

ECONOMIC, ENVIRONMENTAL AND SOCIAL SUSTAINABILITY INDICATORS OF THE AUSTRALIAN COTTON INDUSTRY

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May, 2009.

ABSTRACT

Expectations for industries to manage resources in a sustainable manner raise the question of how industries can demonstrate their sustainability credentials. This thesis reviews the question of sustainability monitoring and reporting in relation to the Australian cotton industry. Principals of sustainability reporting in business and agriculture were reviewed. A set of sustainability indicators has been developed and economic, environmental and social data compiled. A specific analysis of the cotton industry's environmental management system, the Cotton Best Management Practices program was completed to investigate its potential to track and report farm management practice change over a 10 year period.

Key economic sustainability indicators include (Chapter 3): production area, yield, quality, gross value, profitability and regional economic activity. Very good economic data is available about the cotton industry, although it is not readily accessible for all stakeholders. Findings in relation to these indicators include:

- The cotton production area in Australia expanded rapidly during the 1980s and 1990s and peaked in 2001 with a national gross value of production of \$1.9 billion.
- Since 2001, the production area of cotton has fallen in response the water shortages caused by drought.
- During the last 20 years, cotton yields have increased significantly, on average 32.9 kg/lint/ha/year and are the highest of any major cotton producing country in the world and are almost three times the world average.
- Australian cotton is now considered a premium quality product in the world, but still has some quality aspects to further improve.
- Cotton has traditionally been the most profitable crop for the farms where it is grown, producing a gross margin of \$500-\$1000 /ha. Costs are increasing and the net price received has been falling which for the last five years has averaged \$369/bale, which has meant that profitability of cotton has been falling.
- Cotton is a major source of regional economic activity where it is grown and usually generates 30-60% the gross value of all regional agricultural income where it is produced, which makes up 10 -30% of the gross regional product. Its indirect impact on local economies is high.

Key environmental sustainability indicators (Chapter 4) include soil, water, pesticide and transgenic crop trait stewardship, biodiversity and greenhouse emissions. The cotton industry has good data sets available from case studies and research reports for environmental indicators. However, these generally give a 'point in time' picture rather than a long term trend

and are rarely industry wide. They are also often associated with the best producers, rather than the “average” producer. There are very few data sets that can be used to track changes over long periods of time. The BMP analysis showed it has great potential for monitoring long term trends, which should be supplemented with some targeted and repeated surveys as needed.

Key findings in relation to environmental indicators include:

- There have been significant improvements in the management of natural resources by the cotton industry, particularly in the last decade.
- A reduction in soil tillage, adoption of controlled traffic systems and the use of permanent bed farming systems, and less raking and burning of stubble has resulted in less soil compaction and improved soil physical structure.
- Nitrogen, phosphorus and potassium fertiliser rates are increasing in response to rising yields and hence greater nutrient removal from individual farms. Higher fertiliser rates do not necessarily mean that high yields are unsustainable; however, the sustainability of current nitrogen practices is questionable.
- Soil carbon levels are low and need to be improved.
- Soil testing is common for fertiliser decisions, but monitoring the long trends of soil test data is not done by the majority of cotton growers. The soil monitoring case study showed that these attributes can be monitored by farmers over long periods.
- Soil borne diseases such as fusarium wilt and black root rot have become significant management issues in some areas where cotton is produced.
- There is strong evidence that growers have improved their water use efficiency by 3-4% per annum, or at least 20% in last decade. There are documented examples of even more significant improvements in one year by selected growers as a result of irrigation system improvements. However, more comprehensive data for the 2008 and 2009 cotton seasons is needed to be certain that these recent individual improvements are taking place industry wide.
- Water quality where cotton has been grown is generally very good, with the exception of a few, specific groundwater bores. There has been very little water quality monitoring on farms and this issue needs to be addressed.
- Data on biodiversity for cotton farms is lacking.
- Most (at least 70%) of cotton farms have river or creek frontage and the status of the riparian land is another important indicator for the broader catchment sustainability.
- Insecticide (82%) and herbicide (>80%) use has significantly declined as a result of widespread adoption (80-90%) of transgenic cotton varieties.
- Insect resistance to insecticides and transgenic cotton traits is a major sustainability risk for the cotton industry. Since the advent of Bollgard® cotton varieties, resistance to many conventional insecticides has declined. There have been no reports of field failures of Bollgard II® varieties due to resistance, however recent data shows an increase in the frequency of Cry2Ab resistance alleles in *Helicoverpa punctigera*, which is being closely monitored.

Key social sustainability indicators (Chapter 5) include education levels, demographics, employment, health, community attitudes, social capital, research and development and compliance with the law. There exists reasonable data relating to social indicators. This was an unexpected finding as the gathering of social data is usually considered difficult for sustainability reporting. A major gap is employment data, which is not well quantified either for farms or the local service industries. Social findings in relation to cotton industry participants include:

- The education qualification levels of the cotton industry are higher than other agricultural industries.
- Many training initiatives are underway in the cotton industry and participation rates vary with courses between 20-80% industry participation.
- The cotton industry is one of the leading employers in most of the places where it is grown. The specific number of people employed by the cotton industry is not clear. The cotton industry generates many permanent and casual jobs, although labour demands are falling. It has traditionally provided some of the best salary packages in agriculture.
- 75% of cotton growers have been working more than 40 hours per week, which is considerably more than the national average. The drought has also significantly reduced employment in the cotton industry by 30-60%.
- The number of cotton farmers has been falling and it is estimated there are now 800 cotton growers in Australia.
- Cotton farmers are younger than other farmers that do not grow cotton. Forty percent (40%) of cotton growers are aged under 35 years old, compared to 26% of other farmers. Most of cotton agronomy consultants were aged between 35 and 49 (65%).
- Overall health of people in the industry is improving. Deaths rates in the cotton industry are very low. Workers compensation claims for accidents have been falling, but so too has the planted cotton area. This will need to be monitored as the planted cotton area increases again in response to better seasonal forecasts.
- The cotton industry has very high levels of social capital and consists of many well supported organisations and networks. The connections across other industries are not as strong.
- There is rising participation in the cotton industry by women.
- The Australian Cotton Industry has a strong research and development culture.
- The number of breaches environmental laws are not publicly available from Government agencies, but are low and close to zero.

In relation to the broader community (Chapter 5), some findings are:

- The number of complaints received by the NSW EPA has fallen significantly from around 50 per year in 2001 to 3 per year for 2006 and 2007.
- People in cotton communities held a positive opinion of the cotton industry.
- Most people outside the cotton industry have a negative attitude towards the cotton industry and their main concerns were water allocations and pesticide usage.

- Independent attitudinal research showed that community concerns about the cotton industry's chemical use, spray drift and water use had reduced significantly between 1998 and 2004.

The analysis of the Cotton Best Management Practices (BMP) program farm practice audit criteria for the 10 years between 1999 and 2008 shows that it is possible to identify and quantify how cotton growers have implemented changes to a wide range of their farm management practices (Chapter 6). The analysis showed there was:

- A very high standard of legal compliance on farms between 1999-2008 where the BMP program was adopted.
- The mean BMP ranking for all 47 farm practice criteria from the pesticide application, pesticide storage, integrated pest management, farm design and farm hygiene modules for the 10 years between 1999 and 2008 averaged 1.46 (scale 1-4) and showed a 29% improvement over the decade. It showed a 45% improvement between 1999 and 2006. There was a fall in the mean BMP farm practice standards from 2006 standards in 2007 and 2008 that is attributed to the ongoing drought, which reduced expenditure, action and motivation. Despite the drought the BMP farm practice standards for the five years (2004 – 2008) were on average better than the previous five years (1999-2003).
- The analysis showed the mean BMP ranking for certified audited farms between 2006 and 2008 was 24% better than the pre certified audited farms. This supports the premise that the extra rigour associated with external audit does lead to additional on farm improvements in practice.

Recommended actions include:

1. The cotton industry develops a five year sustainability reporting plan.
2. The cotton industry develop a sustainability monitoring and reporting process that includes at a minimum the following indicators:
 - i. profitability (gross margin);
 - ii. economy (gross value of production and employment);
 - iii. water use ;
 - iv. water quality ;
 - v. pesticide use and technology stewardship (transgenic traits, chemistry resistance);
 - vi. soil quality;
 - vii. energy, greenhouse and carbon balance;
 - viii. regional biodiversity;
 - ix. industry demographics;
 - x. community attitudes and
 - xi. workplace health and safety.
3. The Cotton BMP farm practice rankings be used to monitor sustainability trends.
4. Cotton Australia establishes a formal stakeholder consultation roundtable that convenes annually to discuss sustainability matters.
5. The cotton industry undertake scenario planning activities to explore key drivers of change.

6. Cotton Australia produce a social responsibility statement for the cotton industry.
7. The cotton industry formally approach the Queensland and NSW Government agencies to establish what environmental data they may be able to provide and their monitoring intentions for the future.
8. Employment figures need to be better quantified both on farm, in the service industries and the value chain.
9. The Global Reporting Initiative should produce a specific sector supplement for agriculture at the industry level for a region/country.