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Research paper

Helping local industries help themselves in a multi-level biosecurity world – Dealing with the impact of horticultural pests in the trade arena

Heleen Kruger

Australian National University, School of Sociology, Research School of Social Sciences, COP1128, Copland Building (24), Acton, ACT 2601, Australia

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ABSTRACT

In many countries the biosecurity system is under financial strain resulting in an on-going push for shared responsibility and greater industry self-reliance. This occurs in an increasing globalised, multi-level trade context. It raises the question of how the broader support system for local industries can be improved to help industries help themselves. This work relates to systems approaches as a phytosanitary measure in horticulture trade to address pest concerns. Specifically, it investigates how to create an enabling environment for local Australian horticulture industries to pursue systems approaches involving area-wide management (AWM) of Queensland Fruit Fly (QFly). A functional-structural analysis is applied to identify issues that prevent local industries pursuing systems approaches and to suggest ways forward. Primary data is derived from semi-structured interviews with representatives from three levels of government, industry bodies, consultancies and other key groups, complemented by a grower survey in three case study regions. Systems approaches involving AWM comprise a complex domain as it is situated across multiple levels from the local to the international; it involves various dimensions and many rationally-bounded actors. Key blocking mechanisms to local progress include a lack of clear change pathways for local industries; low connectivity between local industries and the innovation system; currently feasibility signals for systems approaches including AWM are weak; and systems approaches are problematic. Ways forward include supporting and initiating innovation platforms, offering domestic and international market access training; and minimising transaction costs to industry.

1. Introduction

Pests and diseases have challenged agriculture since humanity started cultivating food. Besides the impacts on productivity, in an increasingly globalised world many pests and diseases now also have significant implications for domestic and international market access for agricultural produce. Recent decades have witnessed an expansion of formal rules and measures at national and international levels to prevent pest and disease spread associated with trade (Maye et al., 2012).

This article explores the promotion of a pest management approach, i.e. area-wide management (AWM). It asks, how can an enabling environment for industry-driven AWM be created in order to support domestic and international market access for Australian horticultural produce? In answering this question, this article generates insights into how the modern-day biosecurity paradigm configures local constraints and opportunities and shapes the possible means to addressing challenges.

Pests often represent complex problems, that is, they involve uncertainty and multiple facets; with actors and institutions situated across international, national, state, regional, and on-farm levels (Schut et al., 2015). Attempts to strengthen Australian agriculture, including biosecurity, have traditionally relied on technology development and linear technology transfer approaches to farmers (Nettle et al., 2013). The great majority of plant protection literature is based on mono-disciplinary thinking and is technology-oriented (Schut et al., 2014) with some exploring economic impacts (e.g. Yu, 2006). While these have brought tremendous advances, disappointment with outcomes, including a lack of on-ground adoption, is increasingly leading to calls to approach innovation from a holistic systems perspective (Schut et al., 2014). This involves broadening the problem-solving arena to include social and institutional dimensions in order to create an enabling environment for progress to occur (Röling et al., 2012; Klerkx et al., 2012).

This paper contributes to filling this void by applying agricultural innovation systems (AIS) thinking that conceptualises innovation as co-evolving technological, social, organisational, and institutional change (Klerkx et al., 2010). This paper presents a structural-functional analysis of the Australian innovation system for the management of the pest under consideration, i.e. Queensland fruit fly (*Bactrocera tryoni*

E-mail address: heleen.kruger@anu.edu.au.

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(Froggatt)). The innovation system here is defined as the operating arrangements that set out how actors and institutions interact and exchange knowledge to develop and spread innovations (Busse et al., 2015). This work argues that a well-functioning innovation system will create conditions that enable entrepreneurial activities to thrive (Hekkert et al., 2007, Kruger, 2017).

The paper is organised as follows. The remainder of Section 1 describes the QFly challenge in the modern biosecurity context. Section 2 introduces the structural-functional theoretical framework, while the research methods are outlined in Section 3. Section 4 describes the structural and functional components of the QFly management innovation system. Section 5 explores blocking mechanisms, and policy interventions are suggested in Section 6.

1.1. Background

The fruit fly family Tephritidae is one of the world's most significant horticultural pests. The annual global cost is around US$ 2 billion, including impacts on production, harvesting, packing and marketing (Malavasi, 2014). Eastern Australia is confronted by Queensland fruit fly, or QFly. The fly is of considerable concern to Australia's international horticulture trading partners. Most of Australia's fruit and vegetable exports, worth approximately AUS$1048 million in 2014–15 (Abares, 2015), are susceptible to varying degrees (Plant Biosecurity CRC, 2015).

The challenge recently intensified following restrictions on two key pesticides, fenthion and dimethoate, traditionally used to control QFly at relatively low cost through a simple single-treatment approach (Dominiak and Ekman, 2013). A current key recommended strategy to local industries is the application of area-wide management (AWM) (PHA, 2008; Plant Biosecurity CRC, 2015). AWM involves total pest population management by coordinating control strategies across all key pest sources throughout a region (Hendrichs et al., 2007). This allows for the application of softer control techniques for QFly such as protein baits, orchard hygiene, male annihilation technique and sterile insect technique (SIT) (Jessup et al., 2007).

Another benefit of AWM is that it is seen as a good candidate to underpin systems approaches for trade (PHA, 2008; Dominiak and Ekman, 2013). Systems approaches for trade comprise two or more independent pest treatments or measures throughout the supply-chain that collectively reduce pest risk to an acceptable level (PHA, 2008; Jamieson et al., 2013). International trade rules set by the World Trade Organisation (WTO) and the International Plant Protection Convention (IPPC) recognise such approaches as acceptable phytosanitary measures (Dominiak and Ekman, 2013).

This occurs against a national backdrop where Australia's biosecurity governance during recent decades increasingly emphasise shared responsibility and partnerships between government, industry and the broader community. It includes a shift of biosecurity costs and responsibilities from the state to agricultural producers accompanied by cuts to public biosecurity funding (Higgins et al., 2016). It implies that local industries are predominantly responsible for driving initiatives such as AWM and related systems approaches for market access.

The international context involves the WTO and the IPPC advocating free trade whilst promoting a science-based approach in a bid to minimise biosecurity risk (Maye et al., 2012). For example, they oversee the production of globally agreed International Standards for Phytosanitary Measures (ISPMs) to underpin international trade, including several relating to systems approaches, AWM and fruit flies. Australian biosecurity policies and activities are increasingly aligned with international market logics (ibid.).

Hence, in the modern biosecurity paradigm the market dominates and processes of harmonisation and standardisation rooted in scientific expertise stand central (Higgins et al., 2016; Maye et al., 2012). Some call for more "alternative spaces of negotiation" that allows for more flexibility and negotiation (Higgins et al., 2016; Enticott, 2008).

Within the QFly context, these orderings brings about a complex multi-facetted, multi-level innovation system as is outlined in Box 1. There are multiple horticultural crops, geographical and climatic conditions, types and size of horticultural enterprises, and commodity groups differ in how well they are organised. Besides growers, many other actor groups are involved, including different levels of

Box 1
The key structural components of the trade-related QFly management arena.

Actors

International

- WTO and IPPC

Australian Government

- Department for Agriculture and Water Resources – responsible for international border biosecurity and trade, including conducting negotiations for overseas trade

National

- State and territory departments responsible for agriculture – oversee onshore biosecurity and domestic trade
- Plant Health Australia – coordinates government-industry partnerships
- Peak industry bodies – representative bodies for different horticulture commodity groups, including providing some support to QFly-affected industries to facilitate trade
- Horticulture Australia Innovation Limited (HIAL) – a research and development corporation and a key funder of QFly-related on-ground initiatives

Local industries

- Local pest/QFly management groups
- Local coordinator (sometimes)
- Growers