Agricultural Competitiveness White Paper Submission - IP259
Environmental Decisions Group, University of Queensland
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Environmental Decisions Group, University of Queensland, Brisbane, Australia

Thank you for the opportunity to comment on the Agricultural Competitiveness Issue Paper. We congratulate you in recognizing the importance of agriculture in Australia and the vision for ensuring we have a productive and competitive industry. We have two main issues that we feel need to be incorporated in this important white paper. These are:

i) The importance of biodiversity and ecosystem services to the sustainability of the agriculture industry and country as a whole.

Australia ratified the Convention of Biological Diversity (CBD) in June 1993, agreeing to the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources, and is a member of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). Australia therefore has an obligation to conserve and respect the natural ecosystems and biodiversity that this country contains.

Consideration of the importance biodiversity and ecosystem services (the benefits to humans that ecosystems deliver, for example pollination (Millennium Ecosystem Assessment, 2005)), their value, and the opportunities that they provide has not been considered in the desire to focus on increasing productivity. Agricultural systems are multifaceted, providing not only food, but also other important benefits such as clean water, recreation, carbon storage, and flood control that have considerable value and contribute to thriving and resilient regional communities (Foley *et al.*, 2005; Dale and Polasky, 2007). These ecosystem services, including food production, rely on numerous ecological processes such as pollination, pest regulation, and soil erosion control, among others (Zhang *et al.*, 2007; Power, 2010; Tscharntke *et al.*, 2012).

Focusing solely on increasing food production, while appropriate in some cases, can often lead to loss of the other benefits and processes that underlie food production (Matson *et al.*, 1997; Foley *et al.*, 2005; Millennium Ecosystem Assessment, 2005), increasing the need for artificial inputs and costs to farmers. Climatic, economic and social challenges demand that although agriculture needs to be made more productive, it also needs to be stable and resilient to changing environmental conditions and have minimal environmental impact (Foley *et al.*, 2005). At the same time, population increases are putting additional pressure on agricultural lands to provide multiple benefits, making it critical that agricultural areas are managed for multiple goals, not solely food (Foley *et al.*, 2011). Enhancing ecosystem services (e.g. pollination from birds and insects) and biodiversity (diversity within species, between species and of ecosystems (CBD, 1993)) is essential in order to meet the food demand for the predicted population increase (Sandhu *et al.*, 2012).

We call for recognition and inclusion into the white paper (Box 1) of the importance of biodiversity and ecosystem services in providing a sustainable agricultural industry that is economically and socially beneficial for the country.

ii) A shift from a pure focus on increasing productivity to incorporate alternative mechanisms to increase profitability and overall sustainability such as diversification, niche markets and utilizing the benefits of ecosystem services, reducing chemical inputs and crop wastage.

Diversification of agricultural production systems increases the sustainability and resilience of agricultural systems over the longer term by allowing them to sustain periods of adverse conditions (economic, climatic or social). Reducing farm input by using natural alternatives to agrochemicals (i.e. natural pest control) offer a cheaper, safer and more effective means of pest control and organic fertilisation. It also provides additional opportunities by way of access to niche markets. Food loss and waste amounts to approximately 25% of food produced globally (Kummu *et al.*, 2012), reducing this is a cost effective measure that will greatly help to meet increasing food demand.

Specific comments relating to particular issues are detailed below:

ISSUE 1: Ensuring food security in Australia and globally

This section focuses on increasing productivity through increasing yield, increasing intensification and expanding into undeveloped sites. Modern industrial forms of agriculture aim to increase productivity through irrigation, applying inorganic nutrients, crop breeding, landscape homogenization, mechanical loosening of the soil structure and replacing biological pest and weed control with pesticides (Tilman *et al.*, 2001; Pretty *et al.*, 2010). Although this has helped increase the productivity per unit area it has often come at the detriment of the environment and biodiversity (Potts *et al.*, 2010), which, ironically, can have negative effects on further productivity (Matson *et al.*, 1997). Agricultural expansion has also caused the loss of natural habitats and simplification of agricultural landscapes. These changes have been largely responsible for degrading biodiversity and ecosystem services, central to human well-being (Foley *et al.*, 2005; Millennium Ecosystem Assessment, 2005). For example, loss of natural habitat in agricultural landscapes has significant negative impacts on both pollination and pest regulation (Ricketts *et al.*, 2008; Chaplin-Kramer *et al.*, 2011), often resulting in additional costs for farmers. Maintaining these services can in some cases both increase yields (Carvalheiro *et al.*, 2011) and reduce costs to farmers. Additionally, the return for increasing production through agricultural expansion is not linear. Much of the remaining land available for conversion is of marginal quality and will have more production variability, be more prone to degradation and have higher transport costs.

Since agricultural productivity, in part, relies on a variety of other ecosystem services (Power 2010) that in turn rely on different species groups, conflict between crop yields and environmental protection are not inevitable. In many cases, increased food production, ecosystem services, and biodiversity can be realized with different management practices. For example, a new soil-crop management system in China predicts yield increases of 90% with no added N fertilizer inputs (Chen *et al*., 2011); perennial cropping systems in the US can produce profitable yields while reducing nutrient loss, increasing carbon sequestration, reducing vulnerability to climate change, and increasing biodiversity (Jordan *et al*., 2010); agricultural landscapes made up of a variety of cropping systems and habitat types can allow for high biodiversity and sustainable food production (Tscharntke *et al*., 2012); and farming practices that manage for both ecosystem services and yield can perform in similar ways to current, intensive systems (Badgley *et al*., 2007; Seufert *et al*., 2012).

The challenge is to create location and crop-specific plans that influence service-providing species that make important contributions to agricultural production and reduce reliance on external inputs (Bommarco *et al*., 2013).

Other mechanisms to increase profitability aside from increasing productivity should be considered. These include reducing farm inputs and diversification. Reduction to farm inputs can be met by considering alternatives to agrochemicals which offer a cheaper, safer and more effective means of pest control and organic fertilisation. These alternatives include i) natural pest regulation instead of chemical pesticides; ii) better use of nitrogen fixing and crop rotation; and iii) use of organic waste. Diversifying the range of income sources for farmers provides greater opportunity and reduces risk. Biodiversity is a service that is valuable to society and farmers can be motivated to protect with appropriate financial mechanisms for alternative sources of incomes, in effect they becomes stewards of the countryside. The best example of this in Australia to date is the Bush Tender scheme (www.environment.gov.au/node/13922) that started in Victoria (Stoneham et al. 2003). Agri-environmental schemes in Europe are a well known international example (Prince and Jiguet, 2013). These types of programs could help farmers diversify their income sources while protecting biodiversity in areas where the vast majority of land is under private ownership and still has high biodiversity value (e.g. northern Australia). While agri-environment schemes have been criticized for reducing yields, spatial optimization can result in gains in biodiversity, ecosystem services, and food production (Ekroos *et al.*, 2014). These types of strategies should be pursued in the Australian context.

ISSUE 2: Farmer decisions for improving farm gate returns

This section also has a focus on increasing the productivity growth which we commented on in issue 1 along with suggestions towards diversification. This issue also acknowledges the risk farmers are subject to due to changes in the climate which poses a serious challenge to agriculture production across Australia, for example 40% reductions in winter and spring rainfall are predicted to occur in agricultural regions in the southeast and southwest of Australia (CSIRO and Bureau of Meteorology, 2007). Maintaining natural regulating services such as climate and water regulation, and water supply are critical to mitigate and adapt to the changing climate (Howden *et al.*, 2003). Many on-farm practices such as zero-tillage and retention of stubble to promote carbon sequestration can enhance supporting ecosystem services and increase resilience to climate change. Increasing climate variability and extremes are expected to change the current spatial distribution of agricultural production, making some areas currently farmed non-viable in the future. Farmers are already adept at managing risk and adapting to climate variability. However, the increasing frequency of droughts and other extreme events means that the spatial distribution of viable areas for producing cereals, for example, may change. Relatively simple adaptations to climate change could, for example, be worth between $100 and $500 million at the farm gate to the wheat industry (Howden *et al*., 2010). Therefore, farmers need to be developing longer-term adaptation strategies that extend beyond one growing season to ensure that they remain productive and resilient under increasing climatic variability. This will require predictive modelling for particular locations and land uses to ensure future viability under climate change.

ISSUE 4: Increasing the competitiveness of the agriculture sector and its value chains

In order to compete internationally this issue suggests one way would be to differentiate their products. The cotton industry is already pushing to market their product at a premium for being environmental superior to other cotton.This concept could be taken up by other sectors of the industry offering an environmental sound product for a premium which could open up access to niche markets. Examples of environmentally sound practice include no off farm contamination, minimum chemical inputs, or protection of native species and biodiversity.

ISSUE 5: Enhancing agriculture's contribution to regional communities

Recognizing that agricultural landscapes are multifunctional and that they provide numerous benefits to society both through agricultural production and other ecosystem services (Jordan and Warner, 2010), provides a framework to manage agriculture with the goal of maximizing agriculture's total contribution to regional communities. The benefits of increased yields to these communities will only be maximized if potential ecological damage and loss of other nonmarket benefits are minimized. This is especially true for rural agricultural regions, which often disproportionately shoulder the costs of these ecosystem service losses. Recognition of farmers as stewards of the countryside and providing them with financial rewards such as Europe does for protecting biodiversity and ecosystem services, as discussed in our comments to issue 1, provides alternative opportunity for farmers.

ISSUE 6: Improving the competitiveness of inputs to the supply chain

The desire to have cheap and plentiful food is matched by the desire to have safe food. As this issue acknowledges, increased use of pesticides in the race to increase productivity represents a significant risk for human and wildlife health and pollution of waterways. Already we are seeing the development of resistance to herbicides and insecticides in weeds and insects which has resulted in further excessive pesticide use. Australia has the worst weed resistance problem in the world and many herbicides are no longer effective which threatens the profitability of producing crops unless non-chemical alternatives are adopted. Broad-spectrum insecticides wipe out all insects including beneficial insect predators. Many insecticides are neurotoxins to both insects and humans, and although banned in the EU and USA are still widely used here in Australia, jeopardizing human health. The production costs of pesticides are rising, making them increasingly unaffordable to many farmers. Integrated pest management practices reduce the use of pesticides by utilising natural predator–prey relationships and also reduce the negative impact these chemicals have on natural pollinators, water contamination, and dependence on fossil-fuel based inputs which are becoming increasingly expensive (Sandhu *et al.*, 2012).

ISSUE 7: Reducing ineffective regulations

Although we agree that ineffective regulations are undesirable it may not be that the regulations themselves are redundant and the action needed may be to make existing regulations more effective. Many environmental regulations in Australia are already weaker than in other developed countries, for example those relating to the use of pesticides and agrochemicals, posing risks to the environment and human health.

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