

# Thwarting plague and pestilence in the Australian sugar industry: Crop protection capacity and resilience built by agricultural extension

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## ABSTRACT

This paper investigates how Australian sugar industry extension services over the last decade have overcome historical pest management challenges in sugarcane (*Saccharum* spp.). The industry has done this by building increased capacity amongst its extension agents and farmers. This paper considers how coordinated extension efforts have reduced production losses from its two principal pests: greyback canegrub – *Dermolepida albohirtum* (Waterhouse), and rodents (i.e., *Rattus sordidus* and *Melomys burtoni*). It details the complexity of the respective pest management issues and the efficacy of industry efforts in resolving outbreak situations in the early 2000s. The paper then investigates how combined research, development and extension efforts have been able to mitigate risk of similar outbreaks over the last decade. These RD&E efforts have delivered IPM packages that are practical, defined, and ready for on-farm use. They have delivered sustained reductions in pest damage and an increase in knowledge and skills amongst extension agents and growers. Overall, industry is more confident, skilled and pro-active in the management of rats and canegrubs than in decades past. Consequently, the Australian sugar industry is a more resilient entity as a function of these extension initiatives. The strategies described here provide a model for building capacity and resilience in the sugar and other industries when confronted with multi-faceted challenges related to pest biology and behaviour, availability of inputs for production, economic forces and environmental considerations.

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## 1. Introduction

The Australian sugar industry consists of around 4100 farmers operating in discontinuous suitable agro-ecological zones along the east coast of the Australian continent from the northern rivers of New South Wales (29° S) to Mossman (16° S) in far north Queensland, a distance of around 1700 km (ABARE, 2008) (Fig. 1). The industry crushes around 35 million tonnes of sugarcane (*Saccharum* spp.) annually from approximately 400,000 ha of cultivated land (ABARE, 2008). The industry has a history of major productivity losses from pests and building industry capacity and resilience to pest impact has long been a priority.

In the 1990s, the Bureau of Sugar Experiment Stations Limited (BSES) – Australian sugar's principal research, development and

extension (RD&E) agency – developed a three-pronged approach to provide industry with improved systems for the management of all serious pests of sugarcane. These involved: (1) testing new pesticides; (2) further investigating the biology of pests to determine if there were behaviours of pests that could be exploited as control mechanisms; and (3) undertaking action-research initiatives with cane growers in order to develop integrated farming systems to mitigate impact (Robertson, 1997; Allsopp, 2010).

The Australian sugar industry has two major groups of persistent pests – canegrubs and rats. By this we specifically refer to greyback canegrub – *Dermolepida albohirtum* (Waterhouse) and two rodents – *Rattus sordidus* (ground rat) and *Melomys burtoni* (climbing rat). Between 1999 and 2001, outbreaks of these pests in Australian sugar-producing areas tested the effectiveness of pest management systems. This paper provides background to the development of two major integrated pest management (IPM) programs and their initial efficacy in mitigating losses in the Australian sugar industry. It then investigates the success of these programs in reducing losses over subsequent years and provides an understanding of the underlying biological and management reasons for the ongoing success. In particular, it examines shifts in

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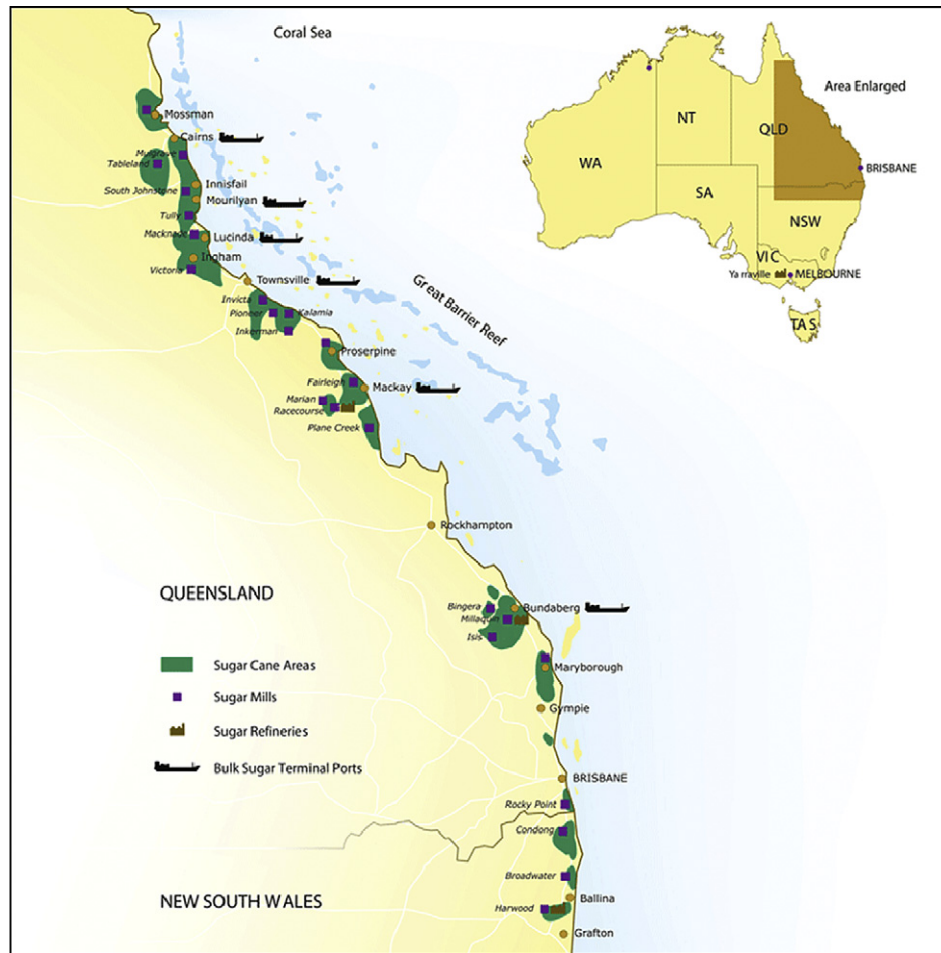


Fig. 1. Sugarcane-growing areas of Australia (Source: CANEGROWERS, 2011a).

technology for improved pest management, and changes in the knowledge and skills of Australian sugarcane growers and their supporting extension agencies in better managing pest infestation risks. The dividend resulting from these improvements is an Australian sugar industry that is more resilient to its two most serious pests.

This investigation addresses how extension services have contributed to capacity building and resilience in this major Australian agricultural industry. To do this we use quantitative data on damage estimates from three case-study mill regions, and qualitative data from interviews with key informants working in the industry. Supporting the study is an initial overview of the significance of the pests and the biology and technical issues associated with control of these species.

## 2. Capacity and resilience

The influences that extension services in the Australian sugar industry have had on industry capacity and resilience against these pests relies on biological and socio-economic understanding (Vanclay, 2004; Hunt et al., 2011, 2012). Macadam et al. (2004, p.17) described the building of capacity in agriculture as “Externally or internally initiated processes designed to help individuals and groups ... to appreciate and manage their changing circumstances, with the objective of improving the stock of human, social, financial, physical and natural capital”. More succinctly, Coutts et al. (2005, p.4) saw capacity as “increasing the abilities or resources of

individuals, organisations and communities to manage change”. Increasing the capacity – i.e., the knowledge and skills of individuals and the industry – is viewed as a necessary precursor to industry resilience. Resilience can be defined as the ability an individual or community has to cope with stress, overcome adversity, or adapt positively to change (Rolf, 1999; Luthar et al., 2000; Kaplan, 1999; Varghese et al., 2006). Thus, the greater the level of capacity that industry participants have, the greater their resilience will be in coping with or rebounding from episodic events, such as pest outbreaks, that bring significant short term challenges.

## 3. The capitals framework

To discern evidence of capacity and resilience building, we used a framework of ‘Capitals’ (Carney, 1998; DFID, 1999; McIntosh et al., 2008). The relative levels and change in capacity and resilience can be analysed around a framework of asset sets:

- (1) *Produced capital* (the impact/benefit of the extension effort on the productivity and economics of the industry);
- (2) *Human capital* (the knowledge, skills, and competencies of the individuals within the industry);
- (3) *Natural capital* (the contribution to the state of the natural bio-physical environment);
- (4) *Institutional capital* (i.e. influence of the initiative upon industry organisations and institutions that can be drawn on as industry capacity); and

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