



Resilience and transformation of the New Zealand kiwifruit industry in the face of Psa-V disease



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ABSTRACT

The New Zealand kiwifruit industry is facing a difficult challenge with regard to the canker disease on kiwifruit vines, caused by a virulent strain of bacteria called Psa, which has affected the majority of orchards in New Zealand. Although it is likely that the industry will be resilient in the face of the current shock, changes and transformation will also take place in the process. Using actor-network theory (ANT) as an analytical tool, this paper explores what resilience means to the industry as Psa-V is enrolled to the actor-network. Drawing on data obtained from semi-structured interviews and document analysis, this paper substantiates the notion that resilience, as with any other social construct, is an effect generated by networks of heterogeneous actors. I argue that resilience and transformation need to be understood as ongoing processes of negotiation between actors, both human and non-human, within the kiwifruit industry. Adopting Michel Callon's moments of translation, this paper proposes the moments of transformation through a series of negotiations that includes enrolment, translation, stabilisation, and alignment. The paper concludes that the complexity of the industry can render it plausible that resilience and transformation occurs simultaneously; hence the concept transformative resilience.

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1. Introduction

The ongoing discussion on achieving sustainability often brings forth the concept of resilience (Folke et al., 2002; Darnhofer et al., 2010), which is understood as the ability of a system or society to bounce back from crisis and adapt to changes. By this definition, the New Zealand kiwifruit industry would be a perfect example of a resilient horticultural system. The 1991 Italian pesticide residue crisis accompanying the 1980s price crash (Campbell and Fairweather, 1998) is evidence that the industry was able to adapt to shocks and emerge stronger after the crisis. However, since 2010, its resilience has been once again challenged by a different type of shock, this time at the orchard level. A bacterial canker disease caused by a virulent strain of *Pseudomonas syringae* pv. *actinidiae*, or also known as Psa¹ has affected the majority of kiwifruit orchards in New Zealand. Greer and Saunders (2012) estimate that Psa-V is expected to cost the industry between \$310 and 410 million over the next five years, and even more during the next 10–15 years.

This occurrence has brought serious attention to bear on the industry's ability to increase its resilience in the face of the prevailing shock.

It should be noted that during the development of the kiwifruit industry, transformation was an integral part of resilience. The 1991 Italian residue crisis and 1992 price crash, which were followed by subsequent changes to the industry, brought about the emergence of a new marketing entity under the name of Zespri International Limited (henceforth is called Zespri) in 1997 (Campbell and Fairweather, 1998; Kilgour et al., 2008). Likewise, the Psa-V crisis indicates a transformation to the industry through the establishment of Kiwifruit Vine Health Inc. (KVH) and reorientation of the industry's focus to include vines and orchards health (Greer and Saunders, 2012), as well as the development of new varieties that are Psa-V resilient (Birnie and Livesey, 2014). It is, then, argued that for a system to be resilient, it also needs to have the capacity for renewal, reorganization and transformation (Berkes et al., 2003), hence the term *transformative resilience* (Darnhofer et al., 2010; Gotham and Campanella, 2010).

This article is thus intended to document the process of transformative resilience within the industry. I argue that transformative resilience depends not only on the humans' capacity to adapt and reorganize, but also on the interplay between human and material

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¹ The term Psa-V indicates a virulent strain of Psa. As developed in the narrative, both Psa-V and Psa refer to the same actant, and thus henceforth will be named Psa-V for ease of.

objects (which are both equally assigned as actants). Using actor-network theory (ANT), I seek to foreground the non-human actors often left 'behind the scene' (Mol, 2002) and to show their roles in shaping the transformative resilience of the industry. The structure of this article is as follows. Firstly, I will provide a brief discussion on the concept of transformative resilience and a novel approach in understanding resilience through an ANT perspective. Secondly, I will discuss what happened in the New Zealand kiwi-fruit industry prior to and post-Psa-V infestation, using the findings from document analysis and interviews, to substantiate the argument that non-human actors, in this case Psa-V, do play an important role in the processes of adaptation and transformation.

2. Nurturing transformative resilience

Resilience is defined as the ability of a system to absorb shocks while still maintaining its structure, function and identity (Walker et al., 2004). In a social context, it also means the capacity to remain "... flexible enough to change in response to whatever hazards or perturbations come along" (Vayda and McCay, 1975, p.299). Based on the definition, resilience implies that transformation can occur in combination with persistence. While Walker et al. (2004) suggest that transformation and resilience are entirely different system properties (i.e. transformation is an alternative to resilience when the system is no longer tenable), Berkes et al. (2003) argue that transformation is often needed for a society to be resilient. Seeing this, Darnhofer et al. (2010) propose two types of resilience: 'shock resilience' (where a shock is absorbed without change in the system) and transformative resilience (where new relationships, new networks and a new mode of organization are conceived during the process).

Both Darnhofer et al. (2010) as well as Gotham and Campanella (2010) suggest transformative resilience as the active effort of the society to remain viable. In their article, Darnhofer et al. (2010) put forward general 'rules of thumb' for building in resilience at the farm level, which require the agency of farmers "... to exploit strengths, absorb shocks, adjust following a disturbance, and transform their farm to take advantage of new opportunities" (p.195). Gotham and Campanella (2010), on the other hand, suggest a deeper analysis of the social-ecological dynamics that render transformative resilience plausible, such as class relations, land-use change, or political economy of resource flows.

Despite their optimistic view, the two articles also assert that there is no 'one-size-fits-all' framework to be applied to building resilience. I found this pertinent because resilience is a contingent process that involves specific interactions between the society and the non-human components (machines, technologies, papers, plants, animals and nature), which differs from one locality to another. To comprehend the social dynamics that lead to a transformative resilience in a given context, I argue that one needs to go beyond the usual framework in order to address the non-human actors with the same importance as the humans. In my argument, actor-network theory offers such an alternative.

3. Foregrounding the practice: the use of actor-network theory

Actor-network theory (ANT) originated from the field of science and technology studies (Latour, 1986, 1987, 2005; Law, 1992; Callon, 1986). It is a material-semiotic framework of human-non human interactions. ANT posits that social constructs (knowledge, power, social institutions) are the results of heterogeneous, interacting, materials (Law, 1992, p.381). What defines an actor is not the actor *per se*, but the interaction it makes with others. In an ANT approach to society, human and non-human actors, or in a less provocative

term, actants, develop a social ordering similar to the structure found in other social theories. These modes of social ordering are not constant but changing over time and in space. ANT, in this sense, is a study of *social transformations* through heterogeneous networks. A network exists only to the extent that the actants are willing to hold themselves together and relate with each other, hence the network being precarious and constantly negotiated.

In linking the notion of network in ANT and system in resilience thinking, so as to bring a novel understanding of transformative resilience, I refer to the work of Noe and Alroe (2006), who describe a system as a stabilised network. This implies that a system needs to be seen as a performative state that is fluid and open to ongoing contestation and negotiation between actants, rather than as a self-regulating entity. The system (henceforth to be called network) is by its nature precarious, and it is only through the process of negotiation that the network achieves stability. This implies that there is no pattern emerging from the relationships and no means of predicting the future trajectories of the network. This, to some extent, resonates with Holling's (et al., 2002) proposition of nature evolving. However, Holling assigns precariousness to the changing nature surrounding a social-ecological system in which the latter acts to stabilise these changes. By contrast, Latour's (2005) uncertainties lie on the performativity of actors, both within and outside of such an arbitrarily-defined system. As John Law simply asserts, "actor-network theory almost always approaches its tasks empirically, and this is no exception. So the empirical conclusion is that translation is contingent, local, and variable" (Law, 1992:387). This is illustrated clearly in John Law (2006)'s paper on the outbreak of Foot and Mouth Disease (FMD) in the UK that shows the ways in which the stability of agriculture is continuously disrupted by the multilateral flow of materials to the extent that a control over this flow may result in catastrophic outcome.

There have been few studies that link resilience thinking and ANT. One notable study is from Dwiartama and Rosin (2014), who attempt to integrate the two theoretical frameworks by foregrounding the agency of non-humans in the making of a resilient system. Resilience in this sense is seen as an ongoing negotiation between actors so that each becomes indispensable to others, resulting in a robust and indispensable network in itself. However, robustness is only one face of a resilient system. Resilience also implies fluidity, a state where a network "transforms itself from one arrangement into another without discontinuity" (Mol and Law, 1994: 664). What Mol and Law implies is that there is no stable relation and defined boundaries in and around which a system/network exists, but that actors lie within a fluid space and that they can transform their relations without necessarily creating any difference. This is what I consider 'transformative resilience' through the lens of actor-network theory.

In regard to the negotiation process within actor-network, this paper refers to the work of Michel Callon (1986) in his social study of scientific research on scallops, in which he describes the way a network is being formed by various actants (scientists, fishermen, scallops, etc.) through a series of negotiations. He describes the way in which scientists attempted to construct a new set of relationships between society (a group of scientists and fisherfolks) and nature (scallops) in which every actant became indispensable to others. Through negotiation processes, actors influence others to an extent that they change the way other actors relate with each other—a process known as *translation*.

Callon then elaborates what he terms the four 'moments of translation'. These are *problematization* (how to define actants and what their role and goals are), *interessement* (how to lock the actants defined into place so that further process can be established), *enrolment* (how to make the actants accept their role so as to be enrolled to the network), and *mobilization* (how to mobilize

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