Drivers of trends in Australian canola productivity and future prospects


ACSIRO Agriculture, GPO Box 1600, Canberra, ACT 2601, Australia. Email: john.kirkegaard@csiro.au
BEastern Cereal and Oilseed Research Centre, Agriculture and AgriFood Canada, Central Experimental Farm, 960 Carling Ave., Ottawa, ON., K1A 0C6, Canada.

Introduction

Canola (Brassica napus L.) or edible oilseed rape, is the third most important oilseed produced globally, and production has expanded remarkably in most of the major producing nations in recent years (FAOSTAT 2015). Since 1993, annual production has increased 2-, 3- and 4-fold in China (to 14.5 Mt), Canada (to 17.9 Mt) and the EU (to 20.9 Mt) respectively. In the same period, production in Australia has increased 10-fold from 0.3 to 4.0 Mt and canola is now Australia’s third most important food crop after wheat and barley, worth around AUS $2.7 Bill in 2012–13 (AOF 2015). The rising world population has increased the demand for vegetable oils, and along with renewable energy policies in some countries, has driven the global surge in oilseed demand which is predicted to continue. It has been estimated that global production of vegetable oils must nearly double by 2050 to meet FAO projections for food, fuel and industrial demands (FAO 2003; Lu et al. 2011).

Brassica napus was first trialled in Australia in the early 1960s and commercial production commenced in 1969 using imported Canadian varieties. However, it was the release of regionally-adapted varieties with improved tolerance to blackleg (Leptosphaeria maculans) and triazine herbicide tolerance (allowing control of Cruciferous weeds) that underpinned the rapid expansion of the crop in the 1990s. The first 30 years of canola production in Australia was reviewed in 1999, when the 10th International Rapseseed Congress was hosted in Australia, signalling Australia’s rise as an important global producer and exporter of canola (Colton and Potter 1999). At that time, Australia produced 2.2 Mt from 1.85 M ha, a remarkable achievement from a recently introduced crop, and it was an appropriate time to review industry progress, and the science, technology, farming systems and marketing that had led to its success. Aside from biennial meetings of industry specialists at the Australian Research Assembly on Brassicas (published by Australian Oilseed Federation, AOF 2015), there has been no comprehensive review of industry progress over the last 15 years despite significant recent shifts in crop breeding and agronomy, and a doubling of production to 3.7 Mt from 2.6 M ha in 2013–14 (ABARES 2014). In this Special Issue of Crop & Pasture Science we present an up-to-date summary of the recent and future trends in genetics, plant breeding, crop physiology and modelling, pathology, and farming systems agronomy in Australian canola production systems, at a time when the area and production are at an all-time high. We also present recent reviews of production trends in other established canola-producing nations including Canada (Morrison et al. 2016a) and Germany (Hegewald et al. 2016) along with the challenges of the fledgling industry in the Pacific North-west of USA (Pan et al. 2016) where farmers and scientists face many of the same biophysical, socioeconomic and marketing challenges that faced the pioneering Australian farmers and technologists in the 1970s and 1980s. In this paper we introduce some of the key changes and drivers of recent trends in canola productivity in Australia, highlight aspects of some of the research presented herein, and discuss the impact of these results on future Australian canola production.

Background and production trends

In Australia, canola was initially grown in more reliable rainfall areas (>400 mm annual rainfall) due to its greater sensitivity than cereals to heat and drought, and the higher production costs which made it risky in more marginal environments (Colton and Potter 1999). Improved varieties and agronomy along with the overall farming systems benefits of weed and disease control in cereals have expanded the area cultivated to canola, and it is now grown in all but the driest margins of the wheat-belt (Fig. 1). The previous review of Australian canola productivity in 1999 ironically marked the start of a rapid decline in canola area to around 0.5 Mha in 2006, which resulted from a combination of poor seasonal conditions and the changing terms of trade (Fig. 2). During its rapid expansion in the late 1990s canola had extended away from the traditional, more reliable rainfall areas (annual rainfall >450 mm) and into lower rainfall areas (<325 mm) especially in Western Australia, and in some cases onto less suitable soils. The period from 1998 to 2010, now known in Australia as the millennium drought (Verdon-Kidd et al. 2014) was characterised by dry autumns, late planting rains and limited soil water storage, together with hot, dry springs which favoured cereals such as wheat and barley over canola. As the area of canola declined and the crop retreated to the more reliable rainfall areas, the overall yield levels were maintained, except for the notable drought years of 2002 and 2006 (Fig. 2). Although some inter-annual variability in area and yield is likely to continue in response to seasonal conditions and relative prices, the current area is at an all-time high (Fig. 2).