

# The Global Farm Metric framework

Categories, sub-categories and indicators explained

February 2024



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| Version: February 2024   |
| Previous version: July 2023  |
| Level of revision: Minor (edit / clarification)  |
| <p>Summary of changes</p> <p>Products category:</p> <ul style="list-style-type: none"> <li>• New sub-categories 'flexibility' and 'buffers' added.</li> <li>• Product yields &amp; quality moved to 'farm outputs' category.</li> <li>• Waste moved to 'farm outputs' category and renamed 'unused products'.</li> </ul> <p>Rationale: Resolving lack of clarity – farm outputs and products categories overlapped in previous version. In products category, the focus is now on the extent to which what is produced is flexible, diverse and/or buffered from shocks, in line with understanding the state of the farm and risks to its future viability. Systems outputs, their types and qualities are gathered under 'farm outputs' as what the farm seeks to optimise.</p> <p>Other changes</p> <ul style="list-style-type: none"> <li>• Accompanying text edits to align messaging to alteration described above, including change to aims GFM17 and GFM 6.</li> <li>• Addition of citation information for this report, and for an article in preparation on the development process.</li> <li>• Correction and clarification of indicator level wording within outputs, practices, and impacts categories, including correction of examples of services &amp; disservices from farming.</li> </ul> |

## Summary

The Global Farm Metric framework presents a common language and holistic approach to describing farm sustainability. It has been developed with farmers to drive the transition towards more sustainable farming systems while avoiding unintended consequences of change. It enables all involved in food and farming, from farmers to policymakers to the CEOs of major companies, to navigate the confusing array of assessments, policy initiatives, projects, and media messaging which undermine trust in the sustainability agenda among farmers and the public.

This report presents the GFM framework, sustainability aims, and the indicators developed to support on-farm sustainability assessment. These resources inform a pathway to change. This pathway begins by providing farmers and others with a common overview of what farm sustainability means in practice, paving the way for the collection of baseline data on the state of a farm across the GFM categories. It recognises the need to evaluate and adjust changes in practice through repeated assessment and highlights the importance of using data on the system and its outputs to underpin evaluations of impacts beyond the farm gate.

The GFM framework and indicators are based on a view of sustainability which requires farms to meet current needs for food, fuel, and fibre, for this production to be sustained to meet the needs of future generations, and for farming to maximise positive and minimise negative impacts on people and planet beyond the farm-gate. Therefore, the framework provides the basis for evaluating farming approaches, systems, and practices against a common, holistic view of farm sustainability - rather than prescribing particular solutions. This enables farmers, communities, and other stakeholders to find the best pathways to change in the unique contexts of specific farms and places.

Over the coming months, the common language of the GFM framework will be incorporated into learning materials, helping farmers to understand how existing assessments and resources can support their sustainability journey and, along with the GFM indicators, supporting the development of improved assessments and farm advice. Projects to apply the GFM framework internationally will continue, and a proof-of-concept assessment tool, the GFM engine, will be used in trials to demonstrate the value of collecting state of the farm data as an aspect of sustainability often overlooked in current sustainability assessments. A key goal is to support tool developers in making assessments more practical, including technical solutions, data sharing and solutions around the timing of assessments (e.g., collecting data on the state of a farm every few years, and information on practices and key outputs more often).

We believe that a common language for understanding farm sustainability, a holistic perspective, and an agreed set of indicators for evaluating progress, enable bottom-up change by farmers and drive the realisation of a supportive economic and policy environment for the transition to a more sustainable food and farming system. We work with a coalition of over 100 partners across the food and farming sector.

**Our framework and indicators are provided open access - please cite/acknowledge our work if you use our thinking and findings, to enable us to continue to provide these shared resources.** The GFM approach is already influencing the adoption of more holistic approaches to understanding and assessing farm sustainability amongst farmers, in government, and along the supply chain.

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## Overview

Last December the Global Farm Metric team released a new version of its farm sustainability framework based on insights from our trials and research<sup>1</sup> and began a period of communication and consultation on the framework. Here we present the framework, revised in response to this feedback and as the result of further work within the team. This report:

- describes what the framework is, how it works and what its uses are,
- presents indicators which can be used to apply the framework within sustainability assessments, and discusses the importance of this,
- identifies the next steps the Global Farm Metric team will take in the development of resources and trials to demonstrate the value of the framework and to support positive change in the farming sector.
- describes the framework categories, sub-categories and indicators

### What is the Global Farm Metric framework?

The Global Farm Metric framework is a way of thinking and learning about farm sustainability. It is designed to be understood by all those who affect and are affected by farming, from farmers to CEOs of major companies. It aims to drive change by:

- Enabling farmers and other stakeholders to make sense of farm sustainability and the myriad of approaches, policies, initiatives, and assessment tools related to it, using the framework as a common language.
- Helping farmers and other stakeholders to think about farm sustainability holistically, in order to avoid negative unintended consequences of change and to maximise opportunities to make changes that have multiple benefits.
- Driving improvements in farm sustainability assessments, so that farming practices, systems and approaches can be evaluated more practically and effectively to support positive change.

By building a common language for farm sustainability, we believe that the Global Farm Metric framework can spur continuous improvement in sustainability on farms, while helping to shape the policy and economic environment needed to support that improvement.

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<sup>1</sup> Kipling, R.P., Arguile, L., Smith, J., Wheeler, M. and Smith, L. (in prep) Driving change in farming – the role of sustainability assessments and holistic approaches to knowledge exchange.

## Who is the Global Farm Metric for?

Work on the Global Farm Metric framework and indicators has focused on its utility and value for farmers.

Our farm trials and consultations with farm advisors, showed that for many farmers, gaining a clear, holistic understanding of what sustainability means for their farm is a vital first step towards change. This is especially true in the context of a confusing array of assessments, policy initiatives, projects, and media messaging, which often undermine trust and confidence in the sustainability agenda among the farming community.

As a common language, the framework can be used by farmers to understand and discuss the sustainability of their farms, to think critically about different initiatives and assessments which might be put to them, and to make coherent plans for change.

We believe that the Global Farm Metric can help shape the policy and economic environment to drive the transition towards greater sustainability in the food and farming sector and beyond. The support of a broad coalition is vital to achieving this. The Global Farm Metric is supported by over 100 partners, including farmers, advisors, researchers, educators, environmental groups, certifiers, food companies, financial services, and government agencies. You can find out more about the coalition [here](#).

## What do we mean by sustainability in farming?

We build on previous sustainability definitions to capture what the term means for farming. For us, sustainability in farming means:

- providing sufficient, high-quality food, fuel, and fibre to meet society's current needs.
- safeguarding the ability of future generations to meet their needs for food, fuel, and fibre by protecting and improving the environmental, social, and economic condition of every farm.
- moving from minimising the negative impacts of farming, towards farming which actively enhances the state of people and planet beyond the farm gate.
- a continual process to meet changing environmental, social, and economic challenges and needs, rather than the realisation of a single target level or state.

**When so much is required of farming, we believe that achieving sustainability in the sector demands a holistic, systems approach to avoid the unintended consequences, confusion, and missed opportunities associated with focusing on specific aspects of sustainability in isolation.**

## The Framework



The 12 central categories of the Global Farm Metric framework describe the different parts of the farm system. The **state** (condition) of these parts represents strengths of, and risks to, the ability of the farm to keep producing food, fuel, and fibre in the long-term to meet the needs of future generations.

These sustainability risks and strengths are shaped and influenced by **farm practices** (top inner edge of the wheel).

The farm system, the practices applied to it, and external pressures affecting it, produce a range of **farm outputs** (bottom inner edge of wheel) – products and byproducts, unused products, services, and disservices which have positive and negative impacts beyond the farm-gate.

**Impacts on people and planet** (outer edge of the wheel) are how the farm system, its inputs, practices, and outputs affect the outside world. The category recognises that a farm is an ‘open system’ - it has effects on the outside world and the outside world has effects on it.

A fundamental principle of the framework is that no category of sustainability should be considered in isolation. Actions focused on one category need to be checked for effects on the other categories.

By monitoring the 12 central Global Farm Metric categories, the effects of changes in practices or outside pressures on the ability of the farm to sustain production in the long-term can be evaluated, and unexpected effects of change recognised. Monitoring farm outputs gives an indication of the likely impacts of the farm on people and planet, while impact assessments can be used to formally estimate these. Data about the world beyond the farm-gate (e.g., landscape-scale data) can be used to formally estimate external effects on the state of the farm, to fairly allocate responsibility for changes.

By highlighting the interactions between different categories of farm sustainability, and how the farm 'nests' within wider systems, the wheel shows that changes will be needed beyond the farm-gate as well as on-farm, to improve and maintain the sustainability of our farming system. Finding ways to make improvements across sustainability categories is a challenge not only for farmers, but also for others within and beyond the sector who have an effect on farming, and whom it affects.

## Reading the Global Farm Metric framework wheel

Reading the spokes of the wheel which represent the state of the farm, and working around clockwise from the top, **climate, community, nature, and soil & water** form the basis of the farm system, and in a good state increase the resilience of production against future challenges.

The farming system is then shaped by the **governance** of the farm, the use of its **resources** and the **inputs** brought into the system.

The **farmer & workers** support the production of **crops & pasture** and **livestock**.

The flexibility, diversity, and level of buffering of the production of crop and livestock **products** underpins the viability of the farm in the long-term.

The **economics** of the farm reflects the value the outside world places on farm outputs and impacts, as well as the costs of the business and the financial resources available to it.

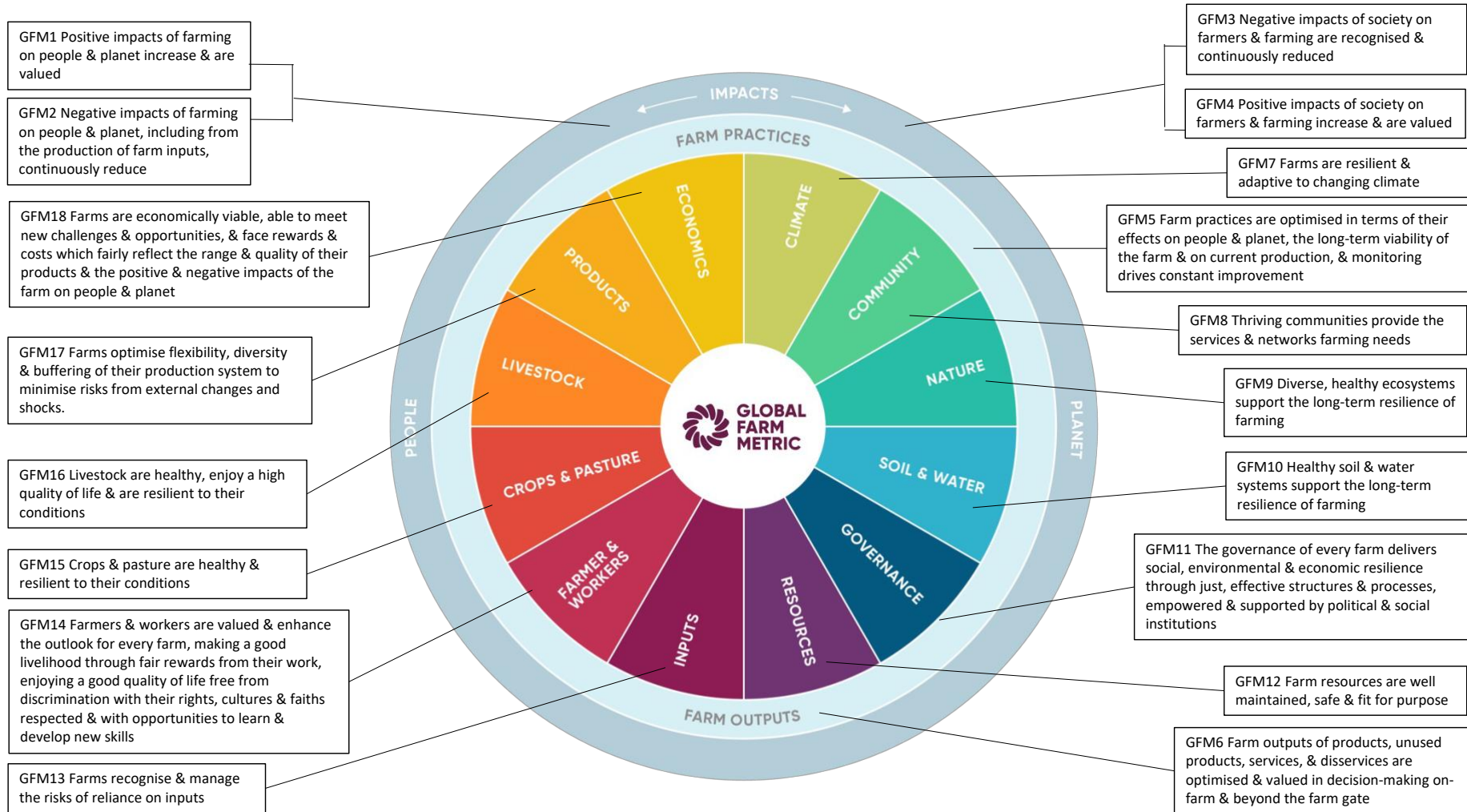


**Farm practices** (inner edge of the wheel) affect all of these aspects of the farm system, interacting with them to produce **farm outputs** including the yields and quality of crops and livestock products, unintended products including greenhouse gas emissions, services like carbon storage and water management, and disservices like injuries to workers.

The system, its practices and outputs produce positive and negative **impacts** (outer edge of the wheel) on people and planet, as well as affecting the state of the farm itself. At the same time, the farm is affected by positive and negative impacts from the outside world (e.g., nitrogen deposition, toxins, pollination services, in-flow of biodiversity). The values of the outside world are imposed on the governance of the farm (e.g., through laws, regulations, advice etc.)



The aims of the Global Farm Metric framework



**Framework aims (GFM1-4)** Aims for the impacts of the farm on people and planet beyond the farm-gate and for the impacts of the wider world on the farm. Impacts are considered holistically, including positive impacts & impacts arising from the production & transport of farm inputs.

**Framework aims (GFM5-6)** Aims for farm practices (including amounts and types of inputs) and for the outputs produced by the farm system.

**Framework aims (GFM7-18)** Aims for farming in terms of meeting the needs of future generations for food, fuel, and fibre. Changes in these categories represent the farm becoming more or less susceptible to risks through changes in its social, environmental or economic condition. The current state of the farm system is determined by its previous state, the farming practices applied to it, and external impacts affecting it.

## Applying the Framework

### From framework to indicators

We have developed a set of indicators to demonstrate how sustainability in each category of the framework can be evaluated in assessments. While the framework, the wheel, its categories, and sub-categories will now stay unchanged, these indicators will evolve with scientific knowledge about farm systems and their sustainability, and the development of new technical options for data collection. They are also likely to be adjusted to fit the needs of the existing wide diversity of farming systems and contexts.

The framework indicators cover farm practices, farm outputs, impacts of the farm on people and planet, and - central to a holistic view of farm sustainability - the state of the farming system itself. Collecting data on state of the system indicators enables the assessment of risks to the farm's ability to provide for the food, fuel and fibre needs of future generations - a key aspect of sustainability. When data for state of the system indicators are collected periodically the effects on the future viability of the farm caused by changes in farming practice and changes in pressures from outside the farm, can be monitored.

Linking the Global Farm Metric framework categories to indicators enables farmers to take the next step, from understanding the different aspects of farm sustainability using the shared, holistic language of the framework, to collecting data to assess their performance in each category and to identify priorities for change.

### The Global Farm Metric and on-farm sustainability assessment

Our aim is for existing sustainability assessments to adopt the Global Farm Metric framework and indicators in order to align around a shared, holistic view of farm-level sustainability.

Every assessment and decision support tool has different aims and priorities, but if they can be viewed within a common way of looking at sustainability, farmers and advisors will be better able to navigate the resources available to choose the best ones for their farm and needs.

While we have developed the Global Farm Metric framework as a common language for farm sustainability, we do not see ourselves as tool or assessment developers. At the same time, we recognise the need for us to demonstrate the value of using our indicators to collect data across sustainability categories.

To enable us to do this, we are developing and using a 'proof of concept' Global Farm Metric Engine for use in farm trials - this engine will focus on assessing the state of the farm system and farm outputs, to highlight the importance of these aspects of farm sustainability to farmers, policymakers, supply chains, society, and future generations. This focus stems from the fact that the state of the farm system is less often considered in existing sustainability assessments than other aspects of farm sustainability.

## What sort of farming systems does the Global Farm Metric favour?

Although the Sustainable Food Trust has clear views on how to move farming along a path of ever-improving sustainability, the role of the Global Farm Metric framework is not to favour or support any specific system or approach to farming. Instead, it highlights that, different farming approaches (conventional, organic, regenerative, agroecological etc.) and systems (arable, mixed, housed livestock, pasture-based livestock, horticulture etc.) should be assessed in terms of all three aspects of sustainability described. It shows how different types of information and data can be used to achieve this. As such, it does not define sets of practices as 'right' or 'wrong', rather it is a common language for evaluating their effects on farm sustainability.

Farmers and others are then empowered to find innovative solutions which, in the unique contexts of individual farms, reduce negative and enhance positive impacts on people and planet, while also building rather than diminishing the capacity of their farm to continue to produce in the long-term, to meet the needs of future generations.

## Sustainability and production

The production of food, fuel, and fibres from farming is essential to human life and is the reason we farm. The amount and quality of food, fuel and fibres produced by farms leads to the greatest positive impacts of farming on the outside world. On farms, these products are produced alongside a range of other positive and negative outputs.

Yields and product quality from a farm, alongside the amounts of unintended products (including emissions) it produces, the services it provides (from carbon storage to employment and water management) are included in the Global Farm Metric framework within the 'Farm outputs' category. These farm outputs (along with the state of the system and the practices used to produce them) have positive and negative impacts on people and planet beyond the farm gate.

The Global Farm Metric framework highlights the importance of considering all farm outputs holistically and alongside each other. The holistic consideration of farm outputs and farm impacts is vital to enable judgements to be made about whether, on balance, the positive effects of a farm system outweigh the negatives.

While a farm may be able to sustain itself as a business while producing very little food, fuel, or fibre – depending, for example, on the prices received for what it does produce – producing very low yields would mean that it was not contributing much to what farming exists to provide.

We must support farmers as they balance the need to keep their businesses going while producing the products we require, improving off-farm impacts, and ensuring that short term production does not undermine the capacity of their farm to meet the needs of future generations. The Global Farm Metric framework and indicators are designed to make this challenge clear, and to emphasise its centrality to pursuing ever more sustainable farming systems.

## Valuing what farms produce

The Global Farm Metric framework and indicators can help the farmer and society to understand the state of a farm and what it produces. But how we value what is produced will always be subjective. We can choose to care about future generations, or we can choose not to, we can choose to worry about biodiversity, or we can choose not to, and so on.

No framework or assessment can make those choices for us, but with a common, holistic view of what is happening on farms we can use our beliefs, ethical principles, and societal priorities to decide together what levels and types of farming outputs and impacts we – farmers, customers, citizens, business people, in fact, all of us – find acceptable.

Many approaches have been developed for determining agreed values for the positive and negative impacts of human activities such as farming – from monetisation to democratic processes which enable everyone's views to be expressed when choices are made. Each approach has its strengths and weaknesses.

The issue of whose values are taken into account, what is valued, and how, remains perhaps the biggest challenge for sustainability and arguably, for the future of humankind.

How society chooses to value the outputs and impacts of farming, is something we all have strong views on. The Global Farm Metric team believe that the common, holistic overview of farm sustainability provided by our framework can facilitate more effective choices, whatever systems of value we choose to implement. As such, our framework and indicators are independent of specific approaches to valuing farming outputs and impacts but we will work to explore different systems of valuation and how they fit with the Global Farm Metric, to support work in this area.

## Recognising farms as open systems

The Global Farm Metric framework takes a farm-centric view of sustainability, with farmers at the forefront of framework development. However, farmers are not the only people affecting farm sustainability. The framework reflects this, highlighting that the outside world affects every farm.

For many, frameworks and assessments of farm sustainability should focus only on things that the farmer can change. There is a strong and valid reason for this – people are much more likely to change if they feel that their actions will make a difference. However, if we are to transform our farming systems, a holistic view of farm sustainability must recognise the role that everyone has in that transformation.

There are many aspects of sustainability a farmer has control over, and many meaningful things they can achieve as individuals and with other farmers. But there are many challenges which farmers will have to adapt to, and many aspects of farm sustainability which depend on change by others.

We can only achieve what we need to in food and farming if the open nature of farming systems is taken into account. Highlighting the indivisible connection between farms and the wider world emphasizes the vital role those of us outside the farm gate must play to enable food systems to deliver long-term food security and bolster our natural life support systems.

While society rightly demands that farmers act to reduce negative impacts which occur beyond the farm-gate as a result of farming, we must also take responsibility for supporting rather than undermining them in providing the food and protecting the ecosystems services on which we rely.

## Where does the Global Farm Metric fit in the process of change?

The GFM indicators show how the holistic view of farm sustainability delivered by the framework can be monitored in on-farm assessments. Assessing the state of a farming system across the 12 central categories in the GFM wheel is particularly important, as a starting point for change and further exploration.

Just the completion of a simple state of the system assessment is valuable – it:

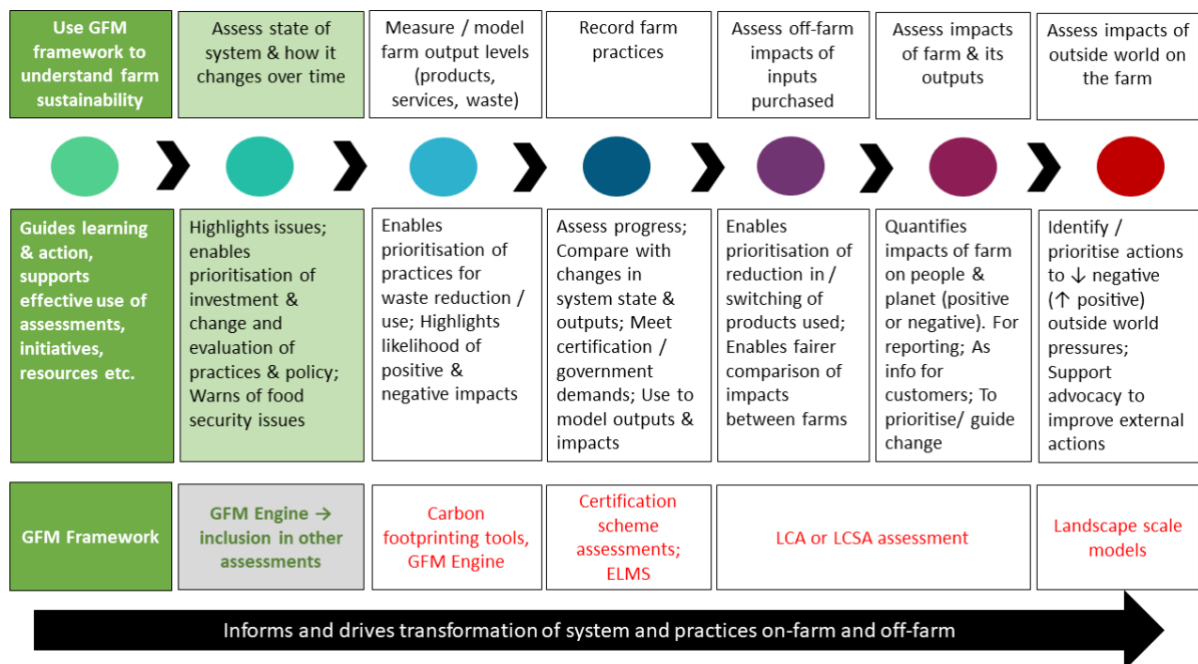
- Enables farmers to prioritise change and spot risks and opportunities for their farms.
- Provides a baseline of farm data for use in other assessments and reporting, making these easier for farmers to use.
- Provides information to policymakers and investors about which areas of a farm require most support to improve sustainability.
- Enables certifiers and policymakers to assess the effects of their standards or policies on farming, including on the state of nature, soil & water on-farm.
- Across farms, acts as a policy warning system for aspects of farms which are in a negative or declining state, enabling prompt action to safeguard sustainability (including food security).

From the basis of assessing the state of their farm system, farmers can choose to explore:

- How their practices might be altered to improve the state of their system, for example by comparing results with other farmers, talking to advisors, accessing knowledge exchange materials, or using decision-support tools to model the likely impacts of changes in practice.
- The levels of outputs they are producing (including products like crops, meat or milk, waste like nutrient loss or greenhouse gas emissions, positive services like farm education, access or worker skills, and disservices, like worker injuries or poor livestock welfare) to guide increases in those likely to have positive impacts on people and planet and decreases in those related to negative impacts. Some outputs can be directly measured (e.g., yields), others can be simply estimated from information about the farm itself or estimated in more depth using modelling based on information about farm practices (e.g., greenhouse gas emissions, nutrient balance).
- The sustainability of producing the inputs they buy, to guide them in their choice of products and help them prioritise which they might reduce. This could involve checking out information from suppliers on product sustainability.
- The impacts of their farm, its practices, and its outputs, on people and planet beyond the farm gate, to access rewards, inform customers or meet reporting requirements. The potential scale of impacts can be estimated simply from information about farm inputs and outputs. More precise estimates using formal approaches like Life Cycle Assessments will require information on practices.

The chart below sums up these steps – which do not necessarily need to be followed in order. Using the GFM framework (dark green) and GFM state of the system indicators (light green) provides a basis to further explore the farm system and the impacts it causes and faces.

Farmers may wish to collect data about the state of their system and its outputs periodically to evaluate the effects of changes they are making. They can record changes in practice more frequently between these assessments to track progress and meet reporting needs. Impacts might also be assessed periodically, to directly measure the external effects of changes in practices, outputs, and the state of the system on people and planet. Formal impact assessments may not be necessary often or for all farms if there is high confidence about this relationship between the farm and its impacts. Finally, landscape/regional data can be used to formally estimate the impacts of the outside world on the farm, enabling the responsibility for change to be allocated fairly.



## Making data collection practical

Assessing the different aspects of farm sustainability at different times (i.e., not all of them every year), is one solution to avoid impractical levels of data collection for farmers. At the same time, technological advances are improving the efficiency with which data can be collected in two ways.

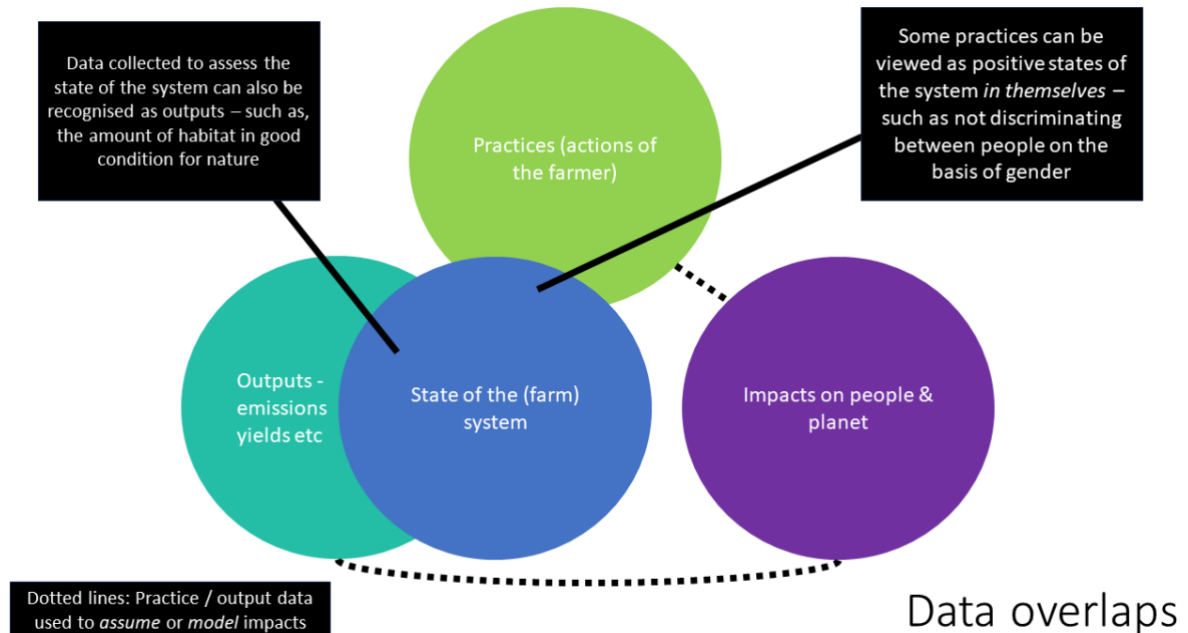
Firstly, advances in technology for monitoring farm sustainability are helping to make the collection of data faster and more accurate. These range from the use of sensors and satellites to gather data, to apps to assist the manual collection and input of data about farms. In addition to technological advances, researchers (including our own) are continually working to simplify protocols for data collection, applying our expanding knowledge of farm systems to reduce effort while retaining data quality.

Secondly, the different groups who use farm data are actively exploring how data can be shared to reduce the number of times farmers are asked to provide it, while maintaining farmer control over their data and who gets to see it.

In itself, the Global Farm Metric framework, as a common, holistic way to understand farm sustainability, promotes the alignment of data collection, minimising the costs and maximising the benefits of assessment for farmers. Through farm trials of our GFM Engine, our team is also working

to simplify data collection and increase data sharing. Underlying all of this, the Global Farm Metric team promotes the importance of farmers maintaining control of data about their farm.

In some cases, the same data can be used in more than one way, reducing the data collection required to assess farm state, practices, outputs and impacts on people and planet:



## Next steps

*A shared, holistic understanding of farm sustainability:* Learning resources for specific audiences based on the Global Farm Metric framework will be developed in 2023 to drive change by sharing a more holistic, accessible, understanding of farm sustainability. These resources, created together with partners from the relevant sectors, will include:

- Training materials for farm advisors
- Knowledge exchange materials for farmers
- Teaching guides for primary education
- Materials for higher education

*Global adaptation:* The Global Farm Metric framework is already being used as a basis for sustainability assessments being tested and trialled in the US and Malawi, with discussions for similar applications underway with partners in Laos, Australia, Canada, and Europe. In addition, the Sustainable Food Trust, through its work on the Global Farm Metric, is a core partner of Regen10, a multi-stakeholder platform which aims to develop and apply a global model of regenerative food production. This initiative provides the opportunity to explore the potential use of the framework and indicators as the basis for the sustainability assessment of farming systems across the globe.

*Continued collaboration on indicator development:* Via continuing research within the Global Farm Metric team and engagement in joint initiatives with other researchers and stakeholder



organisations, we will continue to improve the robustness of GFM indicators and the practicality of approaches to collecting data against these indicators.

*Proof of concept assessment trials:* An updated assessment tool is under development to be applied in farm trials this year. The aim of this work is to demonstrate the usefulness of state of the system data to farmers and other stakeholders. This is because many existing sustainability assessments do not currently focus on risks to the future capacity of farms to deliver food, fuel and fibre as defined by their environmental, social, and economic state. This work will also contribute to efforts to make on-farm data collection simpler and more robust.

*Transparency:* Peer reviewed journal articles are being developed to detail the development and use of the framework, its indicators and the 'proof of concept' assessment used in trials.

*In the commons:* The GFM framework will be registered in the commons to ensure that it remains free to access for all. **To enable us to continue to create these resources and to share our thinking for free, please be sure to cite our work if you make use of our ideas or approaches. Thanks!**

## Some background

### How was the Global Farm Metric framework developed?

The Sustainable Food Trust have been developing the Global Farm Metric framework for the last six years. Our work began with a focus on assessment, using and adapting the Public Goods Tool, a holistic sustainability assessment developed by the Organic Research Centre which explored how the delivery of public goods could be measured and rewarded.

In 2021, the Global Farm Metric was embedded into a research tool that enabled farmers to self-assess their sustainability, and in 2022 we ran trials on 40 UK farms, collecting feedback from a range of farming systems across the country. Workshops were held with farm advisors to explore how a sustainability assessment can help farmers transition towards more sustainable farming. Through the trials, data from farmers and farm advisors were collected and analysed to inform the development of the GFM framework and to build our understanding of the practicalities of on-farm assessment<sup>2</sup>. An overview of the trial results can be found in the [trials case studies report](#).

Alongside this work, researchers from the Sustainable Food Trust, MVArc and the University of Reading undertook desk-based research to revise the categories and subcategories of the Global Farm Metric framework, and to develop sustainability indicators. This included a scoping review of indicators used by existing sustainability frameworks and assessments; a review of recent academic literature; and for the nature category, expert consultation via a Delphi process (academic review), involving three rounds of surveys and a one-day workshop.

As these trials, workshops and accompanying research continued, they led us to focus more and more on the value of a framework for understanding farm sustainability, distinct from the importance of an assessment or tool. Feedback from farmers and advisors showed that having a clear, shared, holistic view of what sustainability meant for farming would be hugely beneficial to driving change in the sector.

The realisation of the value of the Global Farm Metric framework in its own right, has led to its evolution into its current form, as a basis for understanding farm sustainability across and beyond the sector. The value of the framework's holistic view of sustainability as a basis for assessment to monitor and manage farm sustainability is being tested using a revised 'proof of concept' assessment tool, to support and drive the use of more holistic approaches to farm sustainability among tool developers.

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<sup>2</sup> Kipling, R.P., Arguile, L., Smith, J., Wheeler, M. and Smith, L. (in prep) Driving change in farming – the role of sustainability assessments and holistic approaches to knowledge exchange.

## Global Farm Metric framework categories, subcategories, and indicators

The table below summarises the Global Farm Metric framework categories and sub-categories along with the indicators which have been developed to support more aligned and holistic assessments of farm sustainability. These indicators represent key aspects of the farm which can be monitored to assess farm sustainability in terms of meeting the needs of current and future generations for food, fuel, and fibre, while reducing negative and increasing positive impacts on people and planet beyond the farm gate. Underneath the table, each framework category is listed with a more detailed explanation of its importance for farm sustainability.

| Category                        | Sub-category   | Indicators  |                             |
|---------------------------------|--|---|-----------------------------|
| Climate                         | Average conditions                                   | Stability in climatic conditions                          |                             |
|                                 | Extreme events                                       | Climate risks to crop yields & quality & livestock health |                             |
|                                 | Growing season                                       | Limitations of growing season                             |                             |
| Community                       | Local services                                       | Access to key amenities                                   |                             |
|                                 | Farming services                                     | Access to key services for farming                        |                             |
|                                 | Farmer network                                       | Support from community of practice                        |                             |
| Nature                          | Farm biodiversity                                    | Health of farm biodiversity                               |                             |
|                                 |  | Farm habitats   | Farm habitat health         |
|                                 |  |   | Quality of land for farming |
|                                 | Environmental hazards                                | Connectedness of farm habitats                            |                             |
|                                 |  | Level of air pollution                                    |                             |
|                                 |  | Level of soil pollution                                   |                             |
| Soil & water                    | Soil health  | Level of water pollution                                  |                             |
|                                 |  | Structural health of soil                                 |                             |
|                                 | Soil fertility                                       | Health of soil biology                                    |                             |
|                                 |  | Level & availability of soil nutrients to plants          |                             |
|                                 | Water  | Availability of water for plants                          |                             |
| Level of water reserves on farm |  |   |                             |
| Governance                      | Status   | Level of legal protection                                 |                             |
|                                 |  | Management stability                                      |                             |
|                                 | Priorities & support                                 | Prevalence of sustainability in farm priorities           |                             |
|                                 |  | External support for farm sustainability                  |                             |
|                                 | Decision-making                                      | Approach to managing decisions                            |                             |
| Level of inclusivity            |  |   |                             |
| Resources                       | Infrastructure                                       | State of infrastructure                                   |                             |
|                                 | Buildings  | State of buildings  |                             |
|                                 | Equipment  | State of equipment  |                             |
| Inputs                          | Inputs of consumables                                | Use of external inputs                                    |                             |
|                                 |  | Use of inputs from off-farm land                          |                             |
|                                 | Inputs of non-consumables shared / used by agreement | Use of external infrastructure & equipment                |                             |
|                                 | Inputs of services                                   | Use of contractors & service providers                    |                             |
| Farmer & workers                | Health & well-being                                  | Health & safety of farmer & workers                       |                             |
|                                 |  | Well-being of farmers & workers                           |                             |
|                                 | Work & life  | Rewards for farm work                                     |                             |
| Skills                          | Level of skills, knowledge & experience in workforce |   |                             |
| Crops & pasture                 | Crop establishment                                   | Germination success level                                 |                             |
|                                 | Lifecycle  | Level of pre-harvest losses                               |                             |
|                                 |  | Perennial crop productive lifespan                        |                             |
| Health                          | Crop & pasture health level                          |   |                             |
| Livestock                       | Lifecycle  | Livestock losses  |                             |

|   |   |  |
|---|---|--|
|   |   | Productive longevity   |
|   |   | Fertility level  |
|   | Health  | Health level of livestock  |
|   | Quality of Life                                 | Quality of life of livestock   |
| Products  | Flexibility                                     | Capacity to alter crops or livestock produced  |
|   | Diversity                                       | Spread of production risk  |
|   | Buffers   | Level of buffering from changing conditions  |
| Economics   | Profit & costs                                  | Economic sustainability of farming<br>Vulnerability to cost price changes  |
|   | Financial resources                             | Financial flexibility  |
|   | Diversity                                       | Spread of economic risk  |
| Farm practices  | Farming practices                               | Extent to which on-farm & off-farm impacts of farming practices are monitored  |
|   |   | Extent to which farming practices are adjusted to improve farm sustainability & optimise impacts on people & planet  |
|   | Buying practices                                | Extent to which buying choices (inputs) are adjusted to improve farm sustainability & optimise impacts on people & planet  |
|   | Economic practices                              | Extent to which the farm uses economic returns to improve farm sustainability & optimise impacts on people & planet.   |
| Extent to which farm investments focus on improving farm sustainability & optimising impacts on people & planet |   |  |
| Farm outputs  | Products  | Inventory of types, amounts, and quality of all farm products produced, including utilised by-products and other valuable outputs  |
|   | Unused products                                 | Inventory of types and amounts of materials and substances arising from farming activities but not used.   |
|   | Services  | Inventory of types, amounts and quality of services produced (e.g., carbon storage, protection of indigenous practices, conservation of genetic materials, aesthetics of landscape). |
|   | Disservices                                     | Inventory of types and amounts of disservices produced (e.g., experience of discrimination, loss of landscape features)  |
| Impacts on people and planet  | Off-farm impacts of the farm                    | Impacts of the farm, practices and outputs on  |
|   | Off-farm impacts from production of farm inputs | Impacts of the production, processing, & transport of farm inputs  |
|   | External impacts on the farm system             | Impacts of external actions on the environmental, social, and economic condition of the farm   |

## Farm system (wheel spokes) categories

These 12 categories provide a comprehensive view of the state of the farm system, highlighting the importance of each part for the ability of the farm to continue to produce food, fuel, and fibre in the long-term, to meet the needs of future generations. If the farm is in a healthy state, there is a good chance that it will also have more positive than negative impacts on the world beyond the farm gate. Conversely, if any of these parts is in a poor state, there is a good chance that the farm will be having negative impacts beyond the farm-gate, while failing to deliver some of the benefits it has the potential to.

## Climate

**Aim:** GFM7 Farms are resilient and adaptive to changing climate

Explanation: While global warming is most often seen as something which agriculture must help to reduce, it is essential to understand that it is also a major threat to the sustainability of production. Understanding how average conditions, the frequency and severity of extreme events like excess rainfall, drought, floods, and heatwaves, and the length of the growing season is changing on-farm is vital to making timely adaptations to the farm. Even fully housed livestock or indoor horticultural systems may need to adapt if conditions alter the use of temperature control or affect infrastructure. Without monitoring change, problems can 'creep up' year by year, and extreme events can have a bigger impact than if adaptations had been made in advance.

Indicators in this category represent things which farmers are not in control of; the scoring highlights the challenges the farm is facing in order to enable appropriate adaptation and support.

### Subcategories and indicators:

Average conditions:

- Stability in climatic conditions

Climate risks to crop yields & quality & livestock health

- Climate risks to crop yields and quality and livestock health

Growing season

- Limitations of growing season

## Community

**Aim:** GFM8 Thriving communities provide the services & networks farming needs

Explanation: The existence of a thriving local community is vital for farmers, their families, and their workers. This category focuses on services which may provide direct value to the farm, such as farm suppliers, abattoirs, financial services, and veterinary centres, as well as others – like schools, doctors' surgeries, hospitals, and local transport infrastructure – which are important both for farming and for the lives of those who work in the agricultural sector. Professional networks and engagement with peers and others are also vital aspects of farm resilience, providing knowledge, insights, support, and advice when it is needed.

Indicators in this category represent things which farmers are not in control of; the scoring highlights the challenges the farm is facing in order to enable appropriate adaptation and support.

### Subcategories and indicators:

#### Local services

- Access to key amenities

#### Farming services

- Access to key services for farming

#### Farmer network

- Support from community of practice

## Nature

**Aim:** GFM9 Diverse, healthy ecosystems support the long-term resilience of farming

Explanation: For food production and essential ecosystems services to be maintained, biodiversity needs to be incorporated across and within all landscapes. Productive farming systems can provide vital habitat, cover, and resources for organisms – for example, flowering crops for pollinators, open grassland for some bird species, and coppiced woodland for dormice. Farmers can also nurture the habitats which surround their productive land, like hedgerows, scrub, heath, wetlands, and woodlands. In return, healthy natural systems buffer production from extreme events like heatwaves, floods, and droughts, provide pollination services and natural pest control, as well as creating a pleasant working environment for farmers and workers. The connectedness of biodiverse productive and unproductive habitats on farm is key to enabling species to move around the landscape to fulfil their ecological needs. Issues of air, soil, and water quality threaten the health of individual species and their habitats. They have widespread impacts off-farm and threaten the ability of the farm to produce high quality food, fuel, and fibre products today and in the future.

Many indicators in this category are things which a farmer has a large amount of influence over, and so a poor score represents something that can be addressed through change on-farm. However, outside activities will also affect the indicators – for example, if pollutants enter the system from a neighbouring land use. Not only on-farm actions but also adaptation to underlying conditions and external impacts will be needed to fully tackle problems with nature on the farm.

### Subcategories and indicators:

#### Farm biodiversity

- Health of farm biodiversity

#### Farm habitats

- Farm habitat health
- Quality of land for farming
- Connectedness of farm habitats

#### Environmental hazards

- Level of air pollution
- Level of soil pollution
- Level of water pollution

## Soil & water

**Aim:** GFM10 Healthy soil & water systems support the long-term resilience of farming

Explanation: Healthy soil is a prerequisite for the long-term sustainability of food, feed, fibre, and fuel production on-farm as well as underpinning natural ecosystems and the services they provide. Soil health and fertility are key determinants of which crop and pasture species can grow, how they grow, how resilient they will be to environmental conditions including pests and diseases, and what nutritional qualities they will have. Closely linked to soil health, the availability of water for plant growth is key to farming, while reserves of water on-farm, including held naturally in soil and farm habitats, reduce risks from droughts and heatwaves.

The farmer has some, but not total control over these indicators, which can be used to monitor the state of system over time. For example, the farmer can influence the structural health of the soil through management practices but is limited by the soil type and depth.

### Subcategories and indicators:

#### Soil health

- Structural health of soil
- Health of soil biology

#### Soil fertility

- Level and availability of soil nutrients to plants

#### Water

- Availability of water for plants
- Level of water reserves on farm



## Governance

**Aim:** GFM11 The governance of every farm delivers social, environmental, and economic resilience through just, effective structures and processes, empowered and supported by political and social institutions

Explanation: This category focuses on the legal status of the farm, its priorities and standards, the robustness and inclusivity of its decision-making processes, and the external constraints and support which bolster or undermine its ability to effectively foresee, plan for, and respond to challenges. All these things are vital to the survival of the farm in the context of everchanging external conditions.

The indicators in this category include aspects such as farm priorities, management stability and the approach to and inclusivity of decision-making, which the farmer can control. However, it also highlights the extent to which the outside world can affect the sustainability of the farm and constrain or support management choices. There is need for a supportive political and legal context for farming and for farmers – especially those who may be more marginalised or vulnerable – based on a holistic view of farm sustainability.

### Subcategories and indicators:

#### Status

- Level of legal protection
- Management stability

#### Priorities & support

- Prevalence of sustainability in farm priorities
- External support for farm sustainability

#### Decision-making

- Approach to managing decisions
- Level of inclusivity

## Resources

**Aim:** GFM12 Farm resources are well maintained, safe & fit for purpose

Explanation: Deteriorating, unsuitable, or poorly planned buildings and infrastructure, as well as poorly maintained equipment, can cause problems for the efficiency and economic viability of the farm and pose risks for farmers and workers, farm visitors, and livestock. On the other hand, well maintained buildings, infrastructure, and equipment will help to maximise the efficiency, safety, and potential of the farm, and minimise the risk of failures and issues which could jeopardise the viability of the system.

The indicators in this category are things which the farmer is likely to have a lot of control over, although economic challenges affecting farm investment should be recognised and may need to be tackled through changes beyond the farm-gate.

### Subcategories and indicators:

#### Buildings

- State of buildings

#### Infrastructure

- State of infrastructure

#### Equipment

- State of equipment

## Inputs

**Aim:** GFM13 Farms recognise and manage the risks of reliance on inputs.

Explanation: Inputs can be used to help the farm system cope with difficult conditions, but the amounts, types, and sources of inputs used also create vulnerability relating to problems with their supply. Sharing inputs can provide access to equipment that a farm might not easily afford alone, delivering benefits to the farm business. However, its risks need to be recognised and managed, for example by reducing use or by making sure several potential suppliers are available in case one faces difficulties.

The indicators in this category are in the control of the farm. However, external action might be needed to support access to alternative supplies and types of vital inputs when these are not provided by the market, or to support the uptake of approaches which reduce or alter inputs in ways which decrease the risks of over-reliance.

### Subcategories and indicators:

#### Inputs of consumables

- Use of external inputs
- Use of inputs from off-farm land

#### Inputs of non-consumables shared or used by agreement

- Use of external infrastructure & equipment

#### Inputs of services

- Use of contractors & service providers

## Farmer & workers

**Aim:** GFM14 Farmers & workers are valued enhance the outlook for every farm, making a good livelihood through fair rewards from their work, enjoying a good quality of life free from discrimination & with their rights, cultures & faiths respected & with opportunities to learn & develop new skills

Explanation: As employers of permanent and temporary staff, and as workers themselves, farmers are responsible for ensuring that the conditions, pay, and tasks undertaken by people working on the farm enable them to meet their minimum needs and to lead fulfilling, meaningful lives, with opportunities for learning and expression. These needs should be met without discrimination in pay, conditions, treatment, or roles. Poor conditions for the farmer and their workers undermine the sustainability of the farm by increasing staff turnover, making it harder to fill positions, negatively affecting working standards, increasing days lost to sickness, and reducing buy-in to the business aims of the farm.

The indicators in this category are mostly in the control of farmers, with employment laws and regulations in place to reduce the risks of poor conditions being allowed to develop. However, economic challenges and stress can negatively affect the farmer and other workers and may require action by others outside the system to improve things, for example around farm payments or training and support.

### Subcategories and indicators:

#### Health & well-being

- Health & safety of farmer & workers
- Well-being of farmer & workers

#### Work & life

- Rewards for farm work

#### Skills

- Level of skills, knowledge & experience in workforce

## Crops & pasture

**Aim:** GFM15 Crops & pasture are healthy & resilient to their conditions

Explanation: Healthy crops produced for food, fibre, feed, or fuel, as well as grasslands managed to produce forage for grazing animals, are key to the efficiency of production and the quality of products and, therefore, to the sustainability of the farm.

Once the farm's dependencies and risks to external factors are taken into account, the indicators in this category are in the control of the farmer, with actions to improve and safeguard outcomes guided by information on the state of the other Global Farm Metric categories.

### Subcategories and indicators:

#### Crop establishment

- Germination success level

#### Lifecycle

- Level of pre-harvest losses
- Perennial crop productive lifespan

#### Health

- Crop & pasture health level

## Livestock

**Aim:** GFM16 Livestock are healthy, enjoy a high quality of life & are resilient to their conditions

Explanation: Good health and quality of life for farm animals are important for improving the sustainability of the farm through increased production efficiency, improved product quality, reduced risks to the farmer and workers from zoonoses or injury by livestock, and the maintenance of market demand among customers for whom animal well-being is a key concern.

Once the farm's dependencies and risks to external factors are taken into account, the indicators in this category are in the control of the farmer, with actions to improve and safeguard outcomes guided by information on the state of the other Global Farm Metric categories.

### Subcategories and indicators:

#### Lifecycle

- Livestock losses
- Productive longevity
- Fertility level

#### Health

- Health level of livestock

#### Quality of life

- Quality of life of livestock

## Products

**Aim:** GFM17 Farms optimise flexibility, diversity & buffering of their production system to minimise risks from external changes and shocks.

Explanation: This category focuses on risks from changes in conditions in terms of flexibility around what crops and livestock are grown and how well protected they are. There are different pathways farms can take to reduce risks to their production system at this strategic level, depending on context. Reliance on a single, or very few livestock breeds or crop varieties puts production at risk from issues affecting the breeds or varieties the farm has specialised in. Diversifying breed/variety/species would be one option to reduce that risk. Alternatively, the farmer might put plans in place and take actions to be able to very quickly change livestock or crop species when issues arise. Another factor affecting long-term viability is how well buffered the farm's crops and livestock are from extreme or changing conditions – this might be achieved by enhancing protection in the environment (e.g., through features like hedges and trees as windbreaks or improved soil health to hold more water) or by moving some aspects of production indoors. But production might also be buffered from external shocks by using breeds or species that are well-adapted to current and expected conditions. The mix of readiness to change, buffering, and diversification a farmer uses to reduce risks will depend on the context of the farm and the availability of resources.

The indicators in this section are to some extent under the control of the farmer in terms of choices about their production system. However, action by others beyond the farm-gate may be needed to enable the farmer to act on the decisions they make - for example in terms of required support for the production of new and different crops and livestock or to alter the farm environment - and there will be some aspects of the farm (like the agricultural grade of the land) which limit choices.

### Subcategories and indicators:

#### Flexibility

- Capacity to alter crops or livestock produced

#### Diversity

- Spread of production risk

#### Buffers

- Level of buffering from changing conditions

## Economics

**Aim:** GFM18 Farms are economically viable, able to meet new challenges & opportunities, & face rewards & costs which fairly reflect the range & quality of their products & the positive & negative impacts of the farm on people & planet

Explanation: For farming to be sustainable in the long run, it needs to provide a good, secure living for farmers, their families, and workers. Their aim might not be to make or maximise profit but, the business should at least break even or provide enough produce to be worthwhile versus other uses of time. The farm also needs to have sufficient resources to adopt more sustainable practices, respond to immediate challenges, take advantage of new opportunities, and adapt to projected long-term change. For farmers who do not sell their produce, viability relates to the ability to continue farming; ensuring that farming is compatible with the long-term livelihoods of farmers & workers is still relevant for these systems.

The indicators in this section are mostly controllable by the farmer, although the value that the outside world places on i) farm outputs and on ii) how the farm affects people and planet beyond the farm-gate, has a significant impact on farm economics.

### Subcategories and indicators:

#### Profit & costs

- Economic sustainability of farming
- Vulnerability to cost price changes

#### Financial resources

- Financial flexibility

#### Diversity

- Spread of economic risk



## **Farm practices and outputs (inner-edge categories)**

Farm practices are the levers farmers can pull to adjust their outputs, affect the state of their system and ultimately alter impacts on people and planet beyond the farm-gate. Farm outputs, considered holistically, include everything a farm produces, intentionally and unintentionally. Although some farm practices or outputs might be most obviously associated with a specific part of the farm, it is key to sustainability that the farm is considered as a whole - because practices, outputs and impacts can all be affected by (and affect) multiple aspects of the state of the farm at once. That is why these categories are not divided up into the 12 state of the system wheel categories. For example, poor husbandry - a practice most obviously relating to the livestock category - may also cause low meat yields (products category and a key farm output) - and in addition is likely to affect (among other things) the health of workers (farmer & workers category).

## Farm Practices

**Aim:** GFM5 Farm practices are optimised in terms of their effects on people and planet, the long-term viability of the farm and on current production, and monitoring drives constant improvement

Explanation: Farming practices, including the choice of farming aims and system, management practices and buying practices, along with the practical activities of farming, represent the ways in which the farmer and their workers affect the state of the farm system and its outputs. Along with external pressures affecting the farm, its context and its previous state, practices determine the impacts of the system and its outputs on the outside world. As a result, it is essential that the effects of chosen practices on the farm and beyond are monitored in a holistic way, to check their efficacy in meeting their desired goals and to reveal any (negative or positive) unintended consequences on- and off-farm. Farmers can seek advice or use decision support tools to gain an idea of known risks and benefits of changes to practice before they are made. However, monitoring is still vital as every farm is unique and the outcomes of practice change might affect things beyond the scope of support tools or via mechanisms they do not account for. Therefore, farmers should assess how the state of their system is changing over time and adjust their practices accordingly to improve the sustainability of the farm system and its impacts on the sustainability of the wider world.

### Subcategories and indicators:

#### Farming practices

- Extent to which on-farm & off-farm impacts of farming practices are monitored
- Extent to which farming practices are adjusted to improve farm sustainability & optimise impacts on people & planet

#### Buying practices

- Extent to which buying choices (farm inputs) are adjusted to improve farm sustainability & optimise impacts on people & planet.

#### Economic practices

- Extent to which the farm uses economic returns to improve farm sustainability & optimise impacts on people & planet.
- Extent to which farm investments focus on improving farm sustainability & optimising impacts on people & planet.

## Farm Outputs

### Aim:

GFM6 Farm outputs of products, unused products, services, & disservices are optimised & valued in decision-making on-farm & beyond the farm gate

Explanation: Every farm produces a range of outputs. These might be intended, like crops or livestock products, or unintended, like greenhouse gas emissions or plastic waste. They include services such as carbon storage, access to the countryside and the care of cultural sites, as well as disservices which might arise from farming, like injuries to the farmer or workers.

Outputs can be used to indicate the extent to which a farm is likely to be having positive or negative impacts on people and planet (for example, using the output of greenhouse gases to estimate the climate change impacts associated with farming). However, it is important to remember that outputs can have multiple impacts and that these are determined not only by the level and nature of the outputs, but also by how they interact with the world beyond the farm-gate - measuring outputs is only a proxy for measuring impacts directly. As a result, many impacts can be overlooked or inaccurately estimated through i) not taking into account all types of farm outputs and ii) limitations in the impact assessment modelling of the world beyond the farm.

Levels of farm outputs can also be indicators of the state of the system in some cases (for example, the amount of habitat on the farm is an indicator of the state of nature as well as being an output linked to positive impacts beyond the farm-gate).

### Subcategories and indicators:

#### Products

- Inventory of types and amounts of all farm products produced, including utilised by-products and other valuable outputs

#### Unused products

- Inventory of types and amounts of materials and substances arising from farming activities but not used

#### Services

- Inventory of types, amounts and quality of services produced (e.g., carbon storage, protection of indigenous practices, conservation of genetic materials, aesthetics of landscape).

#### Disservices

- Inventory of types and amounts of disservices produced (e.g., experience of discrimination, loss of landscape features)

## Impacts (outer-edge category)

The state of the farm system, its outputs and the practices undertaken to manage it have a range of impacts on people and planet beyond the farm-gate. To avoid unintended consequences, it is important to consider all the impacts the farm is having on people and planet, positive and negative, when taking decisions. Focusing on one negative impact (for example the effects of farm greenhouse gas emissions) might lead to changes which reduce that impact but unintentionally lead to the loss of positive impacts or increase other negative impacts.

## Impacts on people and planet

### Aims:

GFM1 Positive impacts of farming on people & planet increase & are valued

GFM2 Negative impacts of farming on people & planet, including from the production of farm inputs continuously reduce

GFM3 Negative impacts of society on farmers & farming are recognised & continuously reduced

GFM4 Positive impacts of society on farmers & farming increase & are valued

Explanation: One of the key aspects of farm sustainability is the extent to which farms have positive and negative impacts on the world beyond the farm-gate. These impacts arise from the system itself, farm practices and the outputs of the farm. Impacts from the production, processing and transport of inputs which farmers bring onto the farm must also be taken into account, otherwise problems might just be pushed away from the farm without being dealt with (e.g., by importing feed instead of growing it, the farm might produce less waste nutrients and have fewer impacts on nature - but those waste nutrients are still being produced in the system growing the feed). It is also important to recognise and estimate the extent to which the outside world affects the state of the farm and its outputs, to ensure that the responsibility for change is shared fairly between farmers and the other people and organisations whose actions affect farms.

The extent to which farmers can control the impacts their farm and its outputs have on the outside world depends on the extent to which outside forces are driving what happens on the farm. It might also be that expected positive (or negative) impacts don't arise because of what happens beyond the farm-gate (for example, if the farm produces good yields of high quality produce but these are wasted in the supply chain rather than reaching customers).

### Subcategories and indicators:

Off-farm impacts of the farm

- Impacts of the farm, its practices and outputs on people and planet

Impacts from production of farm inputs

- Impacts of the production, processing, & transport of farm inputs on people and planet

External impacts on the farm system

- Impacts of external actions on the environmental, social, & economic condition of the farm