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FARMING AT THE EDGE

# A ROLE OF ECO-EFFICIENCY IN FARM MANAGEMENT?

## CASE STUDY OF LIFE CYCLE ASSESSMENT OF AUSTRALIAN GRAINS[1]

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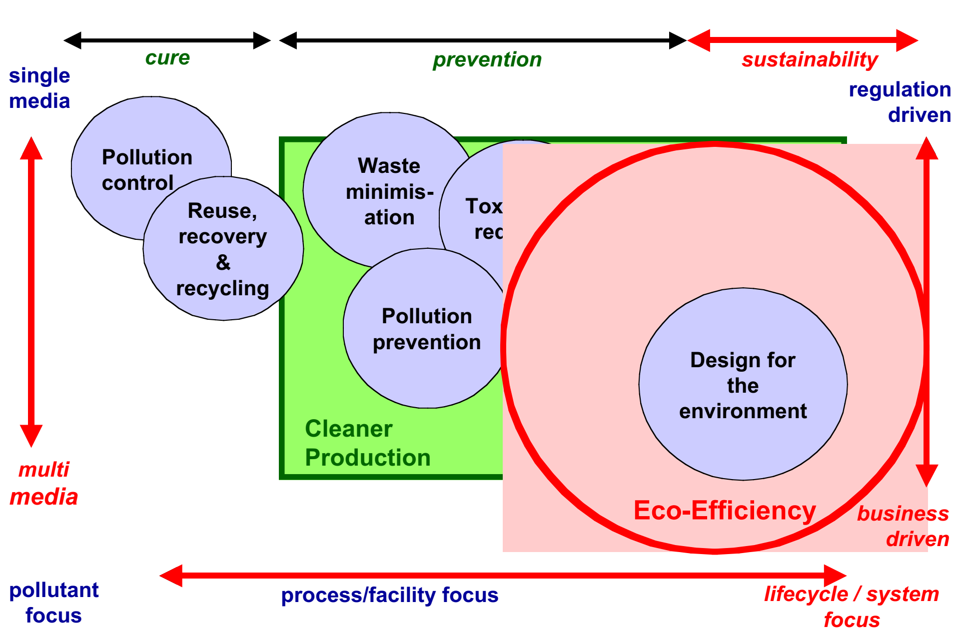
**Abstract**

In the past agriculture has relied on the application of 'end-of-pipe' or preventative solutions to environmental problems brought on by the management and production processes that it has adopted. This has led to outcomes and approaches that are single media and process or facility focused. The recent trends in the broader industrial sector have been towards the adoption of eco-efficiency approaches to environmental concerns that have a strong business focus on sustainability, look at multiple media and adopt a lifecycle and systems approach.

Eco-efficiency *"is reached by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level in line with the earth's estimated carrying capacity"* (World Business Council for Sustainable Development). In practice the objectives of eco-efficiency are to deliver better products that have a lower ecological impact, better meet customer needs and invoke a process of continuous improvement in business process.

**The Concept of Eco-Efficiency**
(Source: Van Berkel, 2000)




This paper will focus on the application of an eco-efficiency tool – Life Cycle Analysis (LCA) - to the Australian grains industry. LCA is a tool that has been developed to understand the environmental impacts of a product as it moves from the 'paddock to plate' or more importantly from 'cradle to grave'. In the case of agricultural products the concept is to develop an environmental impact profile for a product such as wheat from it's production inputs through to its final consumption as bread, pasta, noodles, etc. The typical value chain for a grain is illustrated in Figure I below. The LCA

- quantifies inputs such as energy, water, nutrients, and chemicals
- quantifies outputs such as grains, stubble, flour, oil, and wastes
- assesses the environmental performance due to usage of inputs and release of outputs
- analyses and explains the supply chain picture of the environmental performance and
- recommends where and what measures can improve performance.

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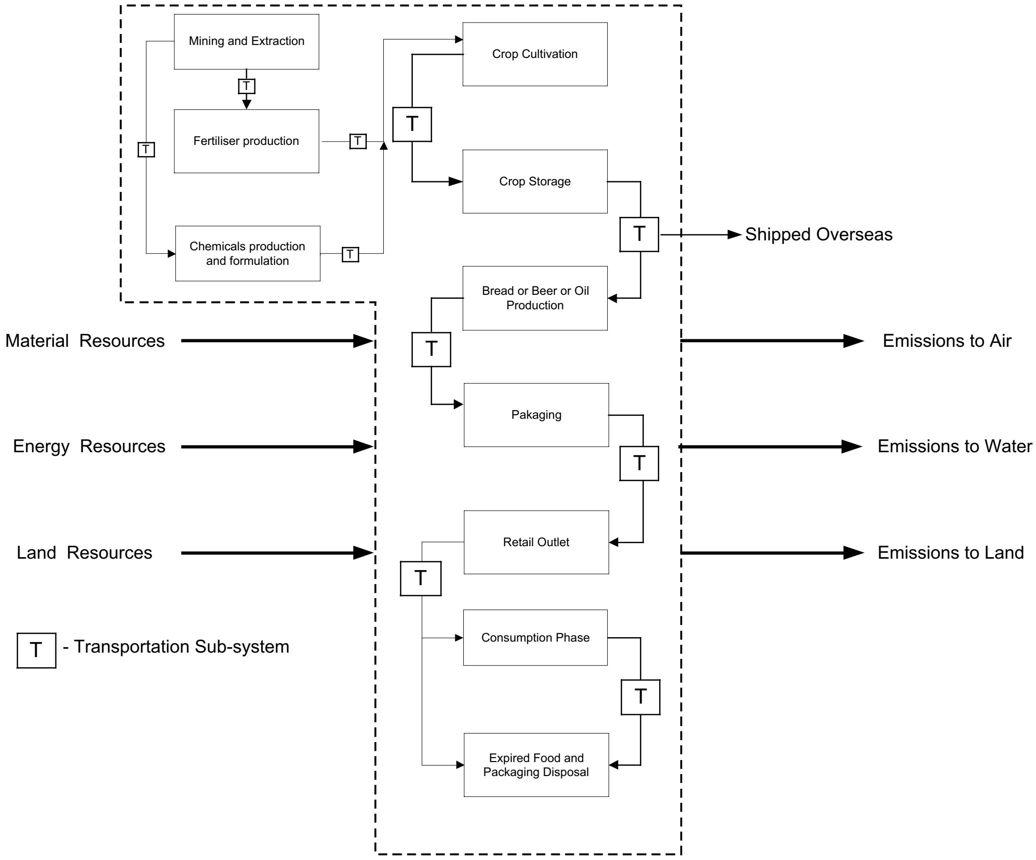
***Figure I A typical grain supply chain***




The dotted line in Figure I shows the boundary of the LCA study. All within this boundary will be taken up for in-depth data collection and evaluation. Fossil-based energy use, water use and other toxic materials use, in the production and supply of farm-inputs (fertilisers and chemicals) are major environmental issues. Similarly diesel use in the trucks and tankers causes winter smog and releases carbon dioxide. At the farm level, topsoil erosion by wind and water, salinity, soil acidification, nitrate leaching into groundwater, persistent toxic pesticides, and herbicide resistant weeds are major environmental impacts. Grain storage consumes electricity to transfer and store grains, and uses fumigants to ward off pests and rodents from damaging the stock. The greater electricity use in any activity demands more tonnes of coal being burnt in power stations causing greater releases of gas pollutants to atmosphere and huge dumping of solid wastes in the community landfills.

Grain milling and processing steps consume water, electricity, heat energy and generates wastewater, chimney gases and solid wastes. They all will be accounted in the LCA. The production and distribution of packaging of the bread, beer and cooking oil also impact on the environment in terms of their energy, material and water use and wastes generation. Finally, the products themselves either end up in the natural environment, e.g. in landfills as unused or expired foodstuff from households and retail shops or consumed by humans and let out as human waste. The LCA covers this issue as well.

In short, LCA paints a more detailed environmental canvas of a typical grain value chain. This helps the individual actors (grain growers, food processors, farm suppliers, retailers, end-consumers, etc.) to micro-manage their environmental issues while receiving strategic inputs from the whole-of-life environmental perspective of their supply chain. The strategic perspective from LCA would help the actors to set their own environmental performance goals and indicators. The detailed input-output analysis at the stage level helps identify cost cutting and value adding environmental performance improvement measures.

AS/NZS ISO14040, 14041, 14042 and 14043 – the international ISO standards have structured the LCA methodology. These standards have been evolving continuously as our scientific understanding of environmental impacts improves day-by-day. But, they also leave significant degrees of freedom to users to customise the LCA methods to suit the specific value chain characteristics, e.g. LCA of a passenger car or wheat bread.

With funds from GRDC, the Centre of Excellence in Cleaner Production and Muresk Institute of Agriculture, are currently undertaking a Life Cycle Analysis of three grains value chains – wheat to bread, barley to beer and canola to cooking oil. Some of the tangible benefits the project offers to grain growers and processors are:

- Real time scientific environmental data on wheat, barley, and canola value chains
- A comprehensive environmental scrutiny of farming systems and management practices
- Practical, cost effective, and on-the ground environmental performance improvement measures