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Australian cotton industry

Management practices to enhance ecosystem services

Ecosystem services are the benefits we gain from the environment.

We rely on ecosystem services to survive and enjoy life so it is important to preserve our resource base through appropriate management.

Ecosystem services also play an important role in agricultural production.

The Australian cotton industry has long recognised the economic advantage of natural pest control through Integrated Pest Management (IPM) strategies.

Using IPM in conjunction with GM cotton, growers from Boggabilla in New South Wales are capitalising on natural pest control to help boost their gross margins by around $250 per hectare.

But pest control is not the only ecosystem service utilised by the cotton industry in order to produce the high quality cotton for which it is renowned.

The industry also relies on ecosystem services including healthy soils, maintenance of surface and groundwater supplies, cycling of nutrients and breakdown of pesticides.

The Australian cotton industry has developed the Best Management Practices (BMP) program to help address issues, enhance ecosystem service provision and minimise its impact on the environment.

This brochure outlines ecosystem services relevant to the cotton industry and provides management tips to enhance these benefits.

Cotton Catchment Communities CRC

Department of Agriculture, Fisheries & Forestry - Australia

action Salinity & Water Australia

Queensland Government Department of Primary Industries and Fisheries

Relevance to industry Management tips

Natural pest control: beneficial organisms such as insects, spiders, bats, microbes, and fungi control cotton insect pests and beneficial soil micro-organisms control soil-borne diseases.

- reduces reliance on chemicals
- reduces soil-borne diseases that limit cotton yields

You can enhance beneficial species numbers through:

- pest control strategies that do not rely on chemicals alone
- stubble retention for improved soil microbial populations
- on-farm habitat protection

Maintenance of healthy habitats: Natural processes maintain and regenerate terrestrial and aquatic habitats for native plants and animals.

- native vegetation provides habitat for beneficial species in cotton production systems
- riparian vegetation helps maintain river channel and bank structure and stability

You can manage native vegetation to enhance its habitat value by:

- minimising disturbances such as stock and vehicles
- leaving branches, rocks, fallen trees etc. in place
- controlling weeds and feral animals
- linking vegetation patches with corridors
- providing on-farm wetland areas with aquatic vegetation, gradual slopes and a variety of depths as habitat for aquatic species

Maintenance of water resources: land, water, soils, vegetation, waterways and associated infrastructure in a catchment provide river flows and determine the groundwater level and quality.

- surface and ground water is used in irrigated cotton production
- deep-rooted, perennial vegetation helps maintain water tables at depth preventing possible waterlogging and saline seepages

You can schedule irrigation to meet crop needs to:

- reduce deep drainage and the risk of rising water tables
- ensure maximum production per ML of this valuable resource

Prevention of soil erosion: vegetation, litter and soil organisms protect soil from erosion.

- soil erosion reduces soil fertility and can reduce cotton yield and quality

You can reduce soil erosion and subsequent loss of nutrients by:

- retaining cotton trash
- maintaining ground cover in non-cropping areas
- promoting river health by avoiding bank erosion
- avoiding bare fallows in rotations

Maintenance of genetic resources: the genetic variation inherent in individuals, species and ecosystems.

- genetic diversity in micro-organisms is required to break-down pesticide residues
- genetic variation in cotton helps avoid epidemics of insects and diseases that might occur if all cotton varieties were identical in susceptibility to those pests

You can help sustain genetic variation through:

- good management of native vegetation, riparian areas and aquatic ecosystems
- appropriate use of pesticides

Life fulfilment: opportunities for recreational and non-commercial activities such as ecotourism, fishing, and artistic, educational, spiritual and scientific pursuits.


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- As custodians of the land, the cotton industry is keen to ensure current and future generations can enjoy the natural environment

You can ensure the natural environment can be enjoyed by others through good management of on-farm native vegetation, riparian areas and aquatic ecosystems

Regulation of climate: oceans, land and vegetation regulate global and regional climate through influence over the composition of the atmosphere and the amount of evapotranspiration.


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Climate change due to increases in greenhouse gases may lead to:

- increases in temperature
- more extreme rain events
- changes in crop yields

- maintain and plant vegetation as a carbon sink to offset greenhouse gas emissions
- align nitrogen inputs with crop requirements to reduce nitrous oxide emissions
- avoid waterlogging to reduce methane emissions

Natural filtration leading to healthy waterways: soil, microbes and vegetation filter water and run-off.

Natural filtration removes sediments and nutrients and provides on-farm benefits including:

- prevention of algae blooms due to excess nutrients
- reduced movement of soil borne pathogens (e.g. Fusarium)
- reduced maintenance of irrigation system infrastructure due to sediment accumulation

You can establish and maintain grass filter strips near waterways that are at least 10 m wide and consist of perennial and flood and drought resistant species

Maintenance of healthy soils: soil sustains biological production and stores water and nutrients.

- Healthy, fertile, productive soils are required to maintain cotton yields and quality

You can monitor soil condition and employ these techniques:

- avoid traffic on wet soils
- use reduced tillage and controlled traffic
- use crop rotations that enhance soil health
- use fertilisers efficiently when they are required
- increase soil organic matter
- avoid sodic and saline irrigation water

Waste absorption and breakdown: soil and aquatic ecosystems break down organic matter, recycle nutrients and convert pesticide residues into harmless compounds ('bioremediation').


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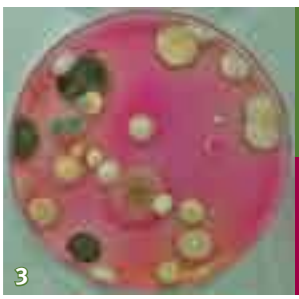
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Breakdown of plant and chemical residues helps:

- reduce fertiliser requirements
- reduce risk of crop damage, damage to non-target species and development of weed resistance

- provide waterways with a mix of fast and slow drying areas, shallow and deep sections, vegetated and open areas to enhance bioremediation
- limit the use of pesticides near water storages

Pollination: plant reproduction by pollinators such as insects, birds, possums and the wind.

- While cotton is self-pollinated to a large extent, honey bee pollination can boost cotton yields by 10%, and other crops and native vegetation may require cross-pollination
- adopt an integrated pest management system to minimise the impact of pesticides on beneficial insects and animals
- provide habitat for insect, birds and possums

Provision of shade and shelter: tall vegetation lessens the impact of weather and climate extremes at a paddock scale and intercept air-borne particles.

- reduces spray damage to non-target crops and vegetation
- reduces evaporation, soil erosion and 'sand-blasting' of crops
- important for stock in mixed cotton and grazing enterprises

When establishing a vegetated buffer consider:

- buffer density, height, width and length
- distance from spray release to ensure the buffer will be effective
- distance from water infrastructure to ensure the roots from the vegetation do not compromise structure stability
- species types and mix

Relevance to industry Management tips

Want to know more about enhancing ecosystem services?

There are a number of Australian cotton industry publications to assist growers to implement management strategies that enhance ecosystem services.

These include:

- Australian Cotton Industry Best Management Practices Manual
- Birds on Cotton Farms
- Design Principles for Healthy Waterways on Cotton Farms – Brochure
- Growing Trees on Cotton Farms
- Managing Riparian Lands in the Cotton Industry
- WATERpak

These resources are available through the Cotton CRC.

Contacts:

Cotton Catchment Communities CRC for your nearest environment extension officer
www.cotton.crc.org.au

For more information on the BMP program contact your local Cotton Australia Grower Services Manager
www.cottonaustralia.com.au

Resources:

Reid, N, O'Shea, G and Silberbauer L 2003, *A review of biodiversity in the Australian cotton industry*, Cotton Research and Development Corporation, Narrabri.

Australian Cotton Industry Best Management Practices Manual, 2004, Cotton Research and Development Corporation, Narrabri.

Reid, N and Milligan, A 2006, *Ecosystem Services – Our benefits from the environment brochure*

Brochure compiled by Veronica Chapman and Susan Maas (DPI&F), Cotton CRC, April 2007. With thanks to Nick Reid, Guy Roth, Letitia Cross, Paula Jones, Graham Harris, Ian Rochester, Oliver Knox and Alan House for their technical input.

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