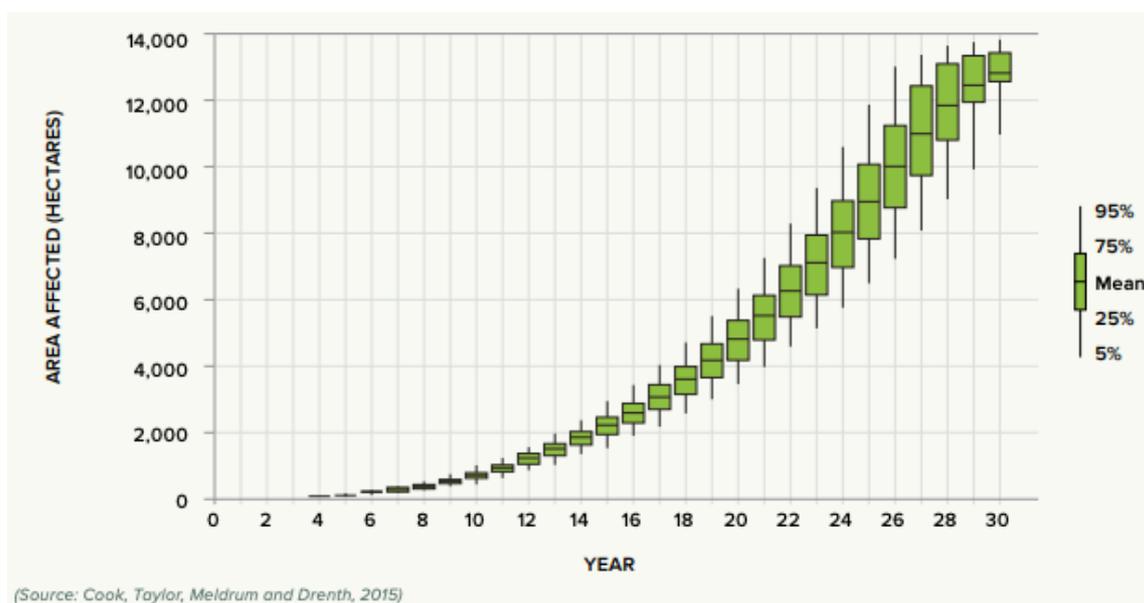
Panama TR4 directly affects the value chain at the farm level. It does not affect the fruit; it affects the plantation. As such, the fruit is still edible. The disease infects the plantations when the spores are in very close proximity to the plant. When this occurs, they germinate and enter through the natural openings and wounds of the plant. The fungus then blocks the vascular system, preventing movement of water and nutrients through the plant. This leads to the plant starving, and consequently wilting and dying. Simultaneously, the fungus produces more spores that spread the disease across the plantation. This is problematic as it only takes one spore to infect one banana plant. The timeframe between the initial infection and disease development is between three-months and a year. The affected plants are unlikely to produce a marketable bunch of bananas. As such, if the disease is not managed, it will result in there being smaller and fewer plantations across Australia.

Figure 3. Symptoms of Panama TR4



Source: Queensland Government (2020)

This will lead to fewer bananas being produced, resulting in lower supply in the future. This is reflected in a prediction that there could be approximately 13,000ha of plantation affected by Panama TR4 by 2045 (Figure 4) (Hort Innovation, 2017). This can then have ripple effects throughout the value chain.

Figure 4. Predicted banana plantation area that could be affected by Panama TR4 from 2017-2045

Flow on effects

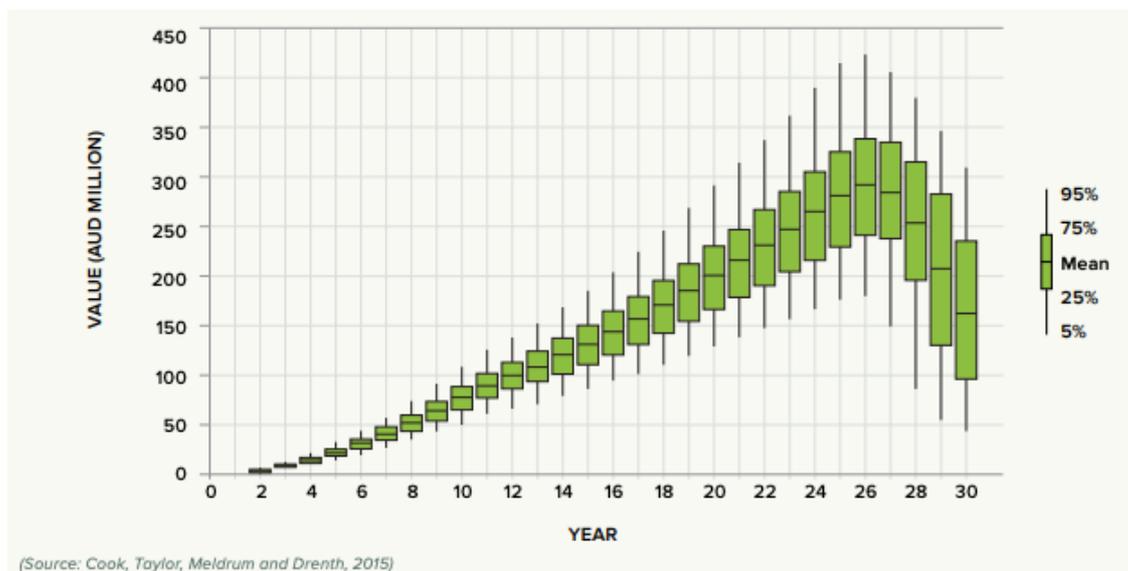
As discussed above, Panama TR4 will result in lower supply. This can have a number of consequential effects on the rest of the banana value chain. One of these effects is that it will cause upward pressure on the prices of bananas in the wholesale market. This is because there will be the same number of retailers trying to purchase the same number of bananas, but there will be fewer available. This higher price will then be passed onto consumers and, thus, could cause a contraction in demand. However, this contraction in demand may be offset by the successful marketing of bananas outlined earlier. If consumers believe that bananas are the best energy snack, they will believe that it is more of a necessity, and thus, be more willing to pay for bananas at any price point (i.e. the demand curve for bananas could become more inelastic). Furthermore, this upward pressure in prices will make it even more difficult to enter the export market.

There is no ripple effect into the international market as there are no exports or imports currently. Besides the high cost of production mentioned earlier, there are no exports because the banana value chain has been focussed on servicing the domestic market. Furthermore, there is still no export market development program currently in place. There have been no imports into Australia since March 2009 due to the quarantine policy that was put into place on the importation of bananas from the Philippines (who were a major exporter) (Department of Agriculture, Water and the Environment, 2011). This policy was put into place to minimise the risk of pests and diseases (such as Panama TR4) entering Australia and negatively effecting the domestic value chain. Whilst this policy may be beneficial to the growers, it may negatively affect other parts of the value chain. This is because the policy creates a high barrier to entry into the Australian banana market for the competitors with a cost advantage. As such, it does not allow free trade to occur and protects growers, resulting in Australian land, labour and capital not being used as efficiently as possible. It is most likely this policy will not be lifted until disease resistant varieties are found.

A lower supply will have a catastrophic economic effect on rural communities. The communities most affected will be the ones that rely heavily on the banana industry for economic stability and growth. These include Tully, Innisfail, Mareeba, Kennedy, Lakeland and Carnarvon. The lower supply results in less employment in these communities, as well as other areas along the supply chain (e.g.

ripeners, sales staff in the wholesale market, etc.). As such, this leads to greater unemployment and/or people receiving less income, resulting in a lower standard of living, in those areas that heavily rely on the banana industry for economic stability. These effects that are caused by lower supply are reflected in the predicted fall in economic value of the banana industry that could occur by 2045 (Figure 5).

Figure 5. The potential effect Panama TR4 could have on the economic value of the banana industry from 2017-2045



The future impact of an unlimited spread of Panama TR4 has been predicted to cost the industry \$138 million per year (Cook et al., 2015). This potential effect can be seen by analysing the experience China had with Panama TR4. They did not effectively manage the disease when it was first identified in 1996. This resulted in a loss of 100,000 hectares of Cavendish banana plantations from 1996-2017 (ABGC, 2019). This represents an economic loss of over USD1.4 billion at current market prices (ABGC, 2019). This illustrates why it is so important that Australia manage and stop the spread of Panama TR4.

Panama TR4 Management Strategies

Queensland Government

Queensland has strict biosecurity measures to prevent the spread of Panama TR4. This is particularly important to the industry as most production occurs in this state. Some examples of these biosecurity measures include footbaths, weed control, communication of a potential detection of Panama TR4, etc. The government puts emphasis on three main measures.

The first is minimising soil movement, which can be done by planting cover crops, timing activities to reduce soil disruption/dispersal, and constructing fences and barriers.

The next measure is monitoring water supply movement and disposal. This is because different sources, movements and disposal methods have different likelihoods of being contaminated with Panama TR4.

The final measure, and one of the best ways of minimising the spread of Panama TR4, is by implementing “zones”. This provides simple and cost-effective biosecurity layers, which manage disease risk pathways onto and out of the farm. It divides the farm into three separate zones: exclusion, separation and farming zones. This is a very beneficial strategy as it allows the activities of the farm to be separated so that the bananas can still be produced and delivered efficiently and at the same time minimise the risk of the spread of the disease. This ensures that the efficiency of the value chain is optimal at the input level.

Hort Innovation’s strategic plan

Hort Innovation has developed a strategic plan, with short-, medium- and long-term strategies to manage the disease. One of the short-term strategies that Hort Innovation have put into place is the establishment of effective destruction protocols for infested plants to reduce spore production. Another is the assessment and development of commercially-available testing kits to determine whether the concentration of decontamination solutions is optimal (Hort Innovation, 2017).

Medium-term strategies focus on finding resistance to the disease. One strategy is to increase investment in mutation breeding to increase the likelihood of developing a resistant variety. Another strategy is the field trials that are currently being undertaken. These trials are being used to establish a screening method to test imported banana cultivars for Panama TR4 (Hort Innovation, 2017).

The long-term strategies are about researchers working to identify disease-resistant varieties that also appeal to consumers (Hort Innovation, 2017). This strategy has a timeframe of greater than five-years. This will be beneficial because if Australia can create the first resistant variety, it will create a viable export opportunity and, thus, create a competitive advantage on the global market. Thus, finding a resistant variety will provide additional benefits to the value chain in the future.

Australian Banana Growers’ Council

This strategy in conjunction with Hort Innovation is the ABCG’s major on-farm biosecurity initiative of purchasing all infected farms and destroying host plants to contain the disease (Hort Innovation, 2017). This is an effective economic strategy for the long term as it stops the spread. It is also beneficial as they are willing to compensate the owners of the land by purchasing their properties, thus giving them an exit strategy. However, it poses the problem of the farmers who previously owned the land being unemployed and having to find another way of making an income. Thus, there are positives and negatives to these strategies.

Potential Panama TR4 solutions

Currently, there are no ways of testing for Panama TR4 in soil or water, it can only be detected when symptoms develop. However, one of the outcomes of the strategic plan set out by Hort Innovation is to have a new variety introduced in the next 5-10 years. The anticipated investment into this outcome is approximately \$10.4 million over five years (Hort Innovation, 2017). The benefit from this investment for the industry is estimated to be approximately \$54.8m for the following 15 years (Hort Innovation, 2017).

Conclusion

Panama TR4 poses a major threat to the banana industry and its value chain, particularly at the farm level. However, the management strategies in place will ensure not only that the value chain is

efficient, but that the ability of Panama TR4 to spread is minimal. Furthermore, finding a disease-resistant variety will ensure the sustainability of the banana industry is secure, as well as potentially creating an opportunity to expand the value chain into the global market.

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