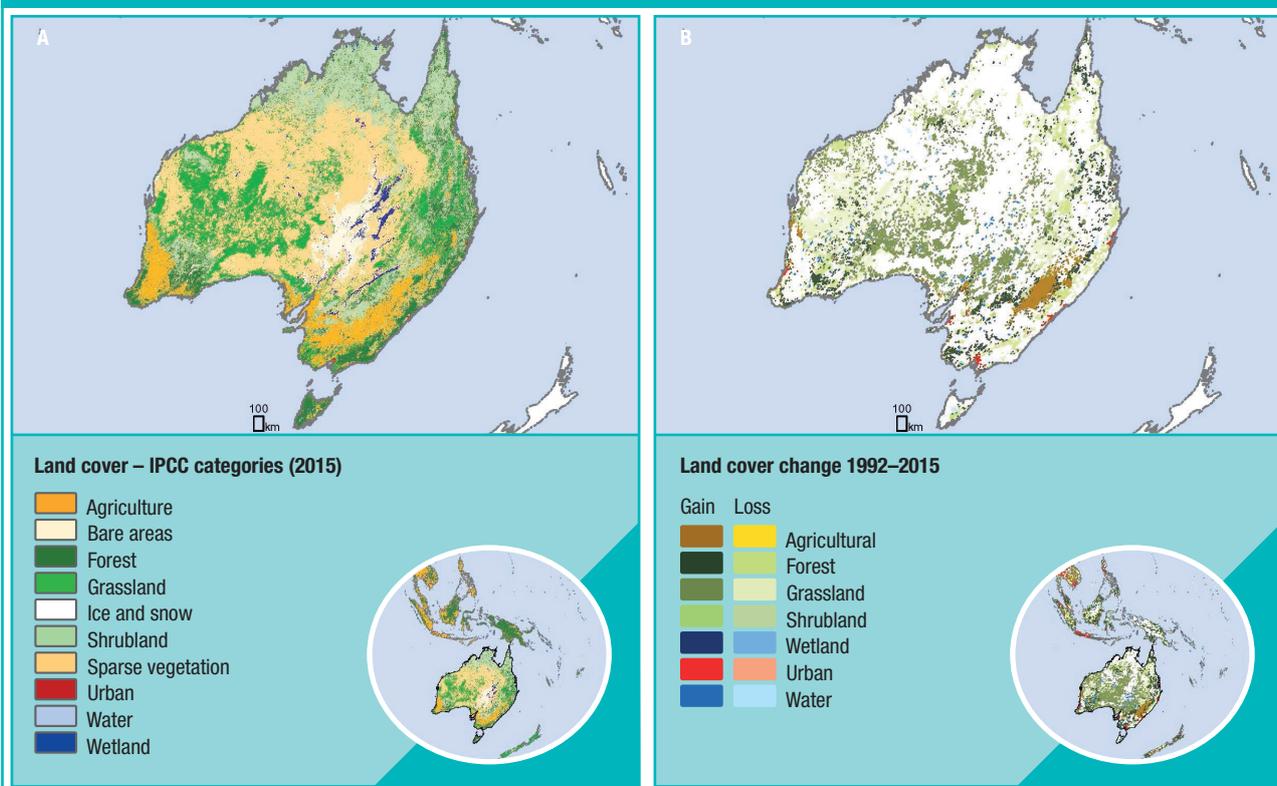


Australia – Country profile

Context

- Covering 48% of the country’s land (Figure 1A), agriculture contributes 3% to Australia’s total gross domestic product. Together with the related supply chains, agriculture provides a job to over 1.6 million people. Approximately 86,000 farm businesses in Australia provide 93% of the country’s daily domestic food supply.ⁱ In addition, Australian farmers export about 77% of what they grow and produce. The livestock export industry is an important part of the Australian agricultural sector and vital to the country’s international competitiveness. Australia is also a major grain producer and exporter. Wheat, barley, canola (rapeseed), oats and lupin produced in the country are exported across the world for a variety of food and livestock feed purposes.
- In Australia, over 220,000 plant accessions are stored in *ex situ* genebanks. Australia is the predominant holder of forage legume germplasm, with 30% of the world holdings of *Medicago* (a leguminous forage plant, the most well-known species of which is alfalfa) at the Australian *Medicago* Genetic Resource Centre and 15% of the world’s clover holdings at the Western Australian Department of Agriculture.ⁱⁱ
- Among adults, the mortality rate attributable to inadequate diets is relatively low at 143 per 100,000 people.ⁱⁱⁱ No national level data are found on minimum diet diversity of children nor child malnutrition status.^{iv}
- Land use change, habitat fragmentation and degradation (Figure 1B) are prevalent in many areas, and invasive species, particularly feral animals, are increasing the pressure they exert on local biodiversity. Impacts of climate change are increasing. Agricultural techniques involving intensive use of fertilizers, pesticides and large machinery put additional pressure on local ecosystems, further reducing biodiversity.^v For example, the Great Barrier Reef off the coast of Australia is seriously affected by nutrient and pesticide runoff from sugar cane farming and other types of agriculture.^{vi}

FIGURE 1 – Major land use (A) and changes in major land use (B)



Source: Adapted from: A) European Space Agency, 2017;^{vii} B) Nowosad, et al., 2019.^{viii}

Agrobiodiversity Index results

- Australia scores medium-high for **status** of agrobiodiversity (Figure 2A). The availability of genetic resources for future options and agrobiodiversity in markets and consumption for healthy diets contribute most strongly to this score, but the level of agrobiodiversity in production is much lower. This indicates that agrobiodiversity is highly available in genetic resource management and in markets and consumption, but that agricultural production systems are not very diversified.
- The **progress** score (Figure 2B) shows that agrobiodiversity related commitment and actions in place are rather weak. Mentions of agrobiodiversity for healthy diets, sustainable production or future options, and specific strategies and targets are mostly missing in the sources analyzed. Australia

also scores low for production practices that support agrobiodiversity, such as agroforestry, integration of crop–livestock systems and limited overuse of pesticides and fertilizers.

- For status, Australia outperforms the 10-country average. Australia's high score on diversity in markets and consumption for healthier diets stands out, while agrobiodiversity in production is below average. However, Australia underperforms on the progress score compared to the 10-country average. This highlights the risk of losing agrobiodiversity and its benefits in the future and calls for more explicit commitment and actions towards sustainable use and conservation of agrobiodiversity for current and future options.

FIGURE 2 – Overview of Agrobiodiversity Index scores for Australia

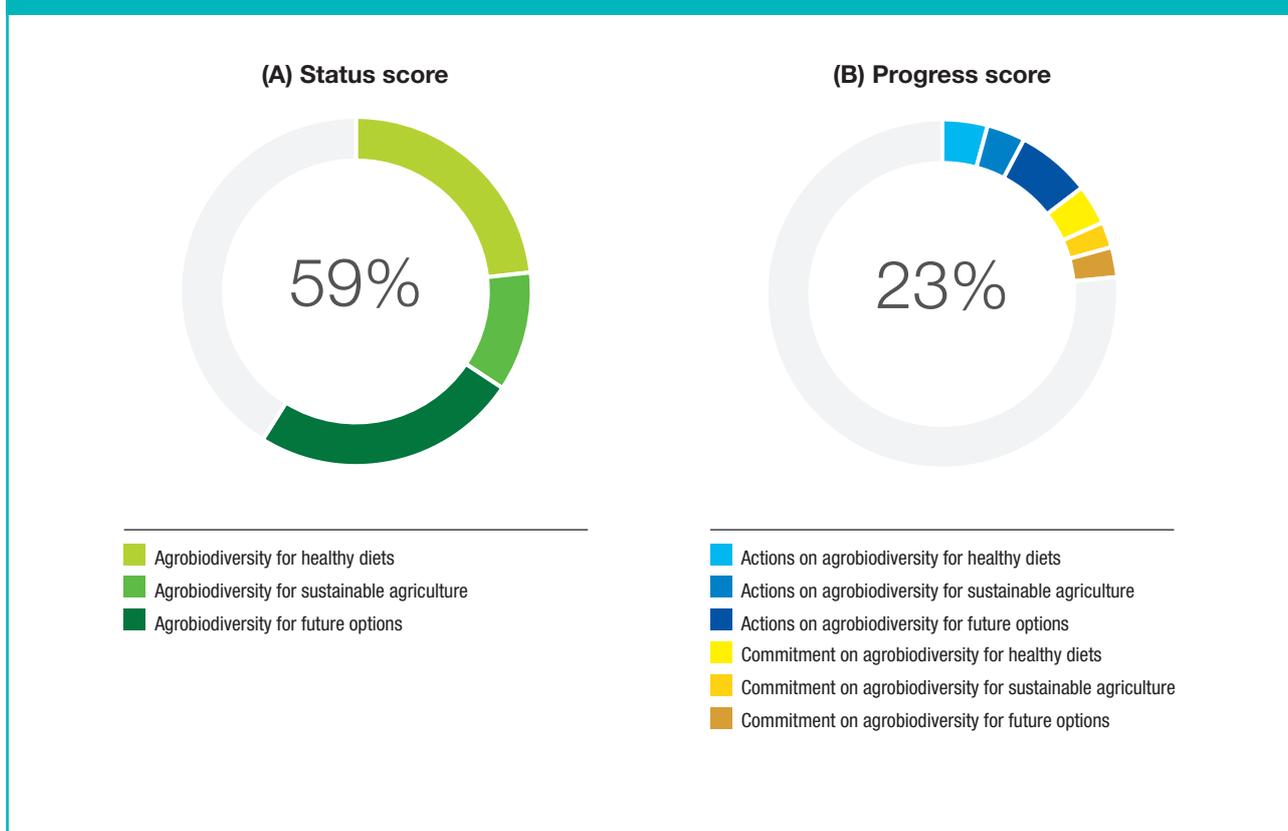


TABLE 1 – Overview of the Agrobiodiversity Indicator scores per pillar for Australia

		Pillar 1	Pillar 2	Pillar 3
		Agrobiodiversity in markets and consumption for healthy diets	Agrobiodiversity in production for sustainable agriculture	Agrobiodiversity in genetic resource management for future options
Commitment	Level of commitment to enhancing consumption and markets of agrobiodiversity for healthy diets	22		
	Level of commitment to enhancing production and maintenance of agrobiodiversity for sustainable agriculture		14	
	Level of commitment to enhancing genetic resource management of agrobiodiversity for current and future use options			17
Actions	Consumption and market management practices supporting agrobiodiversity	25		
	Production practices favouring agrobiodiversity		29	
	Production diversity-based practices		13	
	Genetic resource management practices supporting agrobiodiversity			41
Status	Species diversity	86	24	98
	Varietal diversity			98
	Functional diversity	48		
	Underutilized/local species	75		24
	Soil biodiversity		30	
	Pollinator biodiversity			
	Landscape complexity		46	

Note: All scores are scaled from 0–100. The colour scheme was changed on 1 August 2019 to reflect more accurately the scores

Leading practices

- **Diversity in supply:** About 75% of dietary calories come from non-staples, and species diversity in national food supply is high compared to other countries. The disability-adjusted life years attributed to inadequate diets is medium-low at 2,087 per 100,000 population, reflecting a general high diet diversity but still too low in vegetables, fruits, whole grains, nuts and seeds, and too high in processed meat, red meat and salt.^{ix}
- **Conservation agriculture:** Conservation agriculture is practised on about 37% of Australia's agricultural land. Implementation of conservation agriculture is based on locally developed sets of practices involving integrated management of crops, soil, nutrients, water, pests, labour and energy, to enhance and sustain an optimal environment.
- **International reporting on agrobiodiversity:** Australia systematically reports on 80% of indicators to the World Information and Early Warning System (WIEWS) on Plant Genetic Resources for Food and Agriculture.
- **Integrated *ex situ* and *in situ* conservation:** Australia combines a high diversity in *ex situ* collections (223,137 accessions are reported in WIEWS) with a large diversity of crop wild relatives and a many useful wild plants (49%) conserved *in situ*. Combining *ex situ* and *in situ* conservation is the most comprehensive way to achieve successful conservation, but this tends to be rare in practice.^{x,xi} For example, only 0.2% of the 49% useful wild plants that are conserved *in situ* are stored *ex situ* in the country. This suggest that Australia can further strengthen its actions to combine *ex situ* and *in situ* conservation.
- **Agricultural production practices:** Australia scores low for agrobiodiversity in production for sustainable agriculture, for both status and progress. Species diversity in production is below average, the soil biodiversity index is low, and only 46% of agricultural land includes natural or semi-natural vegetation. Apart from conservation agriculture practices, actions and commitment to increase agrobiodiversity in production are weak. Only 5% of agricultural land includes agroforestry, and only 21% includes integrated crop–livestock systems. Nitrogen use efficiency (the ratio between the amount of fertilizer removed from the field by the crop and the amount of fertilizer applied, which is considered a proxy for avoided overuse of fertilizer) is at 0.75, above the 10-country average, but it can be further improved to avoid harmful effects on Australia's vulnerable ecosystems.
- **Children's diet diversity data:** The country is encouraged to make available data on children's diet diversity.

Notable findings

- **Healthy diets:** Australia performs higher than other countries in agrobiodiversity for healthy diets. This is explained by high species diversity in domestic supply, and a high number of calories from non-staples. However, 71% of men and 58% of women are overweight,^{xii} and dietary intake of vegetables, fruits, whole grains, nuts and seeds is still low, while intake of processed meat, red meat and salt is high. While agrobiodiversity seems present in markets and domestic supply, it is not known if and how the products are consumed, and current diets may be contributing to high rates of overweight.
- **Sustainable production:** Australia scores low on agrobiodiversity in production for sustainable agriculture. While the country has clear commitments for sustainable agricultural production, agrobiodiversity seems not to be part of this agenda yet. Improving agrobiodiversity management in production systems, for example through more agroforestry, natural vegetation, crop species and crop–livestock integration, offers a major opportunity for more sustainable and resilient agriculture in the country.
- **Genetic resources:** Australia performs relatively well on both *ex situ* and *in situ* indicators of conservation. The country can improve this by adopting a comprehensive approach to conservation, combining *in situ* and *ex situ* conservation.

Areas for improvement

- **Commitment to sustainable use and conservation of agrobiodiversity:** Specific commitments to managing agrobiodiversity for sustainable agriculture, healthy diets and future use options are not explicit and can be strengthened through strategies and target setting related to sustainable use and conservation of agrobiodiversity.

Risk assessment

Limited agrobiodiversity in Australia’s production systems exposes the country to increased risk for land degradation and climate change losses (Figure 3). Medium-low soil biodiversity, limited interconnection between agriculture and natural vegetation, and low species diversity per unit of land contribute to making this risk high. The absence of explicit strategies and actions to increase agrobiodiversity in production systems further increases those risks.

Resilience building

Reversing the risk assessment, current use of agrobiodiversity helps most strongly to reduce the risk of malnutrition (Figure 4), although it is uncertain how this agrobiodiversity is used and by whom. Species diversity in domestic supply is relatively high and at least 75% of dietary calories come from non-staple foods. The high scores in genetic resource management of agrobiodiversity help reduce the risk of biodiversity loss, through *in situ* and *ex situ* conservation.

FIGURE 3 – Increased risks related to low agrobiodiversity levels in Australia

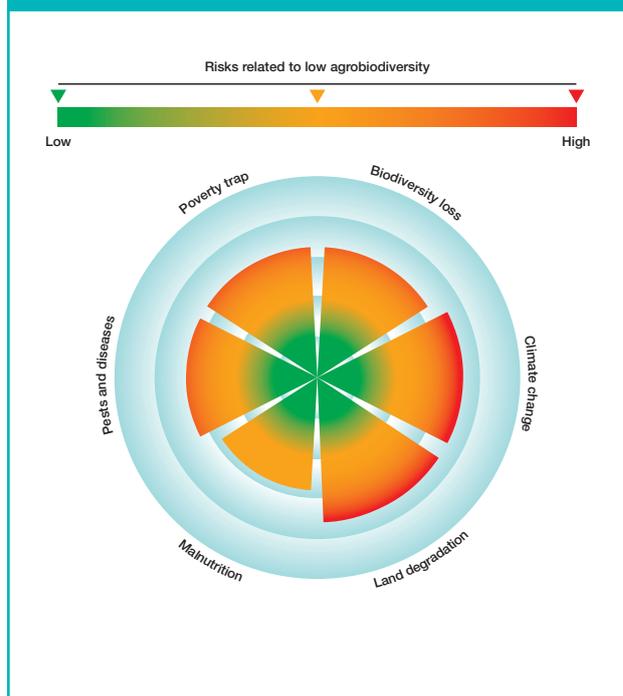
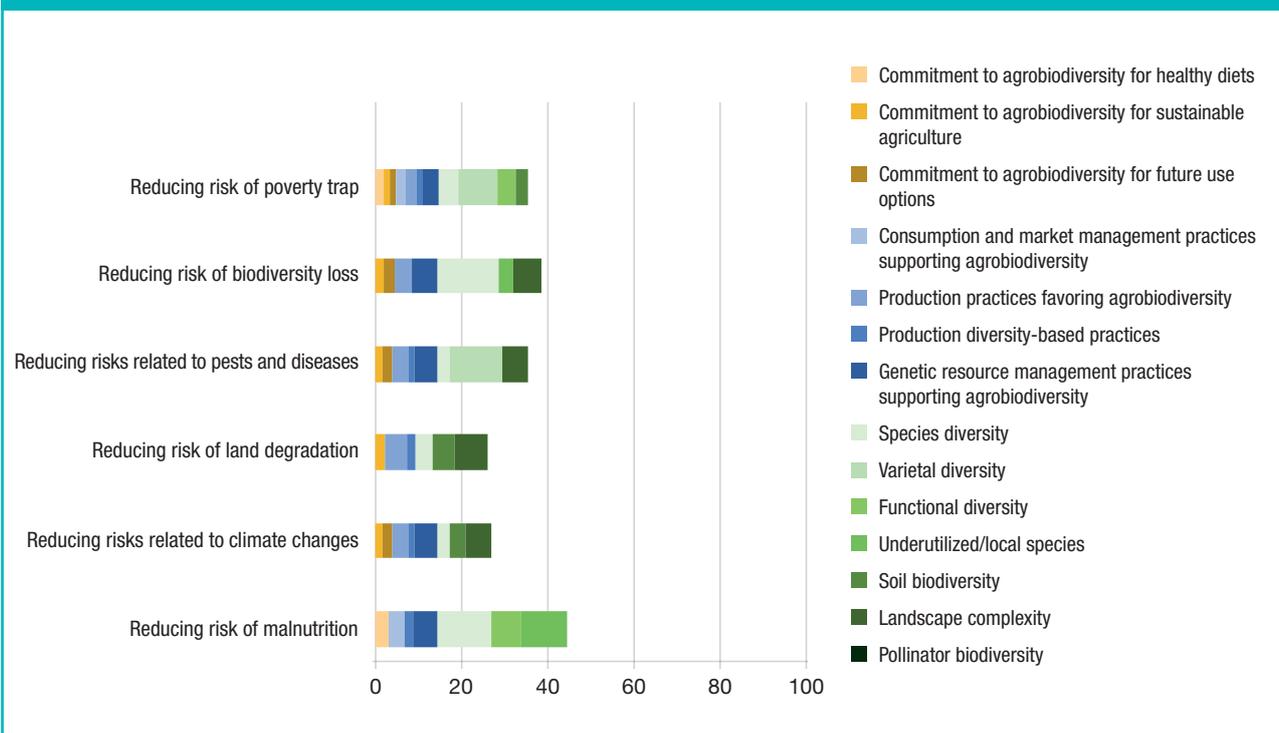


FIGURE 4 – Contributions of Agrobiodiversity Index indicators to resilience building in Australia



Note: All scores are scaled to a maximum of 100. Colours indicate relative scores of individual agrobiodiversity indicators that contribute to building resilience for that specific risk area. No data available for pollinator biodiversity.

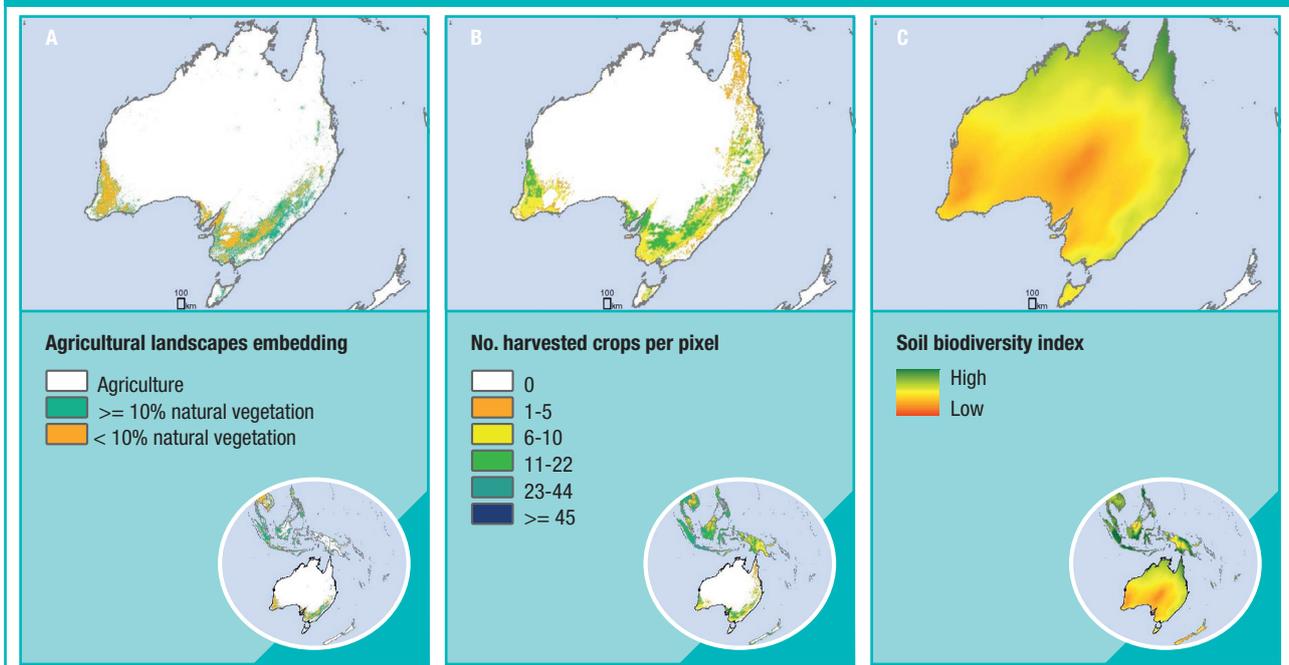
Indicator trends

Spatial trends

Agricultural cropland in Australia is concentrated in the southern and eastern regions. About 46% of this land contains a minimum of 10% of natural or semi-natural vegetation (Figure 5A), suggesting that agriculture is moderately intertwined with the surrounding environment. This land sharing is mainly practiced in eastern Australia and contributes to agroecosystem functioning and resilience. Crop species diversity is

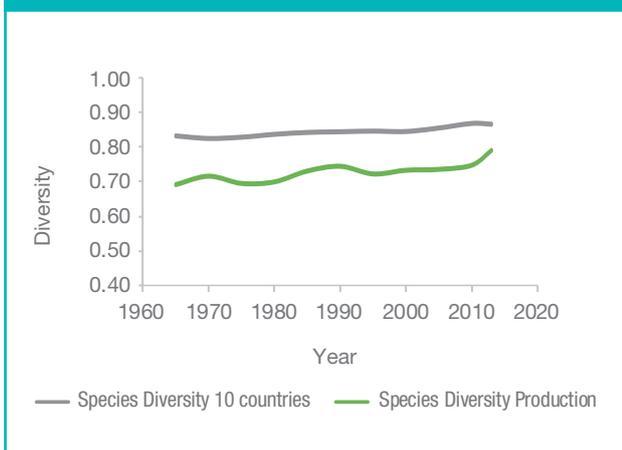
generally low compared to other countries. The majority of agricultural cropland hosts fewer than 10 crops per land unit (10x10km). Crop diversity is lowest in the northeast and in the southwest. This suggests that production systems could benefit from diversification to improve risk management and ecosystem functioning. The soil biodiversity index (Figure 5C) is low in large areas of the country (Figure 5C), including some of the agricultural areas, indicating limitations for agricultural potential. Northern and eastern Australia have higher soil biodiversity (Figure 5C). The combination of low soil biodiversity potential, low crop species diversity and absence of natural vegetation in agricultural land in southwestern Australia make this area vulnerable to land degradation.

FIGURE 5 – Spatial trends in agrobiodiversity indicators for sustainable agriculture, including A) agricultural land with >10% natural or semi-natural vegetation; B) number of harvested crops per pixel, and C) soil biodiversity index



Source: Adapted from: A) European Space Agency, 2017; B) Monfreda et al., 2008;^{xiii} C) European Soil Data Center, 2016.^{xiv}

FIGURE 6 – Temporal trends in species diversity in production in Australia (Shannon diversity index)



Source: FAO^{xv}

Temporal trends

Temporal trends in species diversity in Australia's production illustrate a rather stable production diversity, but levels are below the 10-country average (Figure 6). A slight increase in species diversity can be observed more recently. It will be of interest to explore how this trend further evolves, in combination also with the percentage of natural or semi-natural vegetation on agricultural land.

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