WOOLMARK PLUS

Metrics for ‘nature positive farming’ — a woolgrower-centric approach to environmental performance measurement

Summary report prepared by Australian Wool Innovation/The Woolmark Company, Farming for the Future, La Trobe University and Enviro-dynamics

Executive summary

Woolmark, in collaboration with woolgrowers and the supply chain, is driving industry-wide consensus on the most commercially viable, science-based metrics for woolgrowers to measure, manage, and report their on-farm natural capital and environmental performance. The *Natural Capital and Environmental Performance Measures for Australian Woolgrowers* project has delivered a scientific, outcomes-based environmental wool specification system. This system supports brands and supply chains aiming to foster nature-positive economies.

The project, funded by Woolmark's parent body, Australian Wool Innovation (AWI), was delivered by Farming for the Future[1] (FftF), a not-for-profit research initiative that explores the relationship between natural capital and farm business performance, in collaboration with the Research Centre for Future Landscapes at La Trobe University (LTU) and Enviro-dynamics.com.au.

1 https://farmingforthefuture.org.au/

‘Nature positive farming’ was the agreed term for describing wool-growing that delivers positive environmental outcomes.

Woolmark’s goal was to obtain industry consensus on a suite of science-based, verifiable and outcome-focused metrics, allowing woolgrowers to cost effectively measure their environmental performance.

The project also aimed to unify and clarify the language describing wool-growing with positive environmental outcomes.

The FftF team used stakeholder consultation, desktop reviews and woolgrower case studies to confirm a shortlist of 12 metrics to measure on-farm environmental performance. These metrics were consistent for measuring the outcomes of both ‘nature positive’ and ‘regenerative’ farming practices.

Stakeholders along the value chain acknowledged the importance of supporting a woolgrower-centric approach to environmental performance certification. The use of metrics to establish individual farm baselines and enable ongoing performance monitoring was widely supported. There was strong support for a shift to outcome-focused metrics, using individual farm data to establish a baseline to which future measurements can be compared. The metrics are relevant across different wool-growing regions, streamlining and reducing the cost and effort of reporting environmental performance.

There is more work required to bed down a process for combining data from the 12 metrics to demonstrate ‘nature positive farming’, and to confirm the applicability of the metrics for production of other commodities, and this will be the focus of the next project for the team.

What is the challenge for the wool industry?

As markets focus more on environmental sustainability, the global textile industry is increasingly sourcing fibres produced in an environmentally friendly and sustainable way. Despite widespread positive environmental practices on Australian wool-growing properties, only about one in every 10 bales of Australian wool is certified as sustainably produced.

Several certification schemes assess farm performance using measures such as carbon emissions, animal welfare, resource use and biodiversity. However, there are inconsistencies in the requirements of the different schemes, many of which focus on practice-based measures of performance. There is increasing regulation and market scrutiny around claims of positive environmental performance (e.g. EU greenwashing laws, Science Based Targets Initiative (SBTi)). In addition, there is confusion around, and no clear industry-agreed definition for, the terms 'nature positive' and 'regenerative' or how to measure them.

The challenges faced by woolgrowers may also be relevant to other value chains, such as beef, grain and sheep meat, or even with banks, so streamlining and reducing the cost and effort of reporting environmental performance will be beneficial for woolgrowers beyond their wool value chain.

To support woolgrowers to demonstrate their environmental performance, and supply certified wool, three steps are needed:

1. Scientifically robust outcome-based measures for environmental performance.

2. Consistent, resonate language across the entire supply chain.

3. Cost-effective, streamlined performance measurements for woolgrowers across different value chains and commodities.

Woolmark responded to these challenges by investing in the *Natural capital and environmental performance measures for Australian woolgrowers* project.

How did we tackle the challenge?

Work undertaken in the project included:

Unpacking definitions

Definitions for nature positive and regenerative, in the context of the wool industry, were drafted following a literature review.

Exploring the metrics

The information required by leading sustainability frameworks and certification programs was collated, and mapped against the Australian Agricultural Sustainability Framework (AASF) and the full suite of 28 Farming for the Future metrics. This identified how well the FftF metrics aligned with those used by certifications and whether they could be used to fill gaps in measurement, or to substitute for existing practice-based measures.

Industry consultation

Stakeholders across the wool supply chain (woolgrowers, buyers and brokers, certification schemes and brands) were consulted on the need for consistency in environmental performance metrics. It was critical for the project to have a strong farm-scale focus. A woolgrower focus group was used to refine the definitions for nature positive and regenerative and to shortlist the preferred metrics for demonstrating environmental performance. These were then taken to certification schemes, buyers, brokers and brands for further input.

Road testing the metrics

Five FftF case study farms were used to test and demonstrate applying the proposed metrics. This work also explored how information collected using the metrics could be collated and simplified into meeting the requirements for certification.

Unpacking definitions

'Nature positive' and 'regenerative agriculture' are increasingly common in the agricultural, government and corporate sectors, consumer markets and mainstream media. Woolmark has observed there is growing market demand for 'nature positive' and 'regenerative' products even though few of the aforementioned stakeholders can clearly — and consistently — articulate what these terms mean. The project team undertook a literature review of current definitions to prepare a set of draft definitions of 'nature positive' and 'regenerative' wool-growing. These definitions were road-tested during stakeholder consultation (see page 9).

Exploring the metrics

During previous work, FftF and LTU developed a set of 28 evidence-based, outcome-focused metrics to allow farmers to measure their environmental performance, natural capital and biodiversity outcomes. These metrics were designed to fulfill the information requirements of leading sustainability frameworks. They have been tested on 130 farms across southeast Australia and were used as a starting point for this project.

'Practice-based metrics' report on-farm practices as a proxy for environmental performance, assuming correlation between a practice and an on-ground outcome. However, this over simplifies the complexities of farming systems and nature, and may limit farmers' ability to choose the most appropriate practices for their conditions. It also doesn't account for regional or agro-ecological differences in farming systems. In contrast, 'outcome-focused metrics' measure the results of on-farm management practices on different parameters (e.g. ground cover, ecological condition).
The 28 FftF metrics are associated with three broad categories of on-farm sustainability reporting (Table 1).

Table 1 Brief description of the 28 Farming for the Future metrics

CATEGORY	METRIC	DESCRIPTION
Natural capital	Soil condition	Ground cover (living vegetation, litter/stubble) is used as a proxy for soil condition.
	Ecological condition	The degree to which a farm has been modified from its original (pre-development) condition.
	Aggregation	The degree to which wooded vegetation on a farm is contained in contiguous patches.
	Extent of woody vegetation	The overall extent of tree cover on a farm.
	Aquatic condition	The proportion of tree cover in riparian areas (proxy for aquatic condition) on a farm.
	Forage condition	Pasture condition based on categories of palatability, productivity and perenniality.
	Proximity	The distance of production areas to wooded vegetation.
	Shade	Shade provided by trees to production areas (livestock, forage, crops).
	Shelter	Shelter from wind provided by trees to production areas.
Environmental performance	GHG emissions: Scope 1	Emissions generated directly from on-farm operations (e.g. livestock emissions, fuel/input use).
	GHG emissions: Scope 2	Electricity from the grid consumed on farm.
	GHG emissions: select Scope 3	Emissions generated by off-farm suppliers in producing and transporting select inputs used on farm.
	GHG emissions: total all Scopes	Total GHG emissions (all sources) emitted from a farm.
	Carbon sequestration	Modelled tonnes of carbon sequestered in woody vegetation on farm.
	Net GHG emission: farm	GHG emissions generated within the farm boundary (exc. select Scope 3), minus carbon sequestration.
	Net GHG emissions: all	Total GHG emissions (all sources) emitted from a farm, minus carbon sequestration.
	GHG emissions intensity	Total GHG emissions (all sources) associated with a product (/kg product).
	Nitrogen use efficiency	The amount of nitrogen used to produce a product (kg N per kg product).
	Lime use efficiency	The amount of lime used to produce a product (kg lime per kg product).
	Phosphorus use efficiency	The amount of phosphorus used to produce a product (kg P per kg product).
	Rainfall use efficiency	The amount of production given the amount of rainfall (mm per kg product).
	Water use (efficiency)	The amount of water used in production (mm water per kg product).
	Normalised stress weighted water consumption	The amount of water used in production, adjusted to reflect farm-specific rainfall: appropriate for comparison across regions/countries (mm/kg product).
	Water pollution generated	The amount of nitrogen from fertiliser and manure leeching into waterways and storages (kg input / kg product).
	Plastic packaging waste generated	Non-biodegradable packaging waste from farm inputs (kg waste / kg product).
	Finite resources used as inputs	Total farm inputs derived from non-renewable sources (mined and/or fossil-fuel based) (kg resources / kg product).
	Fossil aquifers	Water use derived from non-refillable fossil aquifers (mm water / kg product).
Biodiversity management index	Biodiversity management Index	Biodiversity positive farming, measured by: canopy cover; land cover type; ground cover; fertiliser, pesticide, and water inputs.

Key aspects of leading national and international reporting frameworks and certification schemes, relevant to the Australian wool industry, were assessed to determine how well the FftF metrics aligned with their requirements. This work also identified gaps between the FftF metrics and certification scheme requirements, specifically as they related to natural capital, and environmental performance. The environmental stewardship principles in the Australian Agricultural Sustainability Framework (AASF)[2] were used as the basis for this comparison. The wool certification schemes explored in detail included AWEX's SustainaWOOL (pre-1 July 2024 relaunch)[3], New Zealand Merino's ZQ and ZQRX[4], Responsible Wool Standard (RWS) - Textile Exchange[5], Schneider Group's Authentico[6], and Savory's EOV[7].

2 https://aasf.org.au/
3 https://awex.com.au
4 https://www.nzmerino.co.nz/zqrx
5 https://textileexchange.org/responsible-wool-standard/
6 https://authentico.gschneider.com/
7 https://savory.global/eov/

Consulting with industry

Stakeholder consultation was a key component of the project to ensure buy-in from the wool value chain, particularly woolgrowers and certification schemes. The project team sought input into the most relevant (i.e. core) outcome-based metrics for demonstrating environmental performance and tested the definitions for regenerative agriculture and nature positive. The project team worked most closely with certification schemes and Australian woolgrowers, and engaged with wool buyers, brokers and global apparel brands during the latter stages of the project. Most consultation (except where indicated otherwise) was done via online meetings.

The details for consultation are as follows:

- certification groups (six) (two meetings per group (one face to face), and then an online workshop)
- woolgrowers (10 Australian woolgrowers invited to be part of a focus group, which met three times, all online)
- wool buyers and brokers (seven)
- brands (four).

Road testing the metrics

The final stage of the project was to demonstrate the use of the core metrics, identified during the earlier phases of the project, and review how they could be practically implemented on farm to deliver robust, transparent and simplified reporting. This involved:

- calculating the core metrics on five wool-growing properties (previously engaged in the FftF program)
- assessing the potential to calculate metrics for multiple points in time to understand change over time
- developing a process for combining insights from multiple metrics into an overall measure for reporting on-farm performance.

What did we learn?

Wool industry stakeholders were overwhelmingly positive about creating a system with consistent metrics and language to measure and report environmental performance. They acknowledged the need for a woolgrower-centred approach to environmental performance certification.

Unpacking definitions – nature positive and regenerative agriculture

Terms such as 'nature positive' and 'regenerative agriculture' are increasingly used by all sectors of the fashion and textiles industry, as well as the wool supply chain.

Nature positive captures the global goal to halt and reverse biodiversity loss, and typically refers to activities beyond farm scale.

Regenerative agriculture represents an approach to farming, underpinned by sustainable management practices and reduced inputs (i.e. working with nature), that leads to improved ecosystem condition, contributes to climate change mitigation and promotes socioeconomic resilience.

Despite widespread use, the two terms face challenges in adoption by agricultural supply chains due to unclear definitions and metrics. Consistent definitions and measures are needed to meet the growing market demand.

The project explored multi-level definitions to accommodate the range of stakeholders covered by the wool supply chain, as the amount of detail needed in the definition depends on the target audience. This allowed for a simple 'headline' definition, easy for consumers to understand, underpinned by a robust 'foundation' definition that could be aligned to metrics for reporting. Headline definitions are easily understood and digestible, and include the key concepts associated with nature positive or regenerative outcomes. Foundation definitions include technical concepts and language, to enable alignment with core metrics. This is important if regenerative agriculture or nature positive are to be transparent and verifiable, as is required for the certification of products, but also able to be presented to consumers in a way that will resonate with them.

Exploring definitions for ‘nature positive’

The term nature positive gained prominence with the 2022 Kunming-Montreal Global Biodiversity Framework[8] (GBF) at COP15. Nature positive practices aim to halt and reverse biodiversity loss by 2030, shifting the current negative trend to a positive trajectory. Nature positive is relevant at multiple scales, including global, national, regional and landscape (the Nature Positive Initiative[9]).

To date, little attention has been paid to considering nature positive outcomes at a farm scale. This could be because biodiversity impacts often extend beyond individual farms, or because the original global focus is yet to apply farm-scale thinking.

The definition of ‘nature positive’ in Figure 1 was developed by the project following a literature review and consultation with stakeholders. This definition, and the definition of ‘regenerative agriculture’ in Figure 2 on the next page, were stepping stones to help the project establish a definition for ‘nature positive farming’ – see page 14.

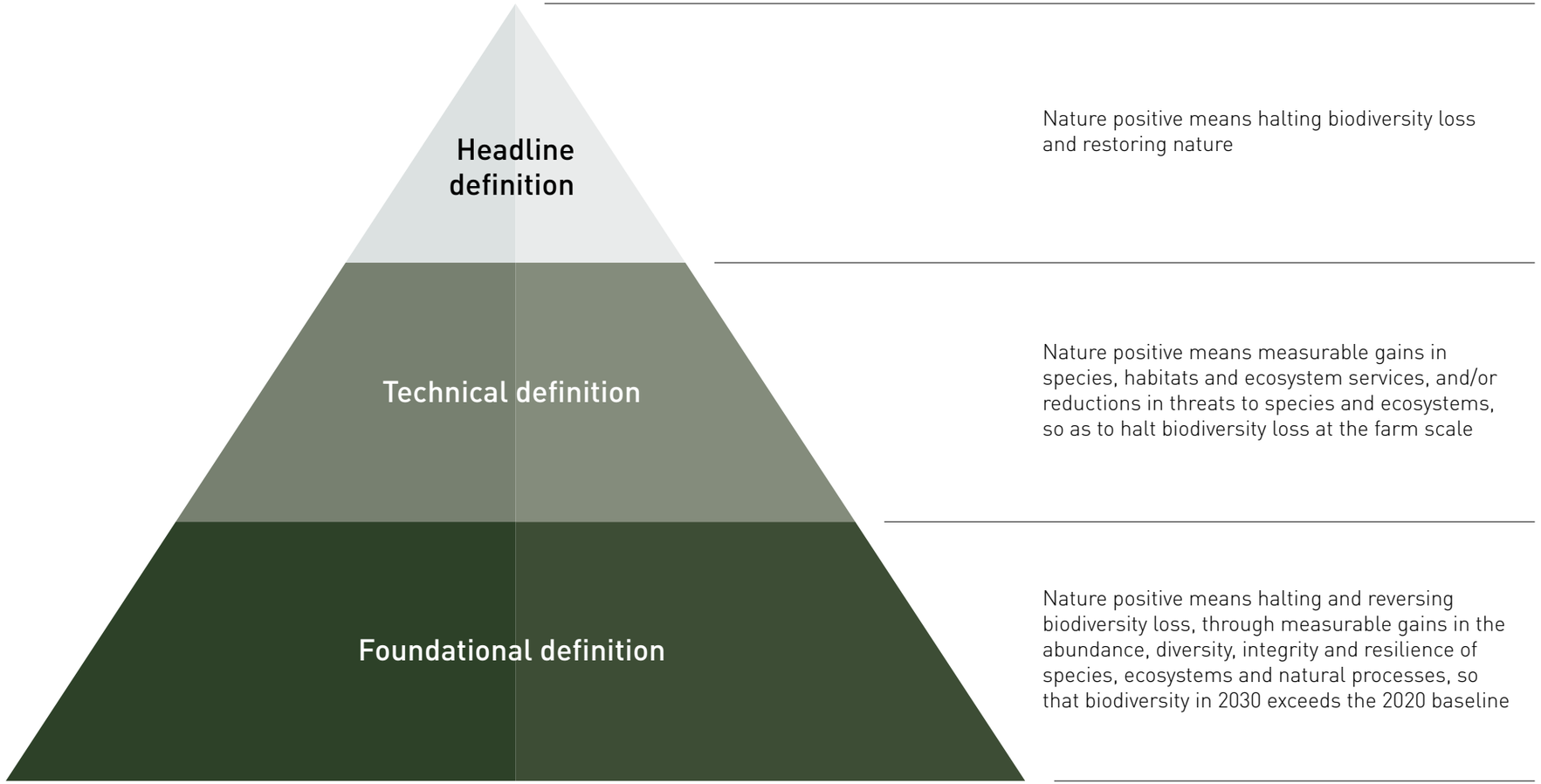


Figure 1: Project definition for nature positive

8 https://www.cbd.int/gbf
9 https://www.naturepositive.org/app/uploads/2024/02/The-Definition-of-Nature-Positive.pdf

Exploring definitions for ‘regenerative agriculture’

There is strong understanding by industry, corporations and consumers that regenerative approaches have a positive impact on the environment. However, as a term, regenerative agriculture has not been widely adopted by farmers in Australia. There may be several reasons for this, including some farmers feeling the term ‘regenerative’ implies their past practices harmed the environment. Because of confusion and stigma surrounding the terminology, there is evidence that woolgrowers are using what are considered regenerative practices without considering themselves ‘regenerative’. For example, practices such as rotational grazing or no-till cropping may be considered by some as regenerative, but often not by the farmers themselves.

There are differing opinions on whether a single, agreed definition for ‘regenerative’ is needed. Some think clear definitions are important for effective communication, providing clarity for producers and supply chains, reducing confusion in the market, and supporting research and market incentives. Others believe regenerative agriculture is context-dependent and a universal definition isn’t workable. However, when regenerative agriculture is discussed, constant themes emerge. These usually focus on specific practices or principles, for example reducing tillage, using cover crops, integrating livestock, and minimising external inputs, or they describe the outcomes of regenerative practices, such as improved soil health and increased biodiversity.

Stakeholders consulted during this project generally agreed measures of regenerative agriculture should be outcomes-focused, allowing farmers the flexibility to choose the most effective practices for different situations. As customer demand for regenerative products increases, the need for outcomes-based definitions and measures will increase.

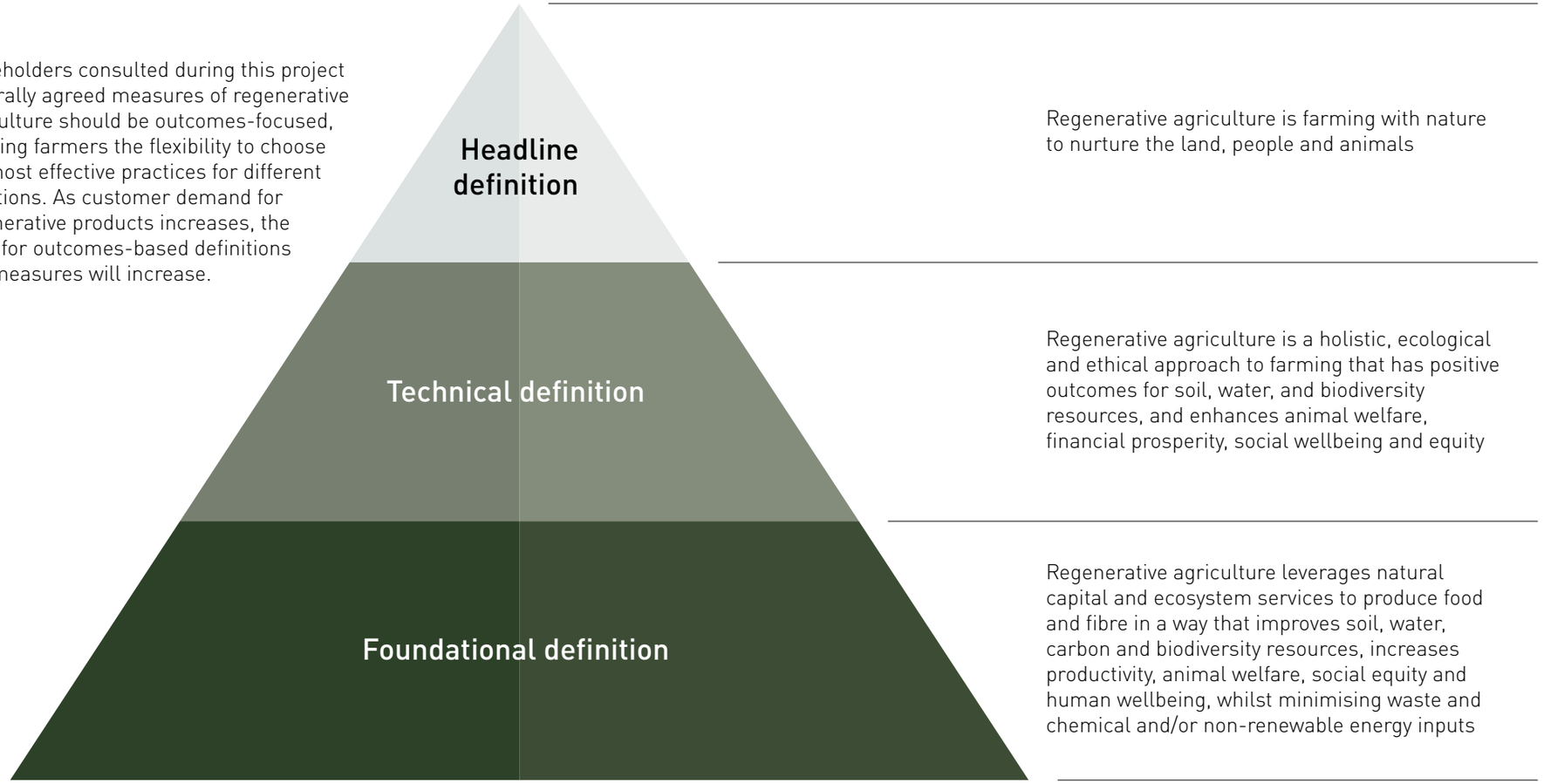


Figure 2: Project definition for regenerative agriculture

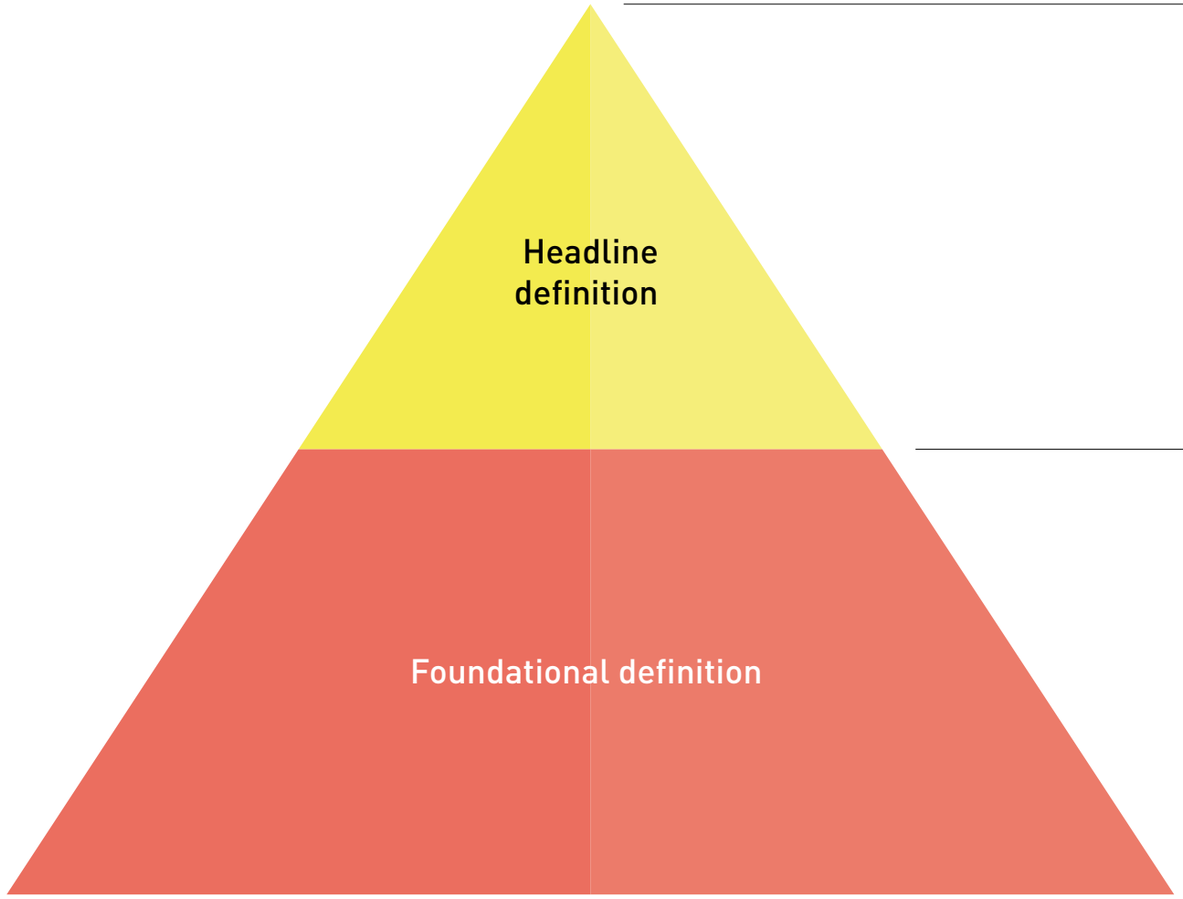
Project agreed definition: ‘nature positive farming’

There is not a simple solution to the challenge of labelling positive environmental management on farm so it is simple and resonates with all players along the supply chain. While regenerative agriculture resonates strongly with the demand-end of the value chain, it is a loaded and vexed term for the supply side (woolgrowers).

The consultation with woolgrowers and certification schemes revealed the same core metrics (Table 2) are required to demonstrate achievement of both regenerative agriculture and nature positive. What was also highlighted in consultation with certification groups, was that while the core metrics covered environmental aspect of regenerative agriculture, using a definition of regenerative without including metrics to cover animal and social wellbeing outcomes was problematic.

For these reasons, Woolmark worked with stakeholders to amalgamate the definitions into ‘nature positive farming’, with a common set of core environmental metrics to demonstrate achievement (Figure 3). During consultation with certification schemes and brands, it was recommended to drop the technical definition, as the headline and foundation definitions were deemed to be sufficient.

While some brands and certification schemes highlighted the potential difficulty of achieving market acceptance for a ‘new’ term, there was strong support for a shift to outcomes-focused metrics.



'Nature positive farming' leaves the land in a better condition for the next generation enhancing regeneration, biodiversity and supporting livelihoods and animals.

'Nature positive farming' leverages natural capital and ecosystem services to produce wool in a way that measurably improves the extent and/or condition of soil, water, carbon, native species and habitats and reduces threats to biodiversity, at the farm-scale relative to a baseline. 'Nature positive farming' can support long-term resilience, productivity, animal wellbeing, sustainable livelihoods, whilst minimising waste and chemical and/or non-renewable energy inputs.

Figure 3: Project definition of ‘nature positive farming’

Exploring the metrics

The mapping of FftF metrics against those required by industry certification schemes found 10 of the FftF metrics provide outcome-based measures of information required by >75% of certifications. These include all the natural capital metrics and the biodiversity management index (Table 1). Fewer than 25% of certifications require greenhouse gas-related metrics. Information required by certification schemes but not measured by the FftF metrics included measures of invasive species, risk from predators, non-GHG air pollutants, and soil pollutants. A key difference between FftF metrics and those of certification metrics were that schemes were almost universally focused on practice-based measures (except for one scheme), whereas FftF measures are outcomes-focused.

Through consultation with woolgrowers and certification schemes the 28 FftF metrics were refined to 12 core metrics considered to be the minimum for measuring positive environmental performance on wool farms (Table 2). There was strong alignment between the metrics identified as important for demonstrating both regenerative agriculture and nature positive. This is important, as the metrics will be sound regardless of any future labelling or definition changes.

Table 2: 12 core metrics for measuring environmental performance on wool farms for 'nature positive farming'

METRIC	MEASURE	MEASUREMENT TYPE
Forage condition	Condition of forage resources across the farm	Remote-sensed and ground observation (future remote-sensed)
Ecological condition	Extent and degree of land cover modification based on underlying state and transition models (surrogate for species habitat)	Remote-sensed and ground observation
Ground cover	Ground cover is used as a surrogate for soil condition	Remote-sensed
Tree cover	Extent of canopy cover	Remote-sensed
Tree aggregation	Distribution of woody vegetation (native and exotic) across farm	Remote-sensed
Aquatic condition	Extent to which riparian and wetland areas are vegetated	Remote-sensed
Shade and shelter	Shade and shelter provided by trees to production areas (livestock, forage, crops)	Remote-sensed
Biodiversity management index	Degree to which a farm is managed in a biodiversity positive way (habitat extent, riparian/wetland with native vegetation), heterogeneity of land-cover types, grazing pressure, intensity (fertiliser, pesticide and water use)	Farm management data and remote-sensed 3–5 years
Carbon sequestration	Carbon stored on farm	Farm management data and remote-sensed
Net GHG balance	Scope 1, 2 and 3 emissions minus woody sequestration	Farm management data and remote-sensed
GHG emissions intensity	Net GHG balance per kilogram of product	Farm management data and remote-sensed
Water use intensity	Water used in production	Farm management data

The consultation also highlighted a perceived need for metrics related to animal and social wellbeing, with some strong views from certifications that using 'regenerative' requires an outcomes-focus on people and animal wellbeing, in addition to the environment. Exploring metrics for these was outside the scope of this project.

Measuring environmental performance needs to be as low cost and practical as possible, whilst retaining robustness and credibility. To reduce the cost, metrics that can be measured using remote-sensing technology or through the capture of farm records are preferred. On-ground measures are more time consuming and expensive to collect. Previous FftF research on 130 farms cross-checked remote-sensed measures with on-ground observations, to help calibrate measurements. Building consistency in the metrics across certification and reporting schemes could lead to increased investment in technology and remote sensing, which may bring the costs of measurement down.

Among woolgrowers involved in the project, the current level of measurement varied (from observations through to detailed record keeping), which is likely to be representative of the broader industry. However, all woolgrowers engaged in the project saw value in measuring and recording to better inform their own management decisions. Other key points made by woolgrowers (and supported by other industry stakeholders) included:

- It was important woolgrowers own their data, so they can choose who they share it with.
- The cost of measurement needs to be valued and shared by those who use the information.
- Establishing a baseline (starting point) for individual farms is important to enable tracking of performance over time.
- A journey of improvement is key (i.e. measuring change in metrics over time, by establishing a baseline for a property), but this needs to take into account the status of a property, particularly where a measure is already at a desirable level and maintenance rather than improvement is the desired outcome.
- The ambition for rigour around measurement should not outpace the ability of technology to produce the information easily and cost-effectively.

Road testing ‘nature positive farming’ metrics

The proposed shift from practice-based certification, to focusing on outcome-based metrics was positively received by all stakeholders (certification schemes, woolgrowers, brokers/buyers), as was the use of metrics to establish individual farm baselines and enable ongoing performance monitoring. There was strong recognition, and agreement, that any system must be flexible enough to accommodate regional and business differences, while being robust and rigorous. The core metrics agreed through consultation are outlined in Table 2.

Table 3 on the next page presents the results from road testing the metrics for five case study farms. It highlights the advantages of the core metrics for measuring ‘nature positive farming’. Each metric provides a numerical value, which quantifies the outcomes from the different management practices used by different woolgrowers, farming in diverse environments. The metrics are consistent across properties, avoiding bias or subjectivity, which is essential for independently reporting on environmental performance. They can also be used to track change in environmental performance over time.

There are some important points to consider when looking at trends in core metrics over time:

1.

Environmental conditions, such as rainfall, can impact trends in metrics. To reduce this influence, metrics are often calculated as five-year averages. It is recommended that average values be used (for calculating trends over time) when annual metric values are available for only short periods of time (i.e. < 5 years).

2.

Declining trends in metrics that should ideally increase, such as carbon sequestration, don’t always indicate poor management. For example, carbon sequestration decreases as vegetation gets older. Other factors, such as drought or fire, can also affect these values.

3.

Trends in metrics over time need to be considered in the context of their status when the initial metric was measured. For example, a stable trend for tree cover over time on a farm with an initial level of cover that was low could indicate there is still room for improvement, while a stable trend for tree cover over time on a farm that initially had a high level of tree cover may be more desirable.

4.

Use a specific point in time as a baseline for interpreting trends.

5.

Where a metric is reported as a number within a range (for example between 0-1), it is not always the case that 1 is the desired outcome. The range should be compared to a regional benchmark.

The scientific basis and methods used to calculate all FftF metrics have been documented, and metrics have been road-tested on 130 grazing and mixed grazing/cropping farms across south-east Australia (see https://farmingforthefuture.org.au/wp-content/uploads/2024/03/Natural-Capital-Methods-Paper-May-2024.pdf[10])

10 https://farmingforthefuture.org.au/wp-content/uploads/2024/03/Natural-Capital-Methods-Paper-May-2024.pdf

Table 3: Measuring environmental performance and natural capital of five wool-growing properties in eastern Australia using the 12 core metrics.

Metric	Farm A	Farm B	Farm C	Farm D	Farm E	Unit of metric
Enterprises on property	Wool, meat (sheep), crops	Wool, meat (sheep, cattle)	Wool, meat (sheep, cattle), crops	Wool, meat (sheep, cattle)	Wool, meat (cattle)	
Farm size (ha)	4196.8	2934.5	1824.4	2633.8	3390.9	
Farm location	VIC	NSW	TAS	NSW	NSW	
Forage condition [a]	0.36	0.72	0.42	0.37	0.73	Derived metric (range: 0-1)
Ecological condition [a]	0.30	0.58	0.19	0.39	0.73	Derived metric (range: 0-1)
Ground cover	0.79	0.86	0.81	0.85	0.87	Derived metric (range: 0-1)
Tree cover [a]	0.92	7.86	0.49	19.4	15.32	Percent
Tree aggregation [a]	0.04	0.11	0.06	0.10	0.21	Derived metric (range: 0-1)
Aquatic condition [a]	0.04	0.16	0.05	0.25	0.17	Proportion
Shade [a]	1	13	N/A	27	26	Percent
Shelter: winter [ab]	4	40	27	62	75	Percent
Shelter: summer [ab]	6	41	37	65	67	Percent
Biodiversity management index	2.30	2.44	2.25	2.86	2.71	Composite measure (range: 0-5)
Carbon sequestration	-0.06	0.23	0.02	-1.10	-0.83	tCO2-e/year/ha [c]
Net GHG balance	0.54	1.33	3.55	-0.06	-0.17	tCO2-e/ha
GHG emissions intensity [d]	29.4	8.0	51.4	31.3	14.1	kg CO2-e / kg greasy wool
Water use intensity [d]	6,932.03	59.75	19,098.49	0.00	104.88	litres H2O / kg greasy wool

a calculated for a single year (2022)

b shelter: winter and shelter: summer reflect shelter provided by both the farm's trees and trees on/adjacent to the farm boundary

c negative values represent removal of carbon from the atmosphere and storage in the biosphere; positive values represent a net emission from the woody vegetation

d calculated for wool production specifically

Using the metrics to demonstrate 'nature positive farming'

Calculating core metrics for properties, and using metrics to measure change in environmental performance over time, is the first step for demonstrating 'nature positive farming'. The next step involves working out how to interpret these metrics when assessing whether they reflect 'desirable' (or 'undesirable') outcomes for environmental performance (steps 3 and 4 in Figure 4). The final step then involves working out how to combine insights provided by all 12 metrics to understand what they mean for overall 'nature positive farming' (step 5 in Figure 4).

STEPS INVOLVED IN ASSESSING THE 'NATURE POSITIVE FARMING' PERFORMANCE OF WOOL GROWING PROPERTIES													CURRENT UNKNOWNS
1. Define 'nature positive farming'													
Foundation definition 'Nature positive farming' leverages natural capital and ecosystem services to produce wool in a way that measurably improves the extent and/or condition of soil, water, carbon, native species and habitats and reduces threats to biodiversity, at the farm-scale relative to a baseline. 'Nature positive farming' can support long-term resilience, productivity, animal wellbeing, sustainable livelihoods, whilst minimising waste and chemical and/or non-renewable energy inputs.													
2. Identify core metrics													
	Forage condition	**Ecol. condition**	**Ground cover**	**Tree cover**	**Tree aggreg.**	**Aquatic condition**	**Shade**	**Shelter (winter, summer)**	**Biodivers. mgmt. index**	**Carbon sequest.**	**Net ghg balance**	**Water use intensity**	
3. Calculate status and trend for core metrics													Benchmarks for interpreting the status of core metrics in relation to 'nature positive farming' outcomes: do values reflect 'undesirable', 'desirable' and 'highly desirable' outcomes?
Status	0.73	0.73	0.87	15.32	0.21	0.17	26	75, 67	2.71	-0.83	-0.17	87.7	
Trend	tbd	tbd	**decrease**	tbd	tbd	tbd	tbd	tbd	tbd	**increase**	tbd	tbd	
4. Combine status and trend into single measure													Process for combining the status and trend of core metrics
	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	
5. Combine insights across core metrics to assess 'nature positive farming' performance													Process for combining 12 core metrics into an overall 'nature positive farming' 'result' for wool-growing properties
Overall 'nature positive farming' result: tbd													

Figure 4: Diagram illustrating potential steps involved in the process of evaluating whether individual wool-growing properties satisfy the requirements of the 'nature positive farming' specification (as set out in the foundation definition). This example shows the values for case study farm E. Outcomes flagged with 'tbd' (to be determined) in steps 4 and 5 are to be explored in future work. Metrics for which trend values are noted as 'tbd' cannot be calculated retrospectively so require ongoing measurement for their calculation.

Determining benchmarks for evaluating the status of metrics for reporting against 'nature positive farming' underpins step 3 in Figure 4. While defining benchmarks was out of scope for this project, and will be explored in a future project, initial thinking included identifying values of each metric that reflect 'undesirable', 'desirable' or 'highly desirable' outcomes for 'nature positive farming'. For example, does a score of 0.5 for forage condition reflect an undesirable, desirable or highly desirable outcome?

Defining benchmarks for each metric will be challenging, and is complicated by a number of factors:

1.

Benchmarks will need to be defined on a regional basis because there is high environmental variation across wool-growing regions in Australia. They must capture the effect of climate/rainfall and underlying productivity gradients on metrics, and should also differ between grassland, woodland and forest ecosystems.

2.

There is variation in the attributes of wool-growing properties. Wool-growing properties may produce wool alone, or wool alongside other livestock or cropping enterprises. These differences can have a strong influence on the status of metrics.

3.

The operating environment (points 1 and 2) also influences the capacity for wool-growing properties to show change over time in core metrics.

4.

Defining values associated with undesirable, desirable and highly desirable outcomes for 'nature positive farming' as a whole, may involve trade-offs between individual metrics.

5.

Benchmarks for each metric should be below the value where FftF research has identified a trade-off between natural capital and farm business productivity and profitability (i.e. where higher value metrics are correlated with reduced productivity or profitability).

Next steps

The next steps for Woolmark:

1.

Continue the collaborative and constructive dialogue with the wool certification schemes and FftF in the next project to:

a. Develop benchmarks for interpreting the status of core metrics in relation to 'nature positive farming' outcomes. These benchmarks must account for factors such as ecosystems (e.g. woodland, grassland), rainfall and enterprise mix.

b. Develop a process for combining the status and trend of core metrics into a single value.

c. Develop a process for combining insights provided by 12 core metrics into a final 'nature positive farming' result for wool-growing properties.

d. Prepare procedures, and provide training, for third-parties to measure the 12 core metrics on wool farms using remote-sensing, farm management data and on-ground observations.

2.

Support awareness raising and capacity and capability building among woolgrowers to enable them to understand and act on the importance of natural capital and environmental performance for production of high-quality wool as well as market access benefits.

3.

Continue to support programs that harmonise data standards and promote interoperability, as well as the development of technological tools to enable woolgrowers to collect and report production and environmental data and share data as they wish.

4.

Further refinement of the core metrics:

Additional work on developing better remote sensing analytics for metrics such as canopy cover, tree aggregation, and proximity.

5.

Encourage collaboration across agricultural sectors, where there is alignment, to drive consistency in environmental reporting.

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