World Vision

Discussion paper

Understanding sustainable agri-food systems: concepts and terminologies

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Purpose

World Vision launched our Environmental Sustainability and Climate Action (ESCA) Strategic Roadmap 2025–2027 in June 2024. The ESCA Strategic Roadmap identifies four focus areas that aim to restore ecosystem services, promote sustainable agri-food systems, strengthen climate resilience, and integrate environmental sustainability and climate action across World Vision's operations and programmes. The focus area working towards building sustainable agri-food systems for food and nutrition security will support smallholder farmers and vulnerable children and their communities to adapt to the impacts of climate change and build longer term resilience. This will be done through promoting the adoption of new farming technologies (e.g., water-saving devices) and new sustainable techniques like Farmer Managed Natural Regeneration (FMNR) and climate-smart agriculture (CSA).

World Vision has a long history of implementing sustainable agriculture practices such as climate-smart agriculture, agroecology and organic farming. However, there is no standard policy or preference for specific practices. Often, the terminologies used for different practices are confusingly used interchangeably, although they have different principles and scope. The terminologies are also constantly evolving and new ones emerging. Therefore, there is a growing need to have more clarity to improve understanding of the different sustainable agriculture terminologies, while also recognising the challenges and limitations given the diversity of local cultural and linguistic contexts that they are often used in.

As part of World Vision's commitment under the ESCA Strategic Roadmap, this discussion paper was developed to inform practitioners working on agri-food systems to gain a better understanding of what each of the different terminologies mean, and how they can be used across diverse contexts. For instance, the scope of terms used can range from focusing on agricultural production practices to focusing on power dynamics and governance within food systems.[1] This discussion paper will help improve the understanding of sustainable agriculture in diverse contexts and thus contribute to developing sustainable agri-food systems.

A literature review was undertaken to address the following issues:

- understanding the context of agri-food systems within climate action and resilience
- identifying and defining what are the main sustainable agri-food system terminologies used, including the main field practices and underlying development principles
- reviewing criticisms related to use of the terms identified and what (if any) reputational risk they may pose
- what terminologies governments and agencies prefer.

Summary of findings

The literature review found that several of the agricultural production practices (e.g., agroforestry, low or no tillage, use of organic fertilisers, etc.) are common across all of the terminologies. The terminologies also have the same underlying goal, which is to increase productivity in a sustainable and resilient manner while taking into account the whole ecosystem.

What differentiated the terminologies were the underlying principles that governed how they are implemented. Moreover, the terminologies vary in their scope, with some concentrating on sustainable intensification practices (such as CSA, regenerative agriculture and nutrition-sensitive agriculture), while others emphasise the interactions between people and food systems rather than the specific techniques employed (like agroecology, organic agriculture and permaculture).

The review also found that some terminologies – such as climate-smart agriculture, regenerative agriculture and nature-based solutions – have attracted strong criticism. Some large corporate agribusiness companies have adopted these terms to hide behind their continuation of 'business-as-usual' industrial agricultural practices such as widespread use of fertilisers, pesticides and genetically modified organisms (GMO) crops to the detriment of farmers in developing nations. However, despite these criticisms, terminologies like climate-smart agriculture and nature-based solutions are still used in funding initiatives and promoted by United Nations (UN) agencies such as the Food and Agriculture Organization (FAO).

Conclusions and recommendations for practitioners and stakeholders within agri-food systems

Sustainable agri-food systems should be promoted to drive transformational change and apply a systemic lens.

Sustainable food systems must:

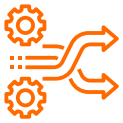
a. promote green and climate-resilient practices that contribute to children's overall well-being

b. have gender equality and social inclusion embedded in any climate-resilient practices implemented

c. support indigenous practices, particularly those practiced by smallholder farmers

d. take a nutrition-sensitive approach

e. include partnerships with government institutions and the private sector to foster long-term sustainability.



Within sustainable food systems, both climate-smart agriculture and agroecology should be recognised and utilised as key sustainable agri-food systems approaches.

CSA has been widely adopted by governments, UN agencies and non-governmental organisations as a valid technical approach. Over the years, it has evolved to take a more systemic perspective, addressing not only agricultural production practices but also incorporating policy, institutions, private sector engagement, markets and investments to drive transformative change in agri-food systems. Similarly, agroecology is embraced by these entities for its focus on environmental health, social equity and ecosystem resilience. Together, CSA and agroecology offer a powerful, complementary approach that enhances the resilience, inclusivity and sustainability of our food systems.

To ensure CSA can truly serve the world's most vulnerable communities it should:

a. have contextualised practices and actions, with strong attention to the role of gender equality and social inclusion in shaping division of labour, access and decision-making

b. be locally led and integrated within a holistic development approach.

CSA programmes should emphasise a 'Do No Harm' approach when implemented in developing nations.

CSA approaches should focus on the well-being of children and community members at their core. Projects are community-led, focusing on smallholder farmers, are designed through a gender equality and social inclusion lens, and take a 'Do No Harm' approach. To ensure CSA can truly serve the world's most vulnerable communities, it should:

- have contextualised practices and actions, with strong attention to the role of gender equality and social inclusion in shaping division of labour, access, and decision-making
- must be locally led and integrated within a holistic development approach.

World Vision's core project models Building Secure Livelihoods and Regreening Communities are good examples of how World Vision integrates CSA as a technical practice within the transformational project models.

In certain contexts, some terminologies can be interchangeable with others.

Appendix 1 provides a summary of the terminologies reviewed. The terminologies can be broadly grouped in two categories – sustainable intensification and agroecological. Within these two categories, the terminologies can be interchangeable depending on the context they are being used.

INTRODUCTION

World Vision has a long history of implementing sustainable agriculture such as climate-smart agriculture, agroecology and organic farming. However, there is no standard policy or preference for specific practices. Often the terminologies used for different practices are confusingly used interchangeably, although they have different principles and scope, and the terminologies are constantly evolving and new ones emerging. Therefore, there is a growing need to have more clarity to improve understanding of the different terminologies, while recognising the challenges and limitations given the diversity of local cultural and linguistic contexts they are often used in.

This discussion paper was developed to help practitioners and donors working on agri-food systems gain a better understanding of what each of the different terminologies mean and how they can be used. For instance, the scope of terminologies used can range from focusing on agricultural production practices to focusing on power dynamics and governance within food systems.[2] This discussion paper will help improve the understanding of sustainable agriculture in diverse contexts and thus contribute to developing sustainable food systems.

A literature review was undertaken to address the following issues:

- understanding the context of agri-food systems within climate action and resilience
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Climate action and resilience in the contexts of agri-food systems

Contribution of the agri-food system to global greenhouse gas emissions

The agri-food system contributes around a third of total anthropogenic greenhouse gas (GHG) emissions, which was around 16 $GtCO_2$equievalent in 2020.[3] Agri-food system GHG emissions are generated at the farm gate through crop and livestock production activities, by land-use change such as conversion of forest land to agricultural land, and by pre- and post-production processes such as food manufacturing, retail, household consumption, and food waste disposal.

Farm-related GHG emissions come from methane emissions from enteric fermentation (microbial action in the digestive system) by ruminant livestock (i.e., cattle, buffalo, sheep, goats), methane emissions from rice production, and nitrous oxide emissions from fertiliser use, drained organic soils, crops, and on-farm energy. Methane and nitrous oxide emissions are potent GHGs that have global warming potentials (100 year) 27.9 and 273 times that of CO_2.[4] They contribute nearly half of all emissions from the agri-food system.[5] GHG emissions from pre- and post-production sources contribute around a third of all emissions. Emission sources from this category include fertiliser production, on-farm electricity use, food processing, packaging, retail, transport, household consumption and food systems waste disposal. The remaining emissions come from land-use change which includes forest conversion, biomass and peat fires.[6]

Asia (41%) and the Americas (27%)[7] account for the majority of GHG emissions from the agricultural food system, which is largely due to the size of the population and area of those regions. GHG emissions associated with land-use change was the most significant source in Africa and the Americas. This is mostly a reflection of the large area agriculture covers in these regions and the impact it has on forest ecosystems due to deforestation. Emissions from pre-and post-production are dominant in Asia and Europe, while farm-related emissions are significant in Asia, the Americas, and Oceania.[8]

Climate change and the risks to the agri-food systems

The Intergovernmental Panel on Climate Change's (IPCC) sixth assessment report[9] extensively details how climate change is already affecting the agri-food system's ability to sufficiently feed the world. Climate change impacts many aspects of the agri-food system. Global warming is adversely influencing weather patterns, leading to more frequent and intense heat waves, droughts, and heavy rainfall.[10] This directly impacts food production through negative changes in yield, biomass composition, and decline in soil health and biodiversity, which subsequently affects human nutrition and health. Climate change can also upset pre- and post-production processes, further impacting food availability by disrupting the supply of crops, meat and fish, and affecting the nutritional quality of food.[11]

Differentiated climate change impacts are highlighted in the aforementioned IPCC report, where vulnerabilities are more often acute for women, the elderly, and children in low-income households, indigenous peoples, minority groups, small-scale producers, and fishing communities. Such groups are said to disproportionately experience livelihood loss and rising food costs due to climate change. Climate change affects all forms of malnutrition, linking directly or indirectly to all three underlying causes of malnutrition: (1) insufficient household food security, (2) inadequate maternal and child care, and (3) insufficient health services and an unhealthy environment.[12] Good nutrition is an essential foundation for the health and development of children, yet malnutrition continues to be the world's most serious health problem and the single-biggest contributor to child mortality.[13]

Approximately 80% of the global population most at risk from crop failures and hunger due to changing weather patterns caused by climate change are in sub-Saharan Africa, South Asia and Southeast Asia, where farming families are disproportionally poor and vulnerable.[14] Furthermore, disasters from weather extremes are having the most impact on agri-food systems in least developed countries (LDC) and low/middle income countries (LMICs), where drought, storm, and floods caused losses of US$37 billion, US$21 billion, and US$19 billion, respectively between 2008 and 2018.[15] Over the same time period, extreme weather impacts caused major economic losses in Asia (US$49 billion), sub-Saharan Africa and North Africa (US$30 billion), and Latin America and the Caribbean (US$29 billion) due to declines in crop and livestock production.[16]

Shift to sustainable agriculture for transformative change

As highlighted above, the agri-food system is both a major contributor to climate change and is also heavily impacted by climate change due to changing weather patterns that lead to more extreme weather events. However, these threats to the sector also provide the opportunity to build a more climate-resilient future with a range of sustainable agri-food system solutions available that will lead to multiple benefits and transformative change, including:[17]

- a more inclusive and equitable agri-food sector that benefits the poorest and most vulnerable communities
- recognition of women's contribution to the agri-food system with better renumeration and promotion into leadership positions
- sustainable diets and well-nourished populations, improving health outcomes and reducing costs of health care
- securing the health and well-being of youth and future generations
- diversified and resilient agricultural food systems
- a whole value chain that provides solutions to reducing and removing GHG emissions
- reduced environmental impact through sustainable management of renewable natural resources
- reduction in food loss and waste.

The following sections of this discussion paper review and discuss some of the 'main' sustainable agri-food systems terminologies and identify the values used to promote social justice, community empowerment, child well-being, gender equity, and environmental sustainability to achieve transformative change[18] in the agri-food system.

REVIEW OF SUSTAINABLE AGRICULTURE TERMINOLOGIES

Background

Sustainable agriculture is a broad concept that has been applied to agriculture, which, along with fisheries and aquaculture, is the dominant production activity within a food system related to achieving food security and nutrition while ensuring economic, social, and environment systems are not compromised. Although there is no universally agreed upon definition for sustainable agriculture, it was described in the UN's 1987 Brundtland report as follows:

> **… sustainable agriculture should be able to meet the current needs of society without compromising the ability of future generations to meet their own needs. It should take into account environmental, social, and economic sustainability, which constitute the three central pillars of sustainable development.[19]**

Many terminologies have emerged that fall under the umbrella term ***sustainable agriculture***. Such terminologies include agroecology, conservation agriculture, precision agriculture, regenerative agriculture, ecological agriculture, agroforestry, climate-smart agriculture, organic agriculture, permaculture, biodynamic agriculture, nature-inclusive agriculture, high nature value farming, ecological intensification and circular agriculture, to name just a few.[20]

Many of the terms identified vary in scope – some are more broadly defined with overarching themes (e.g., CSA, agroecology and sustainable intensification), while some are nested within other terms and may have a narrower focus. For example, conservation agriculture focuses specifically on conserving soils and organic agriculture is focused on reducing external inputs (predominantly chemical) and supporting market labels to promote food products. On the other hand, CSA is more broad in its application, focusing on making agriculture more resilient to climate change, enabling policies and institutions, and identifying financing mechanisms to support funding. CSA is an umbrella term that includes multiple practices, including conservation agriculture and organic farming practices.

Sustainable agriculture is not a new phenomenon, yet new terminologies have been emerging for over a century. Since the beginning of agriculture around 12,000 years ago, the landscape has been dramatically changed due to the cultivation of crops and raising of livestock, particularly the arrival of industrial agriculture in the 1800s. To reverse the damage created by industrial agriculture, many forms of sustainable agriculture such as organic farming and agroecology developed and practiced by indigenous people for millennia are now being adopted. Below is a brief review of how these different terms of sustainable agriculture have emerged and been adopted over the last 100 years.

1920s: *Organic agriculture or farming*

This term can be traced back to the 1840s; however the modern organic movement emerged in the early 20th century, primarily in Europe and later in the United States.[21] By the 1970's organic agriculture was codified into standards and legislation with the emergence of organic food labelling.

1930s: *Agroecology*

This practice first emerged in indigenous people's food systems hundreds of years ago.[22] In the 1930s, it emerged as a scientific concept combining agronomy and ecology, to study the biological interactions between crops and other natural elements of the agro-ecosystem. In the 1980s, a conceptual framework had been developed to promote agroecological practices. Since the 2000s, agroecology has embraced the whole agricultural food system, defined as a global network of food production, distribution and consumption.[23]

Conservation agriculture also first emerged in the 1930s in the US Midwest region, where tillage was creating large dust bowl areas. To prevent this from happening, the concept of protecting soils through reduced tillage and keeping soil covered first emerged and was named *conservation tillage*.[24] Since then, conservation agriculture is now practiced on more than 120 million hectares of land globally, including in the US, Brazil, Argentina, China, Uganda, Kenya, India and Australia.

1970s: *Permaculture*

Australian researchers Bill Mollison and David Holmgren created the permaculture design system in the late 1970s while living in Hobart, Tasmania. It was inspired by Japanese farmer Masanobu Fukuoka's natural farming philosophy, which recognises the need to consider social aspects in any truly sustainable system.

1980s: *Regenerative agriculture*

Robert Rodale coined the terminology in the late 1980s as a way of describing the goals of organic agriculture: a regeneration of soil and biodiversity.[25]

1990s: *Sustainable intensification*

This terminology emerged from efforts to increase the productivity of smallholder farms in African countries.[26]

2010: *Climate-smart agriculture*

This concept was first launched by FAO at the Hague Conference on Agriculture, Food Security and Climate Change.[27] CSA goes beyond agricultural practices and technologies to include enabling policies and institutions as well as identification of financing mechanisms. But controversies around CSA started to emerge accusing it of being used to 'greenwash' practices that are harmful to the climate and agriculture. Other criticisms include the fact that the conceptual underpinnings of CSA are often unclear and that CSA tends to focus on technical fixes, ignoring socioeconomic or political factors that influence adoption.[28]

Around the same time, the term ***nature-based solutions*** also emerged through the World Bank and the International Union for Conservation of Nature (IUCN), which focuses attention on the importance of biodiversity conservation in responding to climate change.

Review of the main sustainable agriculture terminologies

Climate-smart agriculture

CSA as defined by FAO in 2010, is an approach that helps guide actions to transform agri-food systems towards green and climate-resilient practices. CSA supports reaching internationally agreed goals such as the UN Sustainable Development Goals and the Paris Agreement. It aims to tackle three main pillars:

1. sustainably increasing agricultural productivity and incomes
2. adapting and building resilience to climate change
3. reducing and/or removing GHG emissions, where possible.

Under the first pillar, CSA aims to improve crop yields and soil productivity potential, increase incomes, and reduce environmental impacts. This can be measured with indicators like crop yields, agricultural income, food consumption and food deficit, which document the different dimensions of food security.[29] The other two pillars emphasise the focus on addressing climate change aspects. This is reflected in the second pillar, which aims to reduce exposure to climate-related risks , enhancing adaptive capacities and protecting ecosystem services. This adaptation objective can be measured with skills and knowledge, access to information, income stability, soil protection, and crop and animal diversity. Through the third pillar, CSA aims to enhance the role of agriculture in mitigation and thus reduce its contribution to climate change.[30]

CSA is a broad approach centred on production and requires site-specific assessments to identify context-specific interventions. CSA goes beyond agricultural practices and technologies to include enabling policies and institutional strengthening as well as identification of financing mechanisms.

The World Bank also uses a similar definition whereby they describe CSA as an 'integrated

approach to managing landscapes—cropland, livestock, forests and fisheries—that address the interlinked challenges of food security and climate change'.[31] CSA also aims to achieve a triple win of increased productivity, enhanced resilience and reduced GHG emissions, which aligns with the definition used by FAO.

Several practices can be included under the CSA umbrella, including (but not limited to):[32]

Practices that increase productivity

- Agroforestry
- More efficient water management and irrigation practices, such as drip irrigation and rainwater harvesting techniques (e.g., zai pits, micro basins, check dams)
- More efficient fertiliser management approaches, including precision agriculture, micro-dosing, or leguminous cover-cropping
- Sustainable crop production intensification
- Vertical farming

Practices that enhance resilience

- Soil management practices including intercropping, crop rotation, fallow management and conservation agriculture, zero and minimum tillage, controlled traffic, use of biochar, green manure cover cropping, or mulching
- Contour farming, terrace farming and sloping agricultural land technology
- Integrated pest management
- Digital tools that improve decision-making and outcomes, including seasonal forecasts or service delivery platforms that provide agricultural advice or market linkage
- Sustainable and inclusive food value chains, including reducing food waste

Practices that reduce GHG emissions

- Rotational grazing, supplements to reduce enteric emissions of livestock, and improved grassland management
- Energy management by switching to clean and renewable energy applications, thereby reducing GHG emissions from agricultural activities

It should be noted that many of the practices contribute to more than one CSA pillar. For example, while conservation agriculture has been included for enhancing resilience, the practice can also contribute to reducing GHG emissions through sequestering carbon in soils.

SPOTLIGHT: Empowering rural farmers in Mongolia

Mongolia's long severe winters and short cropping durations (three months) are a limiting factor for agriculture. Through climate change adaptation efforts, World Vision is helping empower vulnerable farmers to overcome these challenges and improve their productivity. World Vision introduced innovative greenhouses in Mongolia for cultivation, which increased the cropping duration to 10 months. These changes increased the scope of cultivation as well, thereby enabling farmers to cultivate a diverse variety of crops. The smallholder farmers were equipped with trainings in greenhouse cultivation as well as simple food processing techniques, which further enhanced their skills to produce simple processed food products. Care was taken to use micro-irrigation to ensure that water resources are used judiciously. These initiatives resulted in a significant increase in crop productivity and better economic benefits. Many smallholder farmers in Mongolia have benefitted from these sustainable agricultural practices, which has helped them support their children's development, education and well-being, and provide a better quality of life for them.

Agroecology

According to the FAO definition, agroecology is described as a holistic and integrated approach that applies both ecological and social concepts and principles to the design and management of sustainable agriculture and food systems.[33] Agroecology is a dynamic concept that encompass the broad spectrum of food systems, from production to consumption. It has gained prominence in the scientific, agricultural, and political debate on the transition towards sustainable agriculture and food systems.[34] Agroecology is also very politically driven to radically shift power dynamics and address inequality in landscapes and food policy.

The approach has three main definitions:[35]

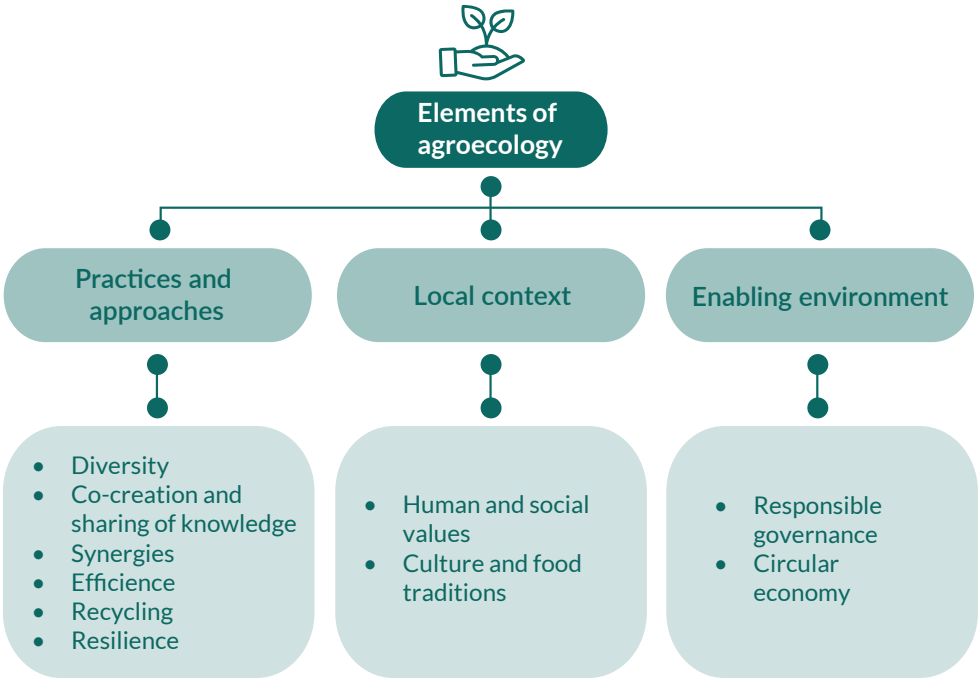
1. A transdisciplinary science which combines scientific disciplines (i.e. ecology, agronomy, sociology and economics) with local knowledge and cultural values, promoting co-learning among researchers and practitioners as well as peer-to-peer knowledge spreading across farmers.
2. A set of practices that harnesses, maintains, and enhances biological and ecological processes in the agricultural system. These aim to reduce the dependence on external inputs (e.g., agrochemicals) and create more diverse, resilient, and productive agroecosystems. Based on this principle, agroecology includes a wide range of practices[36] such as:

- crop diversification and integration of different crops in rotations (such as cover crops)
- intercropping
- crop residue management
- mulching
- crop fertilisation
  - organic fertilisation and biochar
  - biofertiliser through application of living organisms to seed, plant surfaces, or soil such as rhizobacteria
  - Composting
- crop irrigation
  - drip irrigation
  - SRI – System of Rice Intensification[37]
- weed, pest and disease management
  - natural pesticides such as those derived from plants
  - biological pest control or repellents based on introduction of natural enemies of weeds and pests, and complementary planting
- agroforestry
- seed saving
- biodynamic preparations
- tillage management
  - direct seeding into living cover crops or mulch
  - reduced or zero tillage
  - controlled traffic
- livestock integration with crops
- efficient water harvesting, reducing the need for irrigation

- use of local resources and renewable energy sources
- holistic landscape management around the crop field (e.g., windbreaks, living fences)
- farmer-to-farmer knowledge sharing, indigenous knowledge documentation and participator innovation

3. A social movement that is built on the tenets of food sovereignty, sustainability, justice, gender equity, farmer networks, resilience, resistance and access to land. This movement advocates a framework of 10 elements shown in Figure 1 below.

Figure 1. The 10 elements of agroecology[38]



Permaculture

Bill Mollison and David Holmgren created the Permaculture design system in the late 1970s while living in Hobart, Tasmania. They defined permaculture as 'a design system for the creation of socially, economically and ecologically sustainable settlements, whether in rural areas or metropolitan cities.'[39]

Permaculture, like CSA and agroecology, consists not only of a set of practices but also a system of design using a whole-systems approach based on a set of 12 principles that help farmers mimic the patterns and relationships found in nature.[40] The 12 principles are:

1. observe and interact with nature
2. catch and store energy
3. obtain a yield
4. apply self-regulation and accept feedback
5. use and value renewable resources and services
6. produce no waste
7. design from patterns to details
8. integrate rather than segregate
9. use small and slow solutions
10. use and value diversity
11. use edges and value the marginal
12. creatively use and respond to change.

Several practices are used under permaculture following the 12 principles and include (but not limited to):

- focusing on production such as replacing grass with productive crops
- no tillage
- no usage of chemical and synthetic fertilisers or pesticides
- mulching and cover crops
- agroforestry
- integrating livestock with food and fibre production
- water retention
- managing water flows.

Regenerative agriculture

Regenerative agriculture is an alternative form of food production that may have lower or potentially net positive environmental and social impacts. Regenerative farming is generally related to larger scale land management practices such as restoration of grasslands and croplands that have become degraded due to depletion of soils. However, there is no standard definition for regenerative agriculture, according to a review undertaken by Newton et al. (2020).[41] The main aim of the review was to understand how scholars and practitioners have defined regenerative agriculture. The review found many definitions are used and could be broadly categorised into the following groupings:

- process-based (e.g., use of cover crops, the integration of livestock and reducing or eliminating tillage)
- outcomes-based (e.g., to improve soil health, to sequester carbon and to increase biodiversity).

Some examples of definitions identified by Newton et al. (2020) include[42]:

- 'a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services'
- 'a long-term, holistic design that attempts to grow as much food using as few resources as possible in a way that revitalizes the soil rather than depleting it, while offering a solution to carbon sequestration'
- 'a form of enterprise that incorporates a community of people engaged in civil labor to produce and consume the food (and land, landscape and amenity) that they, collectively, decide to grow'.

While there is no generally accepted definition, perhaps one way to enable comparison with the other terminologies reviewed in this paper is to look at the different practices (or processes) that fall under regenerative agriculture. The Newton et al. (2020) review identified the following practices:

- reduced tillage (or zero, minimal, or conservation tillage)
- cover crops
- crop rotations
- crop diversification including intercropping
- incorporate perennials and trees (forms of agroforestry)
- restore natural habitats
- integrate livestock
- use ecological or natural principles or systems
- use no or low external inputs
- use organic farming methods
- natural pest control
- organic fertilisers
- use compost, mulch, green manure or crop residues
- focus on localisation of food production and consumption
- focus on small scale systems.

The Newton et al. (2020) review also found that other terms commonly used alongside the term 'regenerative agriculture' include agroecological farming, alternative agriculture, biodynamic agriculture, carbon farming, nature inclusive farming, conservation agriculture, green agriculture, organic regenerative agriculture and sustainable agriculture.

Regenerative agriculture shares many similarities with organic agriculture, as both terminologies focus on the concept of soil health.[43] Many of the regenerative agriculture practices are found in organic agriculture – for example, cover crops, crop rotation, composting and intercropping. Regenerative agriculture is also broader than conservation agriculture, as it considers not only crops but also involves the mixing of livestock and crops.[44]

Organic agriculture

Organic agriculture is essentially a form of agroecological farming whereby farmers are required to meet a strict set of standards to ensure that farming sustains the health of soils, ecosystems, animals and people. The key principles of organic farming include health, ecology, care and fairness.[45] To be able to claim that a farm (or farm produce) is organic, certification is legally required to grow, process or market those organic products. All organic farms are inspected by an independent certification body on a regular basis (i.e., annually).[46] This is a critical difference with regenerative agriculture, as the term 'regenerative' has no clear legal meaning or framework.

In practice, organic farming includes using fewer pesticides, and the use of all weedkillers, synthetic fertilisers, and GMOs are banned. Instead, natural alternatives are used such as using legumes to fix nitrogen, as well as using compost, biochar, animal manure, green manure and crop rotations to maintain healthy, nutrient rich soils. Organic farming also requires higher standards of animal welfare, from their living conditions and feed to their transportation and humane slaughter.[47] In general, organic agriculture shares many of the same practices that also occur under regenerative agriculture, but with a much narrower focus. Despite the added costs of certification, it provides an opportunity to engage in more lucrative markets.

Nutrition-sensitive agriculture

Nutrition-sensitive agriculture (NSA) is a food-based approach to agri-food systems that puts nutritionally rich foods, dietary diversity, and food fortification at the centre of overcoming malnutrition and micronutrient deficiencies. It is an approach that seeks to maximise agriculture's contribution to nutrition. This strategy includes:[48]

- the multiple benefits derived from enjoying a variety of foods
- recognising the nutritional value of food for good nutrition, health and productivity
- the social significance of the food and agricultural sector in supporting rural livelihoods, targeting poor households, promoting gender equity, and providing nutrition education so that household resources are used to improve household members' nutrition, especially that of women and young children
- linking agriculture to sectors that address other causes of malnutrition, namely education, health and social protection.

There are several broad practices or approaches that are relate to NSA, including:[49]

- consumer demand, food preparation and preferences:
  - nutrition education and behaviour change communication
  - income generation for nutrition
  - nutrition-sensitive social protection

  - school food and nutrition
  - nutrition-sensitive humanitarian food assistance
- food trade and marketing:
  - trade for nutrition
  - food marketing and advertising practices
  - food price policies for promoting healthy products
  - food labelling
- food production
  - diversification and sustainable intensification of agricultural production
  - biodiversity for food and nutrition
  - biofortification
  - urban and peri-urban agriculture
- food handling, storage and processing
  - nutrition-sensitive post-harvest handling, storage and processing
  - food fortification.

The use of sustainable agriculture terms among different agencies

A review of some government and UN agencies (e.g. USAID, European Commission, FAO) was undertaken to determine which sustainable agri-food systems terminologies are used in their key policy initiatives and knowledge documents for international development. The results presented in Table 1 show that European agencies have a preference for terminologies such as agroecology, organic farming, and regenerative agriculture, while US and Australian agencies preferred nutrition-sensitive agriculture and climate-smart or climate-resilient agriculture.

Table 1. Examples of use of terminologies by different agencies

Agencies	Examples of terminologies
Australian Department of Foreign Affairs and Trade (DFAT)	• Nutrition-sensitive agriculture • Climate-resilient agriculture
European Commission	• Agroecology • Organic farming • Seed security and diversity • Nature-based solutions for agri-food
FAO	• Climate-smart agriculture • Agroecology • Nature-based solutions • Organic agriculture • Conservation agriculture • Nutrition-sensitive agriculture • Permaculture • Regenerative agriculture
German Federal Ministry for Economic Cooperation and Development (BMZ)	• Agroecology • Regenerative agriculture • Conservation agriculture • Climate-resilient agriculture
IFAD	• Agroecology • Climate-smart agriculture • Nature-based solutions • Conservation agriculture • Permaculture • Organic agriculture • Nutrition-sensitive agriculture
US Government	• Climate-smart agriculture • Nutrition-sensitive agriculture • Nature-based solutions
World Bank	• Climate-smart agriculture • Nutrition-sensitive agriculture • Nature-based solutions

Summary of the main sustainable agriculture and food systems terminologies

Many of the agricultural or farming practices listed under each of the terminologies reviewed above are common to all of them; therefore we must look to the underlying principles rather than the practices undertaken to determine what, if any, the key differences are between them. One of the key differences that separate them is the incorporation of social design principles. CSA, conservation agriculture, and regenerative agriculture are largely focused on implementing biophysical changes to on-farm practices (e.g., reduced tillage, cover crops, water retention, agroforestry, etc.), compared with agroecology and permaculture, which also bring in a strong social justice element and hence have a more holistic approach. CSA, however, has evolved over time, focusing not only on on-farm technological changes but also incorporating policy, institutions, the private sector, markets and investments[50] to drive a more transformative change to agri-food systems.

Another key difference is the primary focus of the approach. CSA is very much focused on responding to climate change and conservation agriculture is focused on restoring soil health, while agroecology and permaculture are focused on restoring ecological balance within the agricultural system. All of the terminologies, however, have the same underlying goals, which is to increase productivity in a sustainable and resilient manner while taking into account the whole ecosystem. Moreover, these approaches vary in their scope, with some concentrating on specific agricultural production practices (such as CSA, regenerative agriculture and organic farming), while others emphasise the interactions between people and food systems rather than the specific techniques employed (like agroecology).

Benefits of sustainable agriculture practices to ecosystems and biodiversity

Agriculture has significant impacts on ecosystem services and biodiversity to produce food and fibre for human consumption. One of the major impacts of agriculture is the loss of natural ecosystems due to conversion into agricultural lands.

Agriculture can also introduce alien or exotic species including pests and disease and reduce soil health through disturbance and overuse of agrochemicals, which all can have significant impacts on the 'regulating services' provided by the ecosystem.[51] Examples of regulating services include maintaining the quality of soil and air, providing flood and disease control, and pollinating crops. Apart from being a user of these regulating services, agriculture can, however, give back to the ecosystem if done sustainably, rather than continuously drawing down on what is ultimately a finite resource.[52]

Sustainable agriculture has been shown to have many benefits for ecosystem services and biodiversity. Some examples of the sustainable agriculture practices which are beneficial for biodiversity or ecosystem services include:[53]

- ***vegetation (crop) cover***: reduces or prevents soil erosion therefore benefitting water quality
- ***forest restoration***: contributes to air and water purification, carbon sequestration, and storage
- ***natural biological control for pest management***: can significantly reduce the use of agrochemicals, thereby reducing adverse effects on the environment, such as contamination of soils and water ways

- ***reduced or no tillage***: stabilises soil structure which leads to increased organic matter, and reduced erosion and water runoff, therefore resulting in higher water quality, higher soil moisture, and increased soil biodiversity
- ***crop diversification***: can enhance crop productivity and ecosystem services through either intermixing of different crops or combining crops with beneficial neighbouring plants for pest control or pollination.

All these examples are practiced under many of the terminologies covered in the above sections; therefore, regardless of the approach adopted, significant biophysical benefits can be obtained through their implementation.

Nature-based solutions in agriculture and food systems

Nature-based solutions (NbS) first emerged towards the end of the 2000s through the World Bank and IUCN with the aim to focus attention on the importance of biodiversity conservation in responding to climate change. The world has been experiencing a rapid decline in nature, which both contributes to GHG emissions and reduces humanity's ability to adapt to climate change. This in turn drives people further into poverty through negative impacts on economic development. However, restoration and conservation of nature and biodiversity can reverse these impacts and is a critical solution to the triple threats of climate change, biodiversity loss, and poverty.[54]

During the climate change negotiations in Paris in 2015, the IUCN introduced the NbS concept as an approach to mitigate and adapt to climate change, secure water and energy supplies, reduce poverty, and drive economic growth,[55] and created the first definition of NbS in 2016:

> **Actions to protect, sustainably use, manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits.**

The fundamentals of NbS are derived from established practices such as forest landscape restoration, integrated water resource management, ecosystem-based adaptation and mitigation, and ecosystem-based disaster risk reduction. NbS can be applied in both urban and rural settings and across different ecosystems including terrestrial, freshwater, and ocean environments. NbS solutions are applied at landscape scale and include many activities including (but not limited to) avoided forest conversion, reforestation, improved forest management, maintaining riverine habitats, fire management, avoided grassland conversion, improved soils on agriculture land, coastal wetland restoration and protection, and peatland restoration.[56]

In an attempt to standardise how NbS projects are designed and implemented, IUCN developed the first global standard in 2020[57] to provide guidance and a framework for the design, verification, and scaling up of NbS. The standard specifies eight criteria to be met in order for a project to be considered a nature-based solution. These criteria are:

- Criterion 1: NbS effectively address societal challenges
- Criterion 2: Design of NbS is informed by scale
- Criterion 3: NbS result in a net gain to biodiversity and ecosystem integrity
- Criterion 4: NbS are economically viable
- Criterion 5: NbS are based on inclusive, transparent and empowering governance processes
- Criterion 6: NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits
- Criterion 7: NbS are managed adaptively, based on evidence
- Criterion 8: NbS are sustainable and mainstreamed within an appropriate jurisdictional context

NbS is very much a systems-based approach using nature to address climate change and

at the same time improving the governance systems to ensure long-term sustainable change for societies. In agricultural landscapes, NbS can be applied for soil health, carbon mitigation (through soil and biomass), downstream water quality protections, and improved biodiversity while also benefitting agricultural production and supply chains to achieve net zero environmental impacts (e.g., water security, climate commitments). Many of the practices included under the NbS terminology are the same as those found under CSA, agroecology, etc. Some of these practices include:[58]

- cropland nutrient management
- use of biochar as a soil amendment
- conservation agriculture
- agroforestry
- livestock management, including optimising stocking intensity, improved livestock breeds and grazing in crop fields
- improved rice cultivation
- farmer-managed natural regeneration to restore forest landscapes
- mangrove restoration.

When NbS is deployed appropriately, it can deliver multiple benefits, including supporting agricultural production and resilience, reducing poverty, mitigating climate change, and enhancing biodiversity.

SPOTLIGHT: REGREENING AFRICA

The Regreening Africa Project, funded by the European Union, is co-led by the Centre for International Forestry Research and World Agroforestry (CIFOR-ICRAF) with several partners, including World Vision, and is expected to bring 5 million hectares under restoration by 2030, boosting biodiversity and supporting local communities. The first phase of Regreening Africa was carried out from September 2017 to March 2023 across eight countries in sub-Saharan Africa. World Vision led the implementation of Regreening Africa in Kenya, Rwanda, Somaliland, Senegal, Ghana, and Niger, and supported implementation in Ethiopia and Mali.

The initiative has already led to the regreening of over 350,000 hectares across the eight countries, reaching more than 607,000 households through training and tree growing efforts such as FMNR, adopting new regreening practices or intensifying existing ones. Climate benefits from these efforts include sequestering carbon and making the landscape more resilient to droughts and flooding. The success of this project has led to it being recognised as one of the seven UN World Restoration Flagships

Criticisms associated with some sustainable agriculture terminologies

Controversies have arisen over CSA, NbS and other sustainable agri-food system terminologies, including the role of developing countries – and specifically their agricultural sectors – in reducing global GHG emissions, as well as which technologies best promote sustainable forms of agriculture.[59] Some of the main criticisms are summarised below.

The role of sustainable agriculture practices in climate mitigation in developing contexts

One of the main criticisms of the CSA approach has been that it prioritises climate mitigation over food security and adaptation, and it mandates a link to carbon offset markets. In an open letter written by Action Aid in 2017, they outlined their growing concerns that CSA would result in developing nations agricultural food systems having to take on an unfair mitigation burden, particularly when most GHG emissions have been produced by countries that have already industrialised.[60]

Transfer of controversial agricultural technologies and non-sustainable agricultural food systems

Another major criticism of CSA has been the use of its branding to advance non-sustainable and non-desirable forms of agri-food systems development. Through the Global Alliance for CSA (GACSA), which was launched in 2014, big agribusiness has been able to push their agenda into CSA, favouring the use of biotechnologies such as GMOs and soilless farms.[61] GACSA was rejected by civil society on the grounds that it provided a platform for agribusiness and industrial agriculture to promote their practices as solutions to climate change and therefore locking in business-as-usual production.[62] It was also criticised for lacking any clear social and environmental safeguards. Similar criticisms have also been levelled against regenerative agriculture and NbS.[63]

In Germany, several civil society organisations have strongly opposed CSA, viewing it as an approach that potentially enables influential agri-food corporations to declare their harmful practices as part of the solution. In 2016, a coalition of 20 German civil society organisations collectively endorsed a position paper directed at the German government. This paper highlighted the inherent issues associated with CSA, emphasising its inadequacy in effectively addressing climate-related challenges and its disproportionate impacts on most vulnerable communities.

Use of sustainable agriculture as a form of greenwashing

Terminologies such as 'climate-smart', 'nature-based', and 'regenerative agriculture' have no legal definition or set evaluation criteria and therefore are open to misuse by industrial agriculture. For example, multinational corporations such as Syngenta, McDonalds, Kellogg's and Monto – which promote the use of agrochemicals, intensive livestock production, and industrial scale mono-cropping – have developed their own CSA programmes and claim to provide the solutions to climate change. However, in reality these practices run the risk of locking in unstainable practices and continued production of GHG emissions and biodiversity loss. Therefore, due to the generality of these terms, they can be used to 'greenwash' the corporations' activities and enable them to expand into new markets like Africa, to the detriment of local economies, their farmers, and the environment.[64]

Commoditisation of nature

NbS has been criticised for being used by businesses and governments as an approach to commoditise nature, and, without appropriate safeguards, potentially leading to more harm than good for nature.[65] For example, tree planting to date has been used as a key NbS activity, however planting trees in the wrong places (e.g., native grasslands or peatlands) can be counterproductive to desired outcomes for both carbon sequestration and biodiversity.

The rapid development of biodiversity or nature-based markets as an instrument to help businesses meet nature-related targets for reducing their impact on ecosystems may also result in businesses delaying real action and relying on 'offsetting' to achieve their objections. This has been a long running issue with carbon markets, with offsetting potentially impacting on companies' willingness to reduce emissions within their operations and supply chains.

Lack of guidelines

Unlike the label 'organic,' which requires farmers to meet specific guidelines outlined by the United States Department of Agriculture, the term 'climate-smart agriculture' does not include enforceable guidelines, a certification process, or a governing body.

CONCLUSION AND RECOMMENDATIONS

The review of sustainable agri-food systems terminologies found that a range of terminologies have emerged over the last few decades and that many of them are still used and promoted by governments and UN agencies such as the FAO. The review also found that many of the terminologies were similar because several of the agricultural production practices used (e.g., agroforestry, low or no tillage, use of organic fertilisers, etc.) are common across all of them and they have the same underlying goals: to support agricultural production in a sustainable and resilient manner while taking into account the whole ecosystem.

What differentiates the terminologies are the underlying principles that govern how they are implemented. Moreover, the terminologies vary in their scope, with some concentrating on sustainable intensification practices (such as CSA, regenerative agriculture and nutrition-sensitive agriculture), while others emphasise the interactions between people and food systems rather than the specific techniques employed (like agroecology, organic agriculture and permaculture).

The review also found that some terminologies such as CSA, regenerative agriculture and NbS have attracted strong criticism. Large corporate agribusiness companies have adopted these terms to hide behind continuation of business-as-usual industrial agricultural practices, such as widespread use of fertilisers, pesticides and GMO crops to the detriment of farmers in developing nations. However, despite these criticisms, terms like CSA and NbS are still used in funding initiatives and promoted by UN agencies such as the FAO.

Conclusions and recommendations for practitioners and stakeholders

Sustainable agri-food systems should be promoted in order to drive transformational change and apply a systemic lens.

Sustainable food systems must:

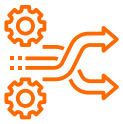
a. promote green and climate-resilient practices that contribute to children's overall well-being

b. embed gender equality and social inclusion in any climate-resilient practices implemented

c. support indigenous practices, particularly those practiced by smallholder farmers

d. take a nutrition-sensitive approach

e. ensure partnerships with government institutions and the private sector are encouraged to foster long-term sustainability.



Within sustainable food systems, both climate-smart agriculture and agroecology should be recognised and utilised as key sustainable agri-food systems approaches.

CSA has been widely adopted by governments, UN agencies and non-governmental organisations as a valid technical approach. Over the years, it has evolved to take a more systemic perspective, addressing not only agricultural production practices but also incorporating policy, institutions, private

sector engagement, markets and investments to drive transformative change in agri-food systems. Similarly, agroecology is embraced by these entities for its focus on environmental health, social equity and ecosystem resilience. Together, CSA and agroecology offer a powerful, complementary approach that enhances the resilience, inclusivity and sustainability of our food systems.

When using the term CSA, we should emphasise a Do No Harm approach.

CSA approaches should focus on the well-being of children and community members at the heart of any project, projects are community-led focusing on smallholder farmers, are designed through a gender equality and social inclusion lens and take a Do No Harm approach. To ensure CSA can truly serve the world's most vulnerable communities, it should:

- have contextualised practices and actions, with strong attention to the role of gender equality and social inclusion in shaping division of labour, access, and decision-making
- be locally led and integrated within a holistic development approach.

World Vision's core project models Building Secure Livelihoods and Regreening Communities are good examples of how World Vision integrates CSA as a technical practice within the transformational project models.

In certain contexts, some terminologies can be interchangeable with others.

Table 2 in the Appendix provides a summary of the terminologies reviewed. The terms can be broadly grouped in two categories – sustainable intensification and agroecological. Within these two categories, the terms can be interchangeable depending on the context where they are being used.

ANNEX 1. SUMMARY OF KEY SUSTAINABLE AGRICULTURE TERMINOLOGIES AND CONCEPTS

Table 2. Summary of the main sustainable agriculture and food systems concepts*

	Climate-smart agriculture	Agroecology	Regenerative agriculture	Permaculture	Conservation agriculture	Organic agriculture	Nutrition-sensitive agriculture
Description	CSA is an approach to help the people who manage agricultural systems respond effectively to climate change. The CSA approach pursues the triple objectives of sustainably increasing productivity and incomes, adapting to climate change and reducing GHG emissions where possible.	Agroecology is described as a bottom-up holistic and integrated approach that applies both ecological and social concepts and principles to the design and management of sustainable agricultural food systems at a landscape level.	Regenerative agriculture consists of practices that regenerate soil, reducing but not necessarily eliminating synthetic pesticides and fertilisers, and going beyond the reduction of negative effects towards ensuring that agriculture has a positive effect on the environment across the landscape. It also focuses on converting the agricultural system to a net carbon sink.	Permaculture is a design system for the creation of socially, economically and ecologically sustainable settlements, whether in rural areas or metropolitan cities. It uses a circularity approach that reuses natural resources (energy, water, etc.) and minimises waste.	Conservation agriculture is characterised by minimal soil disturbance, diversified crop rotations, and surface crop residue retention to reduce soil and environmental degradation as a whole while sustaining crop production.	Organic agriculture is a production system that sustains and enhances the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture practices can be externally accredited through national or international bodies (such as IFOAM), unlocking access to organic markets and improved prices	Nutrition-sensitive agriculture is a food-based approach to agri-food systems that puts nutritionally rich foods, dietary diversity, and food fortification at the heart of overcoming malnutrition and micronutrient deficiencies. Essentially, it is agriculture with a nutrition focus.
Category	Sustainable intensification[66]	Agroecological[67]	Sustainable intensification	Agroecological	Sustainable intensification	Agroecological	Sustainable intensification
Practices	- Agroforestry - Water management - Soil management practices including intercropping, crop rotation, fallow management and conservation, zero and minimum tillage - Contour farming and terrace farming - Vertical farming - Nutrient management - Livestock and grassland management - Energy management - Sustainable crop production intensification - Sustainable and inclusive food value chains - Sustainable forest management	- Crop diversification and integration of different crops in rotations (such as cover crops) - Intercropping - Crop residue management - Mulching - Crop fertilisation - Crop irrigation - Weed, pest and disease management - Agroforestry - Tillage management - Livestock integration with crops - Efficient water harvesting, reducing the need for irrigation - Use of local resources and renewable energy sources - Holistic landscape management around the crop field (e.g., windbreaks, living fences)	- Reduced or zero tillage - Protect/cover the soil - Crop rotations - Crop diversification including intercropping - Incorporate perennials and trees (forms of agroforestry) - Restore natural habitats - Integrate livestock - Use ecological or natural principles or systems - Use no or low external inputs - Use organic farming methods - Natural pest control - Organic fertilisers - Use compost, mulch, green manure, or crop residues	- Focusing on production such as replacing grass with productive crops - No tillage - No usage of chemical and synthetic fertilisers or pesticides - Mulching and cover crops - Agroforestry - Integrating livestock with food and fibre production - Water retention - Managing water flows	- Minimising soil disturbance through reduced or no tillage - Maintaining soil cover by leaving crop residues in the field - Crop rotation and diversification	- Crop rotation and diversification - Composting - Minimal tillage - Cultivation of nitrogen fixing plants - No use of inorganic fertilisers - Use of naturally occurring organic amendments (such as rock phosphate, gypsum, or natural lime) or organic material (manures, composts, or biochar) - Natural pest control - Encourage natural immunological defence of animals - Prevent overstocking of livestock to maintain animal health	- Diversification and sustainable intensification - Biofortification - Food fortification - Nutrition-sensitive post-harvest handling, storage and processing - Nutrition-sensitive social protection - Nutrition education and behaviour change - Food labelling - Food quality and safety - Waste loss management
Agency preferences (examples)	USAID, World Bank, FAO, IFAD	BMZ, European Commission, FAO, IFAD	BMZ, FAO	FAO, IFAD	BMZ, European Commission, FAO, IFAD	FAO, IFAD	DFAT, USAID, FAO, IFAD, World Bank

***As mentioned in this paper, each terminology entails diverse discussions, however, for the use of practitioners, the table portrays the broad definitions applied by the UN agencies.** Annex 2. List of acronyms

ANNEX 2. LIST OF ACRONYMS

Acronym	Description
BMZ	German Federal Ministry for Economic Cooperation and Development
tCO_2-e	Tonnes of carbon dioxide equivalent
CSA	Climate-smart agriculture
DFAT	Department of Foreign Affairs (Australia)
FAO	Food and Agriculture Organization of the United Nations
FMNR	Farmer Managed Natural Regeneration
GHG	Greenhouse gas emissions
GMO	Genetically modified organisms
Gt	Gigatonne
IFAD	International Fund for Agricultural Development
IFOAM	International Federation of Organic Farming Agriculture Movements
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
NbS	Nature-based solutions
NSA	Nutrition-sensitive agriculture
SEA EA	System of Environmental Accounts Ecosystem Accounting
UNFCCC	United Nations Framework Convention on Climate Change
UN	United Nations
USAID	United States Agency for International Development
WV	World Vision

ANNEX 3. GLOSSARY OF TERMS

Term	Definition
Agri-food systems	Agri-food systems encompass the entire range of actors and their interlinked value-adding activities in the primary production of food and non-food agricultural products, as well as in food storage, aggregation, post-harvest handling, transportation, processing, distribution, marketing, disposal and consumption. Within agri-food systems, food systems comprise all food products that originate from crop and livestock production, forestry, fisheries and aquaculture, and from other sources such as synthetic biology, and that are intended for human consumption.[68]
Agroecology	According to the FAO definition, agroecology is described as a holistic and integrated approach that applies both ecological and social concepts and principles to the design and management of sustainable agriculture and food systems.[69]
Agroforestry	Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. There are three main types of agroforestry systems including agri-silvicultural systems that combine trees and crops (e.g., alley cropping, FMNR), silvopastoral systems that combine trees with livestock, and agro-silvopastoral systems that combine trees, crops, and livestock.[70]
Carbon credits	Carbon credits are measurable, verifiable emission reductions from certified climate action projects. These projects reduce, remove, or avoid greenhouse gas emissions. One carbon credit is equivalent to one tonne of CO_2. Carbon credits can be traded to organisations that want to offset their greenhouse gas emissions they are unable to reduce directly.
Carbon insetting	Carbon insetting involves implementing mitigation interventions such as GHG emission reductions and carbon storage within a company's value chain.[71]
Carbon offsetting	A market mechanism by which companies, individuals and governments can pay for carbon reduction or removals elsewhere and claim that 'credit' for carbon reduction within their own organisations. Offsets can be generated from both mitigation (e.g., a reduction in expected emissions) and sequestration projects.
Carbon sequestration	The physical uptake/removal and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release the oxygen and store the carbon.[72] Carbon can also be naturally sequestered in soil, oceans and coastal mangroves.
Carbon sinks	Carbon sinks include forests, oceans and other ecosystems that can absorb carbon, thereby removing it from the atmosphere.[73]
Climate change	A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.[74]

Term	Definition
Climate change adaptation	The process of adjustment in ecological, social, and economic systems in response to both the current effects of climate change and the predicted impacts in the future.[75] Adaptation actions range from setting up early warning systems for cyclones to switching to drought-resistant crops, among others.
Climate change mitigation	Avoiding and reducing emissions of heat-trapping greenhouse gases into the atmosphere to prevent the planet from warming to more extreme temperatures or enhance the sinks of greenhouse gases. Mitigation measures include use of renewable energy, and waste minimisation processes and enhancing carbon sinks, among others.[76]
Climate resilience	Broadly defined as the ability to anticipate, prepare for, adapt to, absorb and recover from the impacts of stresses imposed by climate change.
Climate-smart agriculture (CSA)	Climate-smart agriculture is an approach to help the people who manage food systems respond effectively to climate change. The CSA approach pursues the triple objectives of sustainably increasing productivity and incomes, adapting to climate change, and reducing greenhouse gas emissions where possible. It is not a set of practices that can be universally applied, but rather an approach that involves different elements embedded in local contexts.[77]
Conservation agriculture	Characterised by minimal soil disturbance, diversified crop rotations, and surface crop residue retention to reduce soil and environmental degradation while sustaining crop production.[78]
Ecosystem services	Are the contributions of ecosystems benefits used in economic and other human activity.[79] The System of Environmental Accounts Ecosystem Accounting (SEA EA) uses the following three broadly agreed on categories of ecosystem services: a) ***Provisioning services***, which represent the material and energy contributions generated by or in an ecosystem to economic and human activities, for example, fish or plants with pharmaceutical properties extracted for final consumption by households or intermediate consumption. b) ***Regulating services***, which result from the ecosystems regulating climate, hydrologic and biochemical cycles, earth surface processes, and various biological processes. These services often have an important spatial aspect. c) ***Cultural services***, which are generated from the physical settings, locations or situations that give rise to intellectual and symbolic benefits experienced by people from ecosystems through recreation, knowledge development, relaxation, and spiritual reflection.
Food sovereignty	The right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts the aspirations and needs of those who produce, distribute, and consume food at the heart of food systems and policies rather than the demands of markets and corporations.[80]
Food system	All the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation, and consumption of food, and the output of these activities, including socioeconomic and environmental outcomes.[81]
Greenhouse gases	The gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation. Carbon dioxide, methane, nitrous oxide and chlorofluorocarbons are examples of greenhouse gases.[82]

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