Agriculture, Livestock, Forestry, Fishing and Aquaculture (CNAE A)

BRAZILIAN SUSTAINABLE TAXONOMY

SECRETARIAT OF ECONOMIC POLICY

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Agriculture, Livestock, Forestry, Fishing and Aquaculture (CNAE A)

Sector overview

The Agriculture, Livestock, Forestry, Fishing, and Aquaculture sectors are essential to the Brazilian economy. It is estimated that the sectors contribute directly to approximately 7% of Brazil's Gross Domestic Product (GDP) and are responsible for approximately BRL 72 billion in exports (IBGE, 2024 & MDIC, 2024). Brazil is one of the world's largest producers and exporters of agriculture and livestock commodities such as soybeans, corn, cotton, coffee, sugar, orange juice, beef, and poultry, as well as forest products, especially cellulose. These sectors are engines of economic and social development in various regions.

In addition to its importance for the trade balance and the generation of local employment, Brazilian agriculture, livestock, forestry, fishing and aquaculture play a strategic role in global food security and the processing industry, supplying food and raw materials to numerous countries and sustaining complex and diversified production chains.

Although essential to the economy, these sectors are responsible for a significant part of Brazil's greenhouse gas (GHG) emissions, largely due to deforestation, land conversion, and the burning of native vegetation areas. Agricultural activities have been responsible for approximately 30% of national GHG emissions in recent years. Land use and changes in land use, and forests account for around 40% of national GHG emissions, mostly from activities related to agriculture and livestock (SIRENE/MTCI, 2025). Furthermore, agricultural expansion into sensitive areas may generate social conflicts, particularly affecting indigenous and traditional communities (LASCHEFSKI et al., 2019).

The agricultural and forestry sectors have enormous potential for adopting sustainable practices with low environmental and climate impact. Brazil, a pioneer in the development and adoption of sustainable practices, stands out for its use of technologies such as no-till farming, Integrated Crop-Livestock-Forest (ICLF), agroforestry systems, and the use of bio-inputs, which contribute significantly to emissions reduction and increased production efficiency (EMBRAPA, 2007). However, expanding and scaling up the adoption of these and other sustainable practices among farmers remains a challenge faced by government, companies, financial institutions, and other organizations in Brazilian civil society.

Economic activities covered by the National Classification of Economic Activities (Classificação Nacional de Atividades Econômicas - CNAE) Sector A (CNAE A) are more vulnerable to climate change, as they depend directly on stable weather conditions to ensure both productivity and product quality. Phenomena such as prolonged droughts, rising temperatures, changes in rainfall patterns, and extreme weather events can harm agricultural production, threatening both food security and economic stability (BRASIL. MMA, 2021). It is therefore essential to disseminate sustainable and resilient agricultural practices that can mitigate these impacts and ensure the continuity of production in a scenario full of climate uncertainties.

Brazil has a great diversity of rural producers, reflecting its vast territorial extent, the variety of biomes across the country, and the multiple processes of land occupation. From family farmers to large-scale producers, including private companies and agricultural cooperatives operating on an industrial scale. This heterogeneity is reflected in the size of the properties, access to credit and technical assistance, the different levels of technology adopted, the production systems used, and the production chains to which they belong. This diversity calls for public policies and financing mechanisms adapted to the sector's varied realities, fostering productive inclusion, competitiveness, and environmental sustainability across different producer segments and biomes.

The Brazilian government has been promoting the modernization and sustainability of the agricultural sector through policies such as the ABC Plan (Low Carbon Emission Agriculture) in its second phase, ABC+, and the Safra Plan itself. Within the scope of the Safra Plan, subsidized credit lines are available for producers of various sizes, financing everything from inputs to degraded areas recovery, while also encouraging sustainable practices. Within this context, the RenovAgro Program (formerly the ABC Program) stands out by directing subsidies towards low-impact agricultural practices, such as no-till farming and integrated systems, with the aim of reducing GHG emissions, making the sector more adapted to climate change, and increasing productivity. Also noteworthy are the Inovagro credit lines, which seek to stimulate innovation among producers, and Proirriga, which promotes the adoption of irrigation as a contribution to climate change mitigation. Pronaf Floresta, Bioeconomia, Agroecologia e Semiárido stand out in the area of family farming, with the aim of encouraging the recovery of forest reserves, the implementation of agroforestry systems, and the adoption of practices for coexisting with the environmental constraints present in the Brazilian semi-arid region. In line with the development of the Brazilian Sustainable Taxonomy (Taxonomia Brasileira Sustentável - TSB), the Safra Plan began on an experimental basis in 2025 to grant interest rate discounts for operating loans to producers who adopt good production practices, provided they are certified by public or private entities and accredited in one of the Ministry of Agriculture and Livestock's good practice programs.

These policies are complemented by initiatives such as the National Bio-inputs Program (Decree No. 10375/2020), which encourages the sustainable production and use of biological inputs, the National Policy for the Recovery of Native Vegetation (Proveg) (Decree No. 8972/2017), implemented by the National Plan for the Recovery of Native Vegetation (Planaveg), which aims to articulate, integrate, and promote policies, programs, and actions aimed at the recovery of forests and other forms of native vegetation, in addition to promoting the environmental regularization of rural properties, and the National Policy on Climate Change (PNMC) (Law No. 12187/2009), which seeks nationwide actions to address present and future climate change. The PNMC consolidated the country's commitments to the United Nations Framework Convention on Climate Change (UNFCCC), and one of its main guidelines is the definition of integrated strategies for mitigating and adapting to climate change. In addition to the policies mentioned above, the National Programme for the Reduction of Pesticides (PRONARA) (Decree No. 12538/2025) has been recently created. The initiative combines residue research, information, and monitoring tools, providing as well technical support, agricultural extension, and incentive for the use of bioinputs, aiming to reduce the use of pesticides and increase sustainable food production.

This set of actions aims to consolidate Brazil as a leader in sustainable agriculture, thereby strengthening international competitiveness and contributing to food security and sustainable development. The strategy aims not only to support the sector's economic growth but also to adapt production to environmental and technological demands, preparing it for future climate and market challenges.

Prioritization of activities

Cross-cutting approach to all climate objectives: For the agriculture, livestock, forestry, fishing and aquaculture sector (CNAE A), discussions on prioritizing activities were held throughout 2024 in meetings and technical workshops. These discussions sought to capture the specificities of the sector, as well as its contribution and risk to achieving the environmental and climate and socio-economic objectives prioritized by TSB. To define the priority activities, various agribusiness value chains were evaluated, and those with the largest share in the country's cultivated area, in the value of agricultural production, in access to credit and other means of rural financing were chosen, in addition to choosing activities/chains that represented the agricultural production of the country's five major regions, as well as an activity directly linked to the recovery of native vegetation. To facilitate the work in this initial process of building the TSB, a very limited number of products/activities were selected, seeking to include at least one representative example of annual crops, perennial crops, livestock, forestry production, and aquaculture and fisheries, as well as an activity linked to environmental recovery. It is important to note that, in future phases of expanding the scope of the TSB, the aim will be to systematically include new activities/value chains, based on the methodological and operational advances made in developing technical criteria for the chains selected in the first phase. Furthermore, in future phases, the intention is to develop criteria for assessing the sustainability of rural properties as a whole, with a focus on labeling agricultural operating loans as sustainable. This evolution will represent a significant expansion of the current approach, which is centered on investment projects in specific practices.

The environmental and climate goals include climate change mitigation (Objective 1), climate change adaptation (Objective 2), and conservation and sustainable management and use of soil and forests (Objective 4), in addition to the sector's cross-cutting influence on all the other environmental objectives. For the CNAE A sector, the activities and practices implemented can either generate a substantial contribution or cause significant harm to several climate and environmental objectives simultaneously. Separating contribution and harm by environmental objective represents a major challenge. For this reason, the development of criteria adopted a cross-cutting approach, integrating all climate and environmental objectives.

In addition, a specific approach to Objective 2 is presented below to offer a more comprehensive list of specific measures that can support the sector in its adaptation efforts, considering its notable vulnerability to extreme weather events, which are becoming increasingly frequent.

The criteria, derived from the cross-cutting approach to climate and climate objectives and aimed at the CNAE A sector, were structured based on practices, separated by previously prioritized activities or value chains (see TSB Methodology).

Specific approach to climate change adaptation (Objective 2): The methodology for selecting activities and measures for the adaptation to climate change objective is based on three main steps:

1) identify environmental and climate impacts by sector,
2) propose specific measures to address these impacts and
3) classify them based on established eligibility criteria.

This process is guided by alignment with the goals and priorities of the National Adaptation Plan (PNA, 2021), supported by scientific evidence that demonstrates its positive contribution to climate adaptation, by the ambition to strengthen the resilience of sectors and activities in the face of the impacts of climate change and by interoperability with other international and regional taxonomies. This approach includes adapted and enabling measures. The metrics for determining the eligibility of adaptation measures in all sectors involved the following options: quantitative/verifiable metrics to demonstrate impact, a list of technical criteria and qualitative checks, a list of eligible activities and measures, and vulnerability assessments (see TSB Methodology, section Methodologies for Objective 2 — Climate change adaptation).

Public consultation updates and considerations for future editions

The preliminary proposals for the first edition of the TSB were submitted for public consultation between November 16, 2024, and March 31, 2025, structured in two disclosure stages. The first stage of the consultation included the introductory documents of the TSB, while the second stage provided technical and thematic chapters, including technical criteria for Objective 1 and Objective 2, minimum safeguards and adjustments to economic activities. Civil society was able to contribute freely throughout the process.

This technical chapter incorporates the contributions received and the adjustments made during the public consultation. Below are specific considerations for future updates:

- Inclusion of new economic activities and priority value chains;
- Definition of criteria specific to rural property;
- Improvement of implementation indicators for sustainable practices.
- Review and update of sustainable practices, with enhanced descriptions and inclusion of new practices in the Appendixes.

Cross-cutting approach to all TSB's climate and environmental objectives

Categories of eligible activities

- A1: Annual crops (soybeans and corn) — Appendix A1
- A2 and A3: Perennial crops (coffee and cocoa) — Appendixes A2 and A3
- A4: Grazing systems (beef and dairy cattle) — Appendix A4
- A5: Planted forests (eucalyptus) — Appendix A5
- A6: Assisted Natural Regeneration (ANR) of native forests — Appendix A6
- A7: Fishing (Pirarucu) — Appendix A7
- A8: Aquaculture (excavated nurseries) — Appendix A8

Criteria for substantial contribution

The practices and activities of the agriculture, livestock, forestry, fishing and aquaculture sectors (CNAE A) have the potential to contribute substantially to several TSB objectives simultaneously, while also providing specific benefits for certain objectives, even those that were not prioritized in the initial development phase.

The priority objectives of this edition of the TSB – namely, climate change mitigation, climate change adaptation and conservation and sustainable use of forests (Objectives 1, 2, and 4) - are addressed in a focused way by the practices listed, which also contribute substantially to other environmental objectives, in some cases. Additionally, the criteria of "Do No Significant Harm" (DNSH) for this cross-cutting approach are considered below. Given the sector's complexity, even practices that contribute substantially to a particular short-term objective can cause harm to other objectives if specific measures are not implemented. It is worth noting that the climate change adaptation (Objective 2) is also analyzed through a specific approach presented in the next section. This approach seeks to list a wide range of activities and measures that can be applied to the sector, contributing exclusively to this objective, which is fundamental given the sector's high susceptibility to the impacts of climate change.

For a substantial contribution, a structure based on practices is adopted; these practices are eligible for investment projects on their own, since they are aligned with one or more TSB objectives, and listed by previously prioritized activities or value chains (Appendixes A1 to A8) (see Methodology of the TSB, sections *Methodologies for Objective 1 — Climate change mitigation* and *Methodologies for Objective 4 — Conservation and sustainable management and use of soil and forests*).

These good practices must meet certain quantitative and/or qualitative indicators, which are verifiable after their implementation. Qualitative indicators are used when there are no metrics to verify the adoption of a good practice.

The list of eligible practices is presented for each activity in Appendixes A1 to A9, accompanied by the following information:

- **Title of Practice:** Name of eligible practice.
- **Components of Practice:** A description of the main elements or actions that make up the practice.
- **Description:** A detailed explanation of how each component contributes to the effectiveness of the practice.

Eligible items: A list of resources, materials, or equipment essential for implementing the practice. These components will be linked to the necessary investments. It should be noted that this is not an exhaustive list. It includes only items considered essential and does not cover all requirements needed for implementation.

- **Implementation indicators (monitoring):** Indicators that assess whether the practice has been implemented properly, with a focus on monitoring the effectiveness of the investment.
- **Link to TSB Objectives:** The objectives of the TSB for which the practice is considered qualified to make a substantial contribution
- **Scientific References:** Sources or studies that support and validate the practice.

For a practice to be considered eligible to make a substantial contribution to one or more of the TSB's objectives, it must, in addition to complying with the TSB's general technical criteria (substantial contribution, NPS, and minimum safeguards), also meet the implementation (monitoring) indicators mentioned above after its execution. Moreover, the capital directed towards its implementation (use of resources) must be applied to at least three eligible items essential to its realisation, without excluding the possibility of investment in other necessary and unlisted items, provided that the initial condition is met. If the financed practice includes among its eligible items tractors, general-purpose machinery and implements, the purchase of animals for fattening, or buildings and general-purpose facilities, these items may not represent, individually, more than 30%, nor collectively, more than 40% of the total funds raised and allocated to the practice's implementation. It is essential that the assets financed and labelled as 'sustainable' are genuinely directed, in substance, towards implementing the qualified practices.

Do no significant harm (cross-cutting approach)

The principle of "Do No Significant Harm" in the agriculture, livestock, forestry, fishing and aquaculture sector (CNAE A) is based on the adoption of complementary measures to eligible practices, as detailed in the previous section and appendixes. These measures are essential to ensure that the implementation of practices does not result in adverse impacts on any of TSB's other objectives.

For each objective, it is essential that, at the rural property level, at least three harm-prevention measures for each climate and environmental objective are applied (or already implemented) in the areas where eligible practices are being implemented.

For a practice, or the investment in that practice, to be considered in line with the TSB, in addition to the other requirements already mentioned, there must be documented evidence proving that measures, such as those exemplified below, are in place on the property where the qualifiing practice will be carried out.

Below is a **non-exhaustive** list of examples of measures that prevent harm to each of the TSB's climate, environmental and socio-economic objectives (Table 1).

Table 1. Measures to prevent significant harm specific to the cross-cutting approach to all of the TSB's Environmental, Climate, and Socio-economic Objectives.

Do no significant harm (DNSH)	
Measures	**Environmental and climate objectives**
• Implementation of measures aimed at replacing fossil energy sources with renewable energy (solar, wind, biomass, and other renewables) or effectively reducing fossil fuel consumption.	• Climate change mitigation
• Implementation of integrated fire management (IFM) measures; fire prevention and rapid response actions (including the creation of firebreaks, installation of green barriers, etc.); development of early warning systems to identify fire outbreaks; alerts for conditions conducive to wildfires; and training of rural producers and technicians to form fire brigades, firefighters, and fire managers to implement IFM actions.	• Climate change mitigation • Climate change adaptation • Protection and restoration of biodiversity and ecosystems • Conservation and sustainable management and use of soil and forests
• Adoption of biodigesters to capture and use the biogas and biofertilizers generated by the biodigestion of manure, reducing methane emissions and soil and water contamination. Implementation of biodigesters to promote the anaerobic decomposition of organic waste, capturing and using biogas, both in its original composition and when converted into biomethane, as well as the biofertilizers produced from manure, thereby reducing methane emissions.	• Climate change mitigation • Pollution prevention and control
• Identification and restoration/ degraded areas recovery, both from the recomposition of native vegetation, silviculture (native and/or exotic species), in integrated systems, agroforestry systems, and aquaculture, as well as through soil correction and the implementation of new vegetation cover, with more efficient forage plants adapted to the tropical climate.	• Climate change mitigation • Climate change adaptation • Protection and restoration of biodiversity and ecosystems • Conservation and sustainable management and use of soil and forests
• Implementation and monitoring of strategies to reduce enteric methane production in ruminants.	• Climate change mitigation

Do no significant harm (DNSH)	
• Implementation of digital platforms based on geographic intelligence to monitor soil and water quality in real time, enabling rapid adjustments in agricultural, forestry, aquaculture, and fishing practices.	• Climate change mitigation • Climate change adaptation • Conservation and sustainable management and use of soil and forests
• Use of genetic materials adapted to adverse climatic conditions, such as water stress and higher temperatures.	• Climate change adaptation
• Adoption of soil conservation and management practices.	• Climate change mitigation • Climate change adaptation • Protection and restoration of biodiversity and ecosystems • Conservation and sustainable management and use of soil and forests
• Adoption of technologies to optimize the use of water and to utilize rainwater and reuse water on the property in a manner integrated with the landscape, considering, for example, irrigation, human and animal watering, etc.	• Climate change adaptation • Sustainable use and protection of water and marine resources

Do no significant harm (DNSH)	
• Implementation of agroecological practices that promote biological diversity and soil health, such as the use of cover crops and crop rotation. • Allocation of Legal Reserve, or maintenance of significant portions of areas covered by native vegetation, contiguous to permanent preservation areas that promote the connectivity of natural areas in order to allow the movement of species and the maintenance of biodiversity. • Establish and preserve hydrologic connectivity zones between aquatic habitats, ensuring that the migration and genetic flow of aquatic species is maintained. • Establishment of monitoring programs to assess the health of natural ecosystems and species diversity. • Implementation of monitoring systems to ensure that aquaculture practices do not compromise the health of aquatic ecosystems. • For aquaculture activities carried out in excavated ponds, it is essential to observe CONAMA National Environmental Council (*Conselho Nacional do Meio Ambiente*, CONAMA) Resolution no. 413/2009 to mitigate risks associated with introduction and dissemination of exotic and invasive species.	• Protection and restoration of biodiversity and ecosystems
• Implementation of measures aimed at conserving ecosystems, such as protecting pollinators, maintaining green infrastructure and diversifying the landscape, crop rotation, replacing the use of pesticides with appropriate bio-inputs, alternative techniques to aerial spraying, etc.	• Protection and restoration of biodiversity and ecosystems • Conservation and sustainable management and use of soil and forests
• Use of the property's natural forests through a sustainable forest management plan approved by the competent body, for the production of timber, non-timber products, and/or environmental services.	• Conservation and sustainable management and use of soil and forests

Do no significant harm (DNSH)	
• Participation in water management initiatives in the watershed in which the property is located, including erosion control and the increase of native vegetation or infrastructure that promotes the infiltration of water into the soil, especially in aquifer recharge areas.	• Sustainable use and protection of water and marine resources
• Use of properly managed fishing equipment and techniques, low-impact aquatic food production in river, lake, and estuarine environments.	• Sustainable use and protection of water and marine resources
• Use of data-driven irrigation practices, with precise application of the water depth necessary for crop development	• Sustainable use and protection of water and marine resources
• Implementation of measures to prevent the contamination and destruction of mangroves, estuaries, and coral reef bleaching through systems for collection, treatment, and proper disposal of rural solid waste, as well as control of erosion and management of chemical fertilizers use.	• Sustainable use and protection of water and marine resources • Transition to a circular economy
• Implementation of production systems that integrate agriculture and livestock, utilizing animal manure (biodigestion) and vegetable waste (composting) as a source of nutrients for plants. Use of crop residues as raw material for composting or bioenergy production, closing nutrient cycles.	• Transition to a circular economy
• Implementation of recycling and solid waste treatment plants to convert these materials into electricity and fertilizers, promoting the circular economy and reducing environmental impacts.	• Transition to a circular economy
• Implementation of integrated pest, disease, and weed management practices to promote sustainability and minimize environmental impacts, such as crop rotation to break the life cycles of pests and diseases and improve soil fertility and health; monitoring of crops for early	• Conservation and sustainable management and use of soil and forests • Pollution prevention and control

Do no significant harm (DNSH)	
identification of herbivory and diseases; use of resistant cultivars; use of biological control and bio-inputs.	
• Use of organic fertilizers obtained through biodigestion and composting processes to reduce dependence on synthetic chemical products.	• Conservation and sustainable management and use of soil and forests • Pollution prevention and control
• Implementation of systems for segregation at source, collection, treatment, and proper disposal of agricultural waste, preventing soil and water contamination.	• Pollution prevention and control
• Use of technologies for soil and water decontamination through chemical, physical and biological processes.	• Pollution prevention and control
• Use of crop residues as raw material for composting or bioenergy production, closing nutrient cycles.	• Transition to a circular economy • Pollution prevention and control
• Annex A1: Do no significant harm criteria for socio-economic Objective 9.	• Reduction of socio-economic inequalities, including racial and gender disparities

Additionally, some conditions of ineligibility for the rural property where sustainable practices are to be implemented are listed below. The occurrence of any of these conditions will result in the ineligibility of both the property and the other financed practices or activities, even if they are included in Appendixes A1 to A8 and meet all the technical criteria established. This approach ensures that the benefits generated by the practices are not compromised by potential negative impacts on other climate and environmental objectives[1].

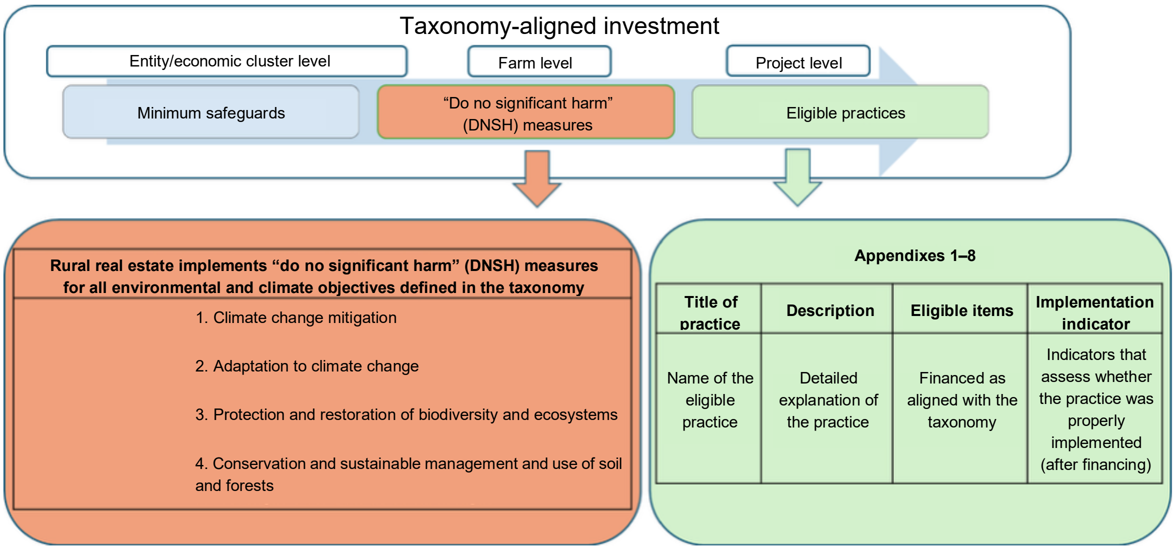
Eligibility conditions for the farm

1. The use of pesticides that do not comply with the provisions of the Stockholm and Rotterdam Conventions or are classified as 1A or 1B according to the World Health Organization (WHO) cannot be financed.
2. The use of pesticides classified in toxicological classes 1, 2, and 3 by Anvisa, and in Environmental Hazard Potential (*Potencial de Periculosidade Ambiental*, PPA) classes I and II of the Brazilian Institute of Environment and Renewable Natural Resources (*Instituto Brasileiro do Meio Ambiente*, Ibama), cannot be financed, except for compositions that demonstrably have no technically and economically viable alternatives, to be specified in the technical project of the financing, while considering the consequences for future financing within the scope of safeguards.

[1] The structure of the Do No Significant Harm (DNSH) criteria for the CNAE A sector: Agriculture, Livestock, Forestry, Fisheries, livestock, forestry, fishing and Aquacultureaquaculture differs from that adopted for other sectors due to its complexity and diversity. Production systems and the realities of the sector vary widely across different regions of the country, which is why adopting DNSH criteria with exhaustive lists and general requirements would make their application impossible on a national scale.

3. Financing intended for the suppression of native vegetation cannot be considered sustainable, even if the deforestation is in compliance with Law No. 12651, of May 25, 2012 (Brazil's Forest Code).
4. Even if it complies with Law No. 12651, of May 25, 2012, the financing for rural properties will not be considered sustainable if:
   a. As of the beginning of the Brazilian Sustainable Taxonomy, the property has registered native vegetation suppression; or
   b. As of January 1, 2030, the property has recorded native vegetation suppression in the five (5) years preceding the financing request.
5. Item 3 does not apply to rural properties where the suppression of native vegetation has been:
   a. Less than 5 hectares in total during the period; or
   b. Carried out exclusively to clear fallow areas that were previously used for agricultural production, provided that the previous agricultural use was interrupted for no more than 5 years and that the area will be allocated for agricultural, livestock, or forestry activities in compliance with environmental legislation.

Application infographic (cross-cutting approach)



Objective 2 — Climate change adaptation (specific approach)

The agricultural sector faces significant risks due to its high vulnerability and exposure to changes in climate conditions. Rising temperatures, unpredictable rainfall and the increasing frequency of extreme weather events such as droughts, floods, and storms pose serious challenges to agricultural productivity. These changes threaten the livelihood of the population, agricultural productivity, animal health, and the stability of food supply chains, putting the national economy and food security at risk locally and globally.

Adaptation measures, designed to reduce the impacts of extreme weather conditions by enhancing the resilience of a given sector, are essential for tackling these threats. By implementing strategies that strengthen adaptation and resilience to climate impacts, agriculture can better cope with growing uncertainties. These efforts aim to protect agricultural productivity and the livelihoods of millions of people who depend on agriculture. In addition, adaptation helps ensure food security, strengthens rural economies, and promotes sustainable development by reducing the sector's vulnerability to climate-induced shocks.

How to use these criteria:

Appendix A9 brings together all the measures qualified by this approach for the CNAE A sector. To ensure alignment with TSB, measures must meet not only the specific criteria presented in these appendixes, but also the DNSH-specific technical criteria for this approach, as described in Table 3. Some measures are directly qualified by simply meeting the DNSH criteria. The list of directly qualified measures, as well as those that must meet specific criteria and their respective criteria, is provided in Appendix A9. The measures can also be classified as adapted or enabling. Adapted measures are those that increase the climate resilience of the activity in which they are applied. On the other hand, enabling measures are implemented within an activity to make other activities more climate resilient. This classification is merely explanatory for the measures listed in Appendix A9.

In addition, any activity in the sector (e.g., soybean production, corn, fish farming, etc.) or other measure (not listed in Appendix A9), adapted or enabling, that contributes to improving the resilience of the CNAE A sector, can be considered aligned with the TSB, as long as it meets the technical criteria of a vulnerability assessment specified in Table 2.

Criteria for substantial contribution: types of technical criteria applied

Qualified measures in the CNAE A sector apply the following types of technical criteria:

- **Directly qualified:** activities or measures with a low risk of maladaptation and a high potential for a substantial contribution to climate change adaptation.
- **Vulnerability assessment:** for any other measure not listed in the Adapted and Enabling Measures, a detailed vulnerability assessment is required to demonstrate that such a measure contributes to improving the sector's resilience. This applies to both adapted and enabling measures.

Vulnerability assessment

Any sector activity or additional measures (not listed in Appendix A9), adapted or enabling, that favor the resilience of the CNAE A sector, can be considered aligned with TSB, as long as they comply with the vulnerability assessment criteria described in the table below.

Table 2. Criteria for Vulnerability assessment of measures in the CNAE A sector

Adapted activities/measures	
Criteria	**Description**
1. Reduce physical and material climate risks: The economic activity must reduce all physical and material climate risks for that activity as much as possible and on a best effort basis.	1.1 The economic activity integrates physical and non-physical measures aimed at reducing, as far as possible and on a best-efforts basis, all material physical climate risks for that activity, which have been identified through a risk assessment (MMA, 2024). The criteria for risk assessment can be qualitative or quantitative, depending on the level of risk: • For low risks, a qualitative technical analysis can be developed to identify the criticality or vulnerability and the actions to mitigate the risk. • For moderate risks, a qualitative analysis can be used to identify criticality or vulnerability, along with a narrative developed through stakeholder consultation on actions to mitigate the risk. • For high risks, both qualitative and quantitative analyses should be conducted to identify criticality or vulnerability, developing a narrative in consultation with stakeholders and quantifying the risks of developing actions to mitigate the risk. **Note:** Any of the following methodologies can be considered to assess risks and vulnerabilities: • Taxonomy of adaptation solutions (BID, 2020). • Risk assessment methodology for disasters and climate change (Barandiarán, Esquivel, Lacambra, Suarez, & Zuloaga, 2019). (Barandiarán, Esquivel, Lacambra, Suarez, & Zuloaga, 2019) • National Adaptation Strategy (PNA, 2021). • Evaluation of Brazilian socio-environmental vulnerability methodologies as a result of urban issues in Brazil (Maior & Cândido, 2014). • ISO 14090, ISO 14091, or ISO 1409
	1.2 The risk assessment has the following characteristics: • It considers the best available information on climate variability, observed changes and future climate change scenarios, using a multi-modal approach to estimate the uncertainties associated with climate modeling. • It is based on a robust analysis of available climate data and projections in a series of future scenarios at various scales (national, regional, local).

Adapted activities/measures	

	• It seeks to measure the probable losses avoided through the implementation of adaptation measures.
	• It is consistent with the expected lifespan of the targeted activity and sector.
	  ○ For activities with a life expectancy of less than 10 years, the assessment is carried out, as a minimum, using climate projections on the smallest appropriate scale.
	  ○ For all other activities, the assessment is carried out using the most advanced and highest-resolution climate projections available across the existing range of future scenarios consistent with the expected lifetime of the activity, including at least 10 years.
	  ○ The future scenarios include the Intergovernmental Panel on Climate Change's Shared Socio-economic Pathways and the most up-to-date future scenarios for the country.
	  ○ It considers possible unintended consequences or side effects.

	1.3 If the risk assessment determines that climate change will have a significant impact on the activity or asset, a corresponding adaptation plan must be defined, describing how the identified climate risks will be managed throughout the project.
2. Adaptation support systems The economic activity and its adaptation measures do not negatively affect the adaptation efforts of other people, nature, and property. It also supports systemic adaptation.	2.1 The economic activity and its adaptation measures do not negatively affect adaptation efforts or the level of resilience to physical climate risks of other people, nature, cultural heritage, assets, and other economic activities. Avoid maladaptive actions (DNSH), where measures in one sector affect and increase the risk of another sector.
	2.2 The economic activity and its adaptation measures are consistent with local, sectoral, regional, or national adaptation strategies and plans; and consider the use of nature-based solutions or blue or green infrastructure as far as possible.
Enabling measures	
3. Contribution to the adaptation of other economic activities	3.1 The economic activity reduces or enables adaptation to physical climate risks beyond the limits of the activity itself. The activity should demonstrate how it supports adaptation through:

Adapted activities/measures	
The economic activity reduces material physical climate risk in other economic activities and/or addresses systemic barriers to adaptation. Activities that enable adaptation include, but are not limited to the: • Promotion of technologies, products, practices, governance processes, and innovative uses of existing technologies and practices (including those related to natural infrastructure). • Removal of information, financial, technological, and capacity barriers to facilitate the adaptation of others.	• An assessment of the risks of current climate variability and future climate change, including uncertainties, using a multi-modal approach, that the economic activity will help to mitigate, based on robust climate data. • An assessment of the effectiveness of the contribution of economic activity to reducing these risks, considering the scale of exposure and vulnerability to these risks. • An assessment of the co-benefits of adaptation in terms of climate change mitigation and disaster risk reduction and avoided losses. 3.2 In the case of infrastructure linked to an activity that allows adaptation, this infrastructure must also meet the technical selection criteria for "adapted activities".

Cross-cutting criteria for adapted and enabling measures (not listed in Appendix A9)	
Monitoring adaptation outcomes	Adaptation outcomes can be monitored and measured based on defined indicators. Recognizing that risk evolves over time, updated physical climate risk assessments should be carried out at an appropriate frequency, whenever possible. **Establish measurement indicators:** • Define clear and measurable indicators to assess the reduction of climate-related physical risks. • Ensure these indicators are relevant and reflect the real impact of the activity on adaptation. • The adaptation plan must have measures implemented to reduce physical risks consistent with the vulnerability assessment and the indicators for monitoring. **Continuous monitoring:** establish a continuous monitoring system to measure and assess adaptation outcomes over time. In addition, conduct updated climate risk assessments at an appropriate frequency, taking into account changes in circumstances and the evolution of risks. **Transparent communication:** establish a communication plan focused on providing adaptation actions and their outcomes. This is necessary to provide clear information on how these efforts contribute to climate risk reduction and the successful adaptation of other economic activities.

Source: Own elaboration

DNSH Cross-cutting criteria (specific approach to Objective 2)

The following criteria apply to all measures listed in Appendix A9, as well as any activity or other measure that contributes to the sector's resilience, provided it is supported by a vulnerability analysis (previous section). The DNSH criteria are based on the adoption of complementary criteria to the substantial contribution criteria, with the aim of ensuring that their implementation does not cause adverse impacts on other TSB's climate, environmental, economic and social objectives. In addition, the criteria of DNSH to the economic and social objectives of reducing socio-economic inequalities, including racial and gender disparities, listed in Annex A1, must be met (Do no significant harm criteria for social-economic Objective 9).

Table 3. Specific DNSH criteria for the specific approach to climate change adaptation (Objective 2).

Do no significant harm	
Generic	• Aligned assets and activities must adhere to the local regulatory framework and policies relevant to their activity and the territory in which they are carried out, as well as having an environmental management system in place. • Entities implementing economic activities or asset owners must demonstrate the existence of a management system proportional to the size of the investment and the scale of the project/entity implementing the financing. • The aligned activity must ensure that it does not generate a negative social impact. To do this, they must adhere to the relevant local regulatory framework and policies and have a social management system in place.

Do no significant harm	
Climate change mitigation	• The activity/measure does not negatively affect the mitigation efforts of other public or private agents. • The activity/measure does not lead to an increase in net GHG emissions. • Economic activity is consistent with sectoral, regional and/or national mitigation efforts.
Protection and restoration of biodiversity and ecosystems	• New construction should not be located in areas that are strategic for food security, rich in biodiversity or that serve as habitat for endangered species, such as those protected by national laws or included on the International Union for Conservation of Nature (IUCN) Red List. • If the facilities are close to sensitive areas, such as UNESCO World Heritage sites or protected areas, an assessment must be carried out according to the criteria of the International Finance Corporation's (IFC) Performance Standard No. 6 or an equivalent national instrument. It is necessary to implement a long-term biodiversity monitoring program.
Conservation and sustainable management and use of soil and forests	• The activity or asset does not alter the physicochemical and biological integrity of the soil but instead improves the state of this resource.

Do no significant harm	
Transition to a circular economy	• Apply the principles of the Circular Economy (EU Parliament, 2023) or national standards related to the removal and dismantling of plants and infrastructure. • Seek maximum efficiency in the use of materials, promoting reduction, repair, recycling, and reuse, as well as ensuring the proper treatment and disposal of waste, such as batteries or Waste Electrical and Electronic Equipment (WEEE), complying with the principles of extended producer responsibility (ELLEN MACARTHUR FOUNDATION, 2022). • Design and manufacture new facilities so that they are durable, easy to dismantle, renovate, and recycle. • Ensure the proper repair of facilities and equipment and the accessibility and interchangeability of equipment components.

Do no significant harm	
Pollution prevention and control	• Water discharges must comply with the discharge permits of the competent National Environmental Authority. • Emissions that pollute the air must have the necessary permits and comply with current national legislation, with special attention to hazardous waste. • Integrated management of waste generated must be carried out by duly authorized waste managers.

Do no significant harm	
Sustainable use and protection of water and marine resources	• Identify, assess and manage the risks associated with water consumption and quality. Water quality risk analysis tools should be used when available. • If assets or activities are located in areas experiencing water stress, sustainable water use management plans must be implemented, covering social, economic, and environmental dimensions, as well as water conservation, and developed in consultation with all relevant local entities.
Reduction of socio-economic inequalities, considering racial and gender aspects	• Annex A1: Do no significant harm criteria for socio-economic Objective 9.

Source: Own elaboration.

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Appendix A1.

Annual crops: Sustainable practices for the Soy – Corn binomial

CNAEs:

- 01.15-6/00: Soybean cultivation
- 01.11-3/02: Corn cultivation

Description:

Annual crops are cultivated plants that complete their life cycle in a single year, from germination to harvest. Among the common combinations in the Brazilian agricultural system, the combination of soybean (*Glycine max)* and corn (*Zea mays*) stands out, which make up a widely adopted production model. Soybean, widely cultivated due to their high economic value and global demand, and corn, used for both human consumption and animal feed, together form an efficient production system.

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
1. GENETICS AND PLANTING PRACTICES	1.1. Soybean co-inoculation	Co-inoculation of soybeans with bacteria of the genus *Bradyrhizobium* and *Azospirillum brasilense* enables all the nitrogen (N) required by soybeans to come from the soil and biological N fixation, eliminating the need for mineral nitrogen fertilization. In addition, co-inoculation increases root growth and, consequently, improves nutrient and water uptake, productivity, and tolerance to water deficit. The	Bio-inputs (inoculants). Seed treatment and inoculant application equipment adapted to the seeder (in the sowing furrow).	Effective use of inoculation with bacteria of the genus *Bradyrhizobium* and *Azospirillum brasilense*.	1. Climate change mitigation.	(Hungria, Nogueira, Araujo, 2015)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		production of soybeans, the world's largest source of protein, without the use of mineral nitrogen fertilizers reduces the emission of nitrous oxide, one of the main GHGs, into the atmosphere.				
	1.2. Use of certified corn and soybean seeds	The use of certified seeds allows for proper plant establishment and maximizes grain yields. It also reduces the transmission of seed-borne diseases and the infestation of weeds whose diaspores may be present in the seeds. The use of corn and soybean seeds with high physiological quality reduces the negative effects of thermal and/or water stress.	Purchase of certified seeds, cold room, and seed treaters	Use 100% certified seeds in its production system.	7. Pollution prevention and control.	(França Neto et al., 2010)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
2. PLANT FERTILITY, FERTILIZATION, AND NUTRITION	2.1. Fertilizing and correcting the soil according to analyses and technical recommendations (quantity, positioning, frequency)	Fertilizing and correcting soil acidity are fundamental practices for achieving economic yields and biomass production, influencing soil and water conservation over time. The correction of acidity and balanced fertilization is fundamental for mitigating and adapting to climate change. The absence of significant chemical restrictions in the soil profile for corn and soybean root growth increases access to water, reducing the negative effects of water deficit, which is often associated with thermal heat stress.	Correctives and fertilizers. Equipment for distributing correctives and fertilizers. Technical assistance for sampling and interpretation of soil and plant tissue analyses. Georeferenced soil chemical, physical, and biological collection and analysis service and respective interpretation and application maps.	Chemical, physical, and biological analysis of soil and plant tissue and nutrient export from cultivated areas.	2. Climate change adaptation.	(Debiasi et al., 2023)
	2.2. Physical and biological analyses to monitor soil quality	Monitoring the soil's physical and biological properties is important for adjusting management practices to correct any soil management problems. The absence of significant physical restrictions in the soil profile for corn and soybean root growth	Hiring technical assistance and laboratory services to collect, analyze, and interpret/recommend biological and physical soil analyses.	Physical and biological soil analysis.	2. Climate change adaptation.	(Mendes et al., 2024)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		increases access to water and nutrients, reducing the negative effects of water deficit, which is often associated with thermal heat stress. At the same time, it is known that there is a positive correlation between soil biological activity and the productivity and stability of corn and soybean crops.				
3. INTEGRATED PEST, DISEASE, AND WEED CONTROL	3.1. Integrated pest management (IPM) for corn and soybean	Integrated insect and pest management enables the rationalization of insecticide use, reducing production costs and potential environmental contamination from insecticides. It also reduces the appearance and infestation of insects that are resistant to insecticides. IPM consists of: Apply only chemical products registered for the crop, following technical recommendations, agronomic prescriptions, and the legislation in force. Only adopt control	Purchase of inputs: Purchase of sprayers and Remotely Piloted Aircraft-RPA (drones), including accessories for localized and variable-rate application. Software for registering and managing the property and phytosanitary management in IPM. Technical assistance. Training and technical	Use of registered insecticides for crops, cultivars registered for the region, sowing within the planting window recommended by the Agricultural Climate Risk Zoning (ZARC), fertilization and soil correction, and crop rotation.'	7. Pollution prevention and control.	(Bueno et al., 2021)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		measures when the density of a particular insect species exceeds the level of economic damage. Do not adopt control if the population density of natural enemies is sufficient to balance the pest population and the damage is below the damage level tolerable to the producer. Prioritize the use of natural, biological, and biotechnological methods.	qualification of producers and employees.			
	3.2. Integrated weed management (IWM) in corn and soybean	Integrated weed management enables the rationalization of herbicide use, reducing production costs and the possible environmental contamination from herbicides. It is also important for reducing the appearance and spread of herbicide-resistant biotypes. Apply only chemical products registered for the crop, following technical recommendations, agronomic prescriptions, and the	Purchase of sprayers and Remotely Piloted Aircraft-RPA (drones), including accessories for localized and variable-rate application. Purchase of an autopilot. Software for registering and managing the property and phytosanitary management in IPDM.	Use of herbicides registered for the crop; cultivars registered for the region; sowing within the recommended planting window (ZARC); fertilization and soil correction; crop rotation	7. Pollution prevention and control.	(Adegas et al., 2022)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		legislation in force. Use non-chemical cultural methods to control invasive plants whenever possible; prevent the production of seeds or the introduction of new species into the crop area. When agrochemicals are needed, prefer those with the lowest degree of environmental contamination, according to the information on the product label.	Personal protective equipment (PPE), technical assistance (maintenance and repair). Training and technical qualification of producers and employees.			
	3.3. Integrated disease management (IDM) in corn and soybean	Integrated disease management enables the rationalization of fungicide use, reducing production costs and potential environmental contamination from fungicides. It is also important to reduce the appearance and spread of fungicide-resistant biotypes. Apply only chemical products registered for the crop, following technical recommendations, agronomic prescriptions, and the legislation in force.	Purchase of inputs: biofungicides, resistance inducers, etc. Purchase of sprayers and drones, including accessories for localized and/or variable rates application. Purchase of an autopilot. Software for registering and managing property and phytosanitary management. Technical assistance. Training and technical qualification of	Use of fungicides registered for the crop; cultivars registered for the region; sowing within the recommended planting window (ZARC); fertilization and soil correction; crop rotation.	7. Pollution prevention and control.	(Godoy; Bueno; Gazziero, 2015)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			producers and employees.			
4. MANAGEMENT AND CONSERVATION OF SOIL, WATER AND VEGETATION COVER	4.1. Conservation practices complementary to SPD	In areas with steep slopes and/or long inclines, complementary practices to DPS are needed to properly conserve soil and water, especially terraces.	Technical assistance for locating and implementing soil and water conservation practices (terraces, retention basins, contour lines, etc.). Rental of machinery, equipment, and implements to implement conservation practices. Purchase of a terrace harrow and a backhoe loader. Financing for the relocation of rural roads under the responsibility of municipalities.	Verification of the presence of physical structures (terraces, contour lines, level cultivation, roads) designed to reduce water erosion in the field or by remote sensing	4. Conservation and sustainable management and use of soil and forests.	(Freitas et al., 2021.)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
5. SUSTAINABLE PRODUCTION SYSTEMS	5.1. Direct Planting System (DPS)	DPS increases soil and water conservation, reduces greenhouse gas emissions, allows intensification of land use, and increases productivity, stability, and profitability of agricultural activities in Brazil. Therefore, it plays a central role in climate change mitigation and adaptation, sustainable land use, and the reduction of socio-economic and regional inequalities.	Purchase of seeders and/or adaptation kits for no-till farming; purchase of harvester with chopper and/or straw spreader; sprayer; technical assistance — machine maintenance; purchase of seeds (crops and cover crops); tractor or micro-tractor; purchase of equipment for handling crop residues and biomass from cover crops.	Area under DPS adopted following the three basic technical criteria: minimal soil turning over; permanent soil cover (live plants or crop residues); and adoption of diversified production systems, including the use of cover crops. Field verification and/or the use of remote sensing tools enable auditing the practice and its three associated technical criteria.	1. Climate change mitigation.	(Debiasi et al., 2022)
	5.2. Crop-livestock integration (CLI)	CLI makes it possible to intensify the use of land, labor, and other resources, reducing the need to open new areas for cultivation — the land-saving effect. In addition, CLI increases soil carbon sequestration, reduces the	Tractors, seeders, grain and forage harvesters. Livestock. Infrastructure for water distribution and construction of fences. Animal handling equipment (scales, cattle	Area with implemented CLI. Field verification and/or the use of remote sensing tools enable auditing the practice and its three	1. Climate change mitigation.	(Salton et al., 2014)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		pressure of biotic and abiotic stresses, making a significant contribution to climate change mitigation and adaptation, as well as sustainable use of soil and water. Reconciling DPS with CLI represents one of the main advances in Brazilian tropical and subtropical agriculture.	chute, etc.). Technical assistance for CLI project development. Seeds and other inputs needed to implement and manage the CLI system.	associated technical criteria.		
6. USE OF DIGITAL TECHNOLOGIES	6.1. Adoption of digital and georeferenced tools for site-specific management	Site-specific management makes it possible to rationalize the use of inputs, reduce costs and/or increase productivity. Producing corn and soybeans with fewer inputs is important for reducing the carbon footprint and increasing producers' income.	Technical assistance; Hiring services to collect soil samples and/or other data to draw up maps of the spatial variability of attributes of interest and application/intervention maps; Acquisition of digital and precision agriculture resources, such as: equipment for localized or variable-rate application; autopilot; telemetry systems in agricultural machinery; on-board sensors;	Digital and precision farming resources.	2. Climate change adaptation.	(Cherubin et al., 2022)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			systems for collecting data and drawing up maps of the spatial variability of attributes of interest; drones and satellite images.			
7. HARVESTING	7.1. Efficient harvesting techniques	Learn about grain losses at harvest. Harvest the grain at the right moisture content to reduce grain losses and drying energy costs. Carry out proper and periodic maintenance on machinery. Adjust machines correctly, according to specifications. Adjust the cylinder's rotation speed appropriately according to the grain moisture content. Reducing corn and soybean grain losses at harvest, even in conditions of severe lodging and/or stalk breakage in the case of corn, in the face of extreme weather	Grain and/or forage harvesters. Implements (forage wagons, agricultural trailers, etc.) for internal transportation of grain and forage. Construction of grain storage structures (silos/warehouses). Technical assistance. Training and technical qualification of producers and employees. Personal Protective Equipment (PPE), Collective Protective Equipment (CPE)	Field and storage verification of grain losses. For soybean, the maximum tolerated is 1 bag/ha. For corn 1.5 bags/ha.	2. Climate change adaptation.	(Silveira et al., 2022)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		events, is important for reducing waste.				

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
8. IRRIGATED AGRICULTURE	8.1. Use of irrigated areas to intensify grain production	Adoption of irrigation systems to increase efficiency in the use of natural resources, with an emphasis on water, and reducing climate risks. This includes sprinkler, micro-sprinkler, and drip irrigation systems.	Acquisition and maintenance of sprinkler, micro-sprinkler, and/or drip irrigation equipment. Purchase of automation tools for irrigation management. Technical assistance (for irrigated system design and management).	Technical project. Environmental licensing. Granting of water use. Prohibited in priority areas for water conservation and in regions where irrigation will lead to a reduction in water availability.	2. Climate change adaptation.	(Bernardo; Mantovani; Silva, 2019)

Appendix A2.

Perennial crops: Sustainable practices for coffee

CNAEs:

- 01.34-2/00: Coffee cultivation

Description:

Perennial crops are plants that remain alive for more than two years, continuing to produce fruit, flowers, or other products over several growing cycles without the need for annual replanting. Coffee cultivation (*Coffea spp.*) is crucial to the Brazilian economy, generating jobs, supplying the domestic market, generating export revenues, and supporting thousands of farmers. In addition, the growing global demand for coffee has driven investments in sustainable cultivation practices and certifications that promote fair trade and social responsibility.

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
1. ENVIRONMENTAL MANAGEMENT	1.1. Fire protection	Inspect the fire protection system annually.	Tractor, disc harrow (firebreaks), firefighting and support equipment, personal protection equipment (PPE), tools, and signs.	Existence of an operational fire prevention system.	3. Protection and restoration of biodiversity and ecosystems	(Embrapa, 2007)
	1.2. Organic waste	Use organic waste from coffee processing (pulp, husk, parchment) on the crop as fertilizer or mulch to improve soil quality or protect it.	Tractor, fertilizer spreader, compost and waste spreader, washer, depulper, fermentation tank, demucilator.	Presence of coffee by-products and other organic waste on the crop and recording in field journals or other devices.	4. Conservation and sustainable management and use of soil and forests.	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.3. Polluting waste	Reduce the generation of polluting solid and liquid waste.	Equipment for pre-cleaning the harvested product and filters for reusing the wastewater from coffee washing.	Existence of a plan to avoid or reduce the production of solid waste.	2. Climate change adaptation.	(Embrapa, 2007)
	1.4. Shading and agroforestry systems	Whenever possible, opt for intercropping with service plants or plants with commercial value that can increase biodiversity and create ecosystem services for the coffee plantation. When choosing, consider plants with desirable characteristics such as the ability to attract natural enemies, fix nitrogen, and generate biomass through pruning, as well as having deeper root systems than coffee trees.	Seedlings, tractor, auger, fertilizers, protection and care supplies, irrigation equipment.	Evidence of trees on the site.	2. Climate change adaptation. 4. Conservation and sustainable management and use of soil and forests.	(Lima, et al. 2010.) (Damatta, et al. 2017)
	1.5. Triple rinsing of	Provide an appropriate place on the property for the triple rinsing of pesticide containers	Buildings, water tanks, water application equipment, pumps.	Evidence of the site's existence.	2. Climate change adaptation.	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	pesticide containers					
	1.6. Cleaning spraying equipment, machinery and equipment	Provide a suitable place on the property to wash spraying equipment.	Buildings, water tanks, water application equipment, pumps.	Evidence of the site's existence.	2. Climate change adaptation.	(Embrapa, 2007)
	1.7. Storage of pesticides	Set aside a safe place to store pesticide containers until they are collected by the responsible agency.	Buildings, ventilation system.	Evidence of the site's existence.	7. Pollution prevention and control	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
2. PROPAGATIVE MATERIAL	2.1. Cultivar selection	Choose cultivars that are suitable and indicated for the location, prioritizing those that are resistant to pests and diseases, and that meet the standard of superior beverage quality. Use only propagative material of known origin from authorized and registered nurseries or produced on the property in accordance with current legislation regarding production of seedlings and with qualified technical supervision.	Seeds, cuttings or seedlings, materials for the structure of the nursery, substrates, containers for the seedlings, irrigation equipment, inputs for protection and care.	The varieties grown are among the most recommended for the region.	2. Climate change adaptation. 4. Conservation and sustainable management and use of soil and forests.	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
3. LOCATION AND ESTABLISHMENT OF COFFEE PLANTATIONS	3.1. Soil mapping	Map the property's soils, focusing on conservation and fertility, and take into account edaphoclimatic suitability and environmental legislation.	Technical design and georeferencing, soil analysis, *Computer Aided Design* (CAD) software, remotely piloted aircraft (drones), image editing software, and GPS devices.	Existence of a soil map of the property	4. Conservation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	3.2. Identification of plots	Identify plots to record information on cultivar, age, and cultivation for traceability purposes.	Technical project and georeferencing, GPS device, signaling material.	Evidence of plot identification for recording information.	4. Conservation and sustainable management and use of soil and forests.	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
4. SOIL FERTILITY AND NUTRITION	4.1. Soil corrections	Identify soil correction and fertilization needs based on official recommendations.	Soil analysis, sampling equipment (such as an auger or equivalent), sample preparation, identification, and handling.	Records of soil correction and fertilization recommendations.	4. Conservation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	4.2. Evaluation of nematodes	Before planting and every two years, monitor the population and type of nematodes present in the different plots on the property.	Nematode analysis.	Records of nematode analysis results per plot.	Conservation and sustainable management and use of soil and forests.	(Salgado, S. M. L., Rezende, J. C. 2010.)
	4.3. Foliar nutritional assessment	Conduct at least one foliar analysis per plot each year.	Foliar analyses.	Records of foliar analysis results by plot.	4. Conservation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	4.4. Selection of correctives and fertilizers	Use correctives and fertilizers registered with MAPA suited to the needs of each plot and avoid nutrient sources of industrial	Solid fertilizer applicators, liquid fertilizer applicators, liquid fertilizer tanks, limestone and phosphate	Field chapter, or other device, with records of information on correctives and	4. Conservation and sustainable management and	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		origin or urban waste that exceed the heavy metal limits permitted by current legislation.	applicators, precision equipment.	fertilizers used. Presence of correctives and fertilizers in sheds.	use of soil and forests.	
5. SOIL AND VEGETATION COVER AND COFFEE TREE MANAGEMENT	5.1. Soil conservation	Adopt soil conservation techniques such as terracing, contour planting, mulching and thick planting.	Tractors, leveling plows, cultivators, terrace mowers, soil compactors	Evidence that adequate mechanical soil conservation techniques are adopted to control erosion.	4. Conservation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	5.2. Erosion on internal roads	Protect the property's internal roads from erosion by planning machinery traffic, surface cover, and stormwater storage areas.	Tractors, excavators.	Evidence that there is an erosion control system on the internal road network, with no serious erosion problems observed.	4. Conservation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	5.3. Soil conservation practices	On sloped plots, control erosion and water run-off with soil conservation practices.	Tractors, brushcutters, and crop seeds for covering and commercial seeds for inter-row sowing (*Brachiaria*, beans, rice, peanuts etc.).	Evidence that coffee grown on slopes has adequate erosion control and water run-off.	4. ConservationConservation and sustainable management and	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
					use of soil and forests.	
	5.4. Ground cover	In the coffee plantation alleys, keep the ground covered with live or dead vegetation, especially species that produce a lot of mass and have deep roots, which can be cut or mowed, to accumulate organic matter and control invasive plants.	Tractors, brushcutters, and crop seeds for covering and commercial seeds for inter-row sowing (*Brachiaria*, beans, rice, peanuts etc.).	Evidence that the ground remains covered most of the year with vegetation, living or dead.	4. ConservationConservation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	5.5. Ground cover management	Mechanically manage the height of the ground cover with vegetation in alternate rows of the coffee plantation.	Tractors, brushcutters, and crop seeds for covering and commercial seeds for inter-row sowing (*Brachiaria*, beans, rice, peanuts etc.).	Evidence that weed control is carried out on alternate rows.	4. ConservationConservation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	5.6. Herbicides	When necessary, give preference to post-emergent herbicides after mechanical management of	Tractors, soil injection systems, granular spreaders.	Field journals, or other devices, and records of	3. Protection and restoration of	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		weeds or before major vegetative growth, using only the minimum recommended doses and avoiding the application of just one active ingredient. Prefer, when appropriate, the combination of broadleaf and narrowleaf herbicides in the same application, in order to also reduce the development of resistance. Use only herbicides registered for coffee, follow an agronomic prescription, and write down the products applied, the date, and the name of the applicator.		withdrawals from the warehouse of registered herbicides only.	biodiversity and ecosystems 7. Pollution prevention and control.	

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
6. WATER AVAILABILITY AND IRRIGATION	6.1. Irrigation management	During irrigation, use an estimated water depth based on climatic data, the physical structure and water content of the soil, crop demand, and the water distribution efficiency of the irrigation system.	Irrigation systems, valves, pipes, pumping systems, water collection and storage systems, measuring and control equipment, construction of water reservoirs.	Records of the amount of water to be applied during irrigation, which takes into account rainfall, soil moisture, and the crop's needs, technically determined in a field chapter or similar device.	4. ConservationConse rvation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	6.2. Irrigation uniformity	Test the uniformity of the water distribution in the irrigation equipment annually.	Collection containers, water flow meters, soil moisture sensors, pressure measurement equipment, control and monitoring systems.	Records of uniformity tests of water application, in field journals or other devices.	4. ConservationConse rvation and sustainable management and use of soil and forests.	(Embrapa, 2007)
	6.3. Fertigation	In addition to water control, record the dates and quantities of fertilizers applied via irrigation water.	Irrigation systems, dosers, pumps, chemical product injectors, mixers, monitoring and safety equipment.	Daily control records of water and fertilizer applications, in field journals or other devices.	4. ConservationConse rvation and sustainable management and	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
					use of soil and forests.	
	6.4. Chemigation	Use pesticides registered for application via irrigation water.	Technical project, irrigation systems, dosers, pumps, chemical product injectors, mixers, monitoring and safety equipment.	There is no physical or testimonial evidence of the use of pesticides not registered for application via irrigation water.	4. ConservationConse rvation and sustainable management and use of soil and forests.	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
7. INTEGRATED COFFEE TREE PROTECTION	7.1. Pest and disease control methods	Conduct pest and disease controls according to a technical schedule or after indication of need by the Integrated Pest and Disease Management (IPDM). Prefer alternative methods (biological, physical, and/or cultural) for pest and disease control, analyzing the different plots separately, taking into account the genetic material of each area and the susceptibility of each to pests and diseases. If it is necessary to use pesticides, choose the least toxic ones, apply different active ingredients with precision and use the recommended dose with leak-free equipment, while preventing contamination of soil, water, and protected environmental areas.	Inoculators and equipment for releasing natural enemies, pheromone diffusers and traps, bioinsecticide and natural product applicators, pest and disease monitoring equipment.	Documentary records of the justification for the pest and disease control methods and the diseases supporting the use of more toxic products.	3. Protection and restoration of biodiversity and ecosystems	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	7.2. Maintenance and calibration of pesticide application equipment	Perform preventive maintenance on pesticide application equipment annually, and to minimize drift and maximize efficiency, ensure the equipment is regulated.	Spare parts	Evidence of preventive maintenance of pesticide application equipment.	3. Protection and restoration of biodiversity and ecosystems	(Embrapa, 2007)
	7.3. Containment of pesticide spills	Provide a spill containment system to contain pesticide leaks at storage sites.	Buildings, ventilation system.	Evidence of the existence of a spill containment system at the pesticide storage site.	3. Protection and restoration of biodiversity and ecosystems	(Embrapa, 2007)
	7.4. Grain sampling for residue analysis	Collect grain samples at the harvest site for residue analysis, following the methodology described in the 'Sample collection manual of the national plan for the control of residues and contaminants in products of plant origin of the Ministry of Agriculture, Livestock and Supply' in force.	Sampling, preparation, and handling equipment.	Field journals, or other devices, with sampling records.	3. Protection and restoration of biodiversity and ecosystems	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
8. HARVESTING	8.1. Harvest processing	Keep the sweeping coffee, collected from the ground, separate from machine-harvested coffee or harvested onto a cloth (*derriça*). In addition, process the coffee cherries preferably on the same day of harvest to ensure quality.	Tilling machines, dried fruit harvesters, washers, depulpers, fermentation tanks, demucilagers, drying patios, mechanical drying systems.	Harvested coffee cherries are processed on the same day, as recorded in field journals or other devices.	7. Pollution prevention and control.	(Embrapa, 2007)
	8.2. Hygiene and prevention of contamination by pesticides and mycotoxigenic fungi	Keep containers, tools, equipment, and vehicles clean in order to prevent product contamination and ensure the quality of the coffee and the efficiency of the harvesting process. Furthermore, calibrate the volumetric devices used to estimate production.	Water tanks, water application equipment, pumps, blowers, compressed air applicators.	Evidence that containers, tools, equipment and vehicles are kept clean.	7. Pollution prevention and control.	(Embrapa, 2007)
	8.3 Ochratoxin contamination of the harvested product	Minimize the contact of harvested coffee with potential sources of contamination from ochratoxin-producing fungi.	Buildings, warehouses.	Evidence that contact between harvested coffee and sources of contamination is minimized.	7. Pollution prevention and control.	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
9. POST-HARVEST	9.1. Wet pre-processing	Use good quality water and minimize the consumption of water used in wet pre-processing.	Filters, dosers, water application systems, pumps.	Documented evidence of actions to minimize water use.	5. Sustainable use and protection of water and marine resources	(Embrapa, 2007)
	9.2. Reuse of water from wet pre-processing	Reuse water in wet pre-processing, preferably for crop application.	Water tanks, filter systems, water application equipment, pumps, containers or storage tanks.	Evidence of the reuse of water used in pre-processing.	5. Sustainable use and protection of water and marine resources	(Embrapa, 2007)
	9.3. Waste from wet pre-processing	Properly dispose of solid waste from coffee wet pre-processing, preferably by using it as fertilizer for the crop.	Washers, depulpers, fermentation tanks, demucilagers.	Evidence that the solids resulting from water treatment are reused, according to information documented in a field chapter or other device.	4. ConservationConservation and sustainable management and use of soil and forests. 5. Sustainable use and protection of water and marine resources	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	9.4. Prevention of microorganisms	During post-harvest operations, minimize the coffee's contact with sources of contamination from microorganisms.	Equipment for the preparation stage (washers, depulpers, fermentation tanks, demucilagers), drying systems, storage systems.	Existence of a management system in the drying yard to minimize the contact of coffee during the drying process with a source of fungal contamination.	7. Pollution prevention and control.	(Embrapa, 2007)
	9.5. Sanitizing equipment	Sanitize equipment and drying yards to prevent coffee contamination.	Water tanks, water application equipment, pumps, blowers, compressed air applicators.	Evidence that drying yards and equipment are sanitized before contact with coffee.	7. Pollution prevention and control.	(Embrapa, 2007)
	9.6. Grain moisture control	Monitor the humidity of the grains during drying and storage.	Coffee bean moisture meters.	Evidence of recorded moisture control of the coffee in storage.	7. Pollution prevention and control.	(Embrapa, 2007)
	9.7. Separation of sweeping coffee	Separate batches of sweeping coffee at all stages of harvesting and pre-processing.	Buildings and storage system adapted for sweeping coffee.	Evidence that batches of sweeping coffee are kept separate at all stages of pre-processing.	7. Pollution prevention and control.	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	9.8. Coffee storage	Keep warehouses ventilated, clean and disinfected.	Water tanks, water application equipment, pumps, blowers, compressed air applicators.	Evidence that coffee storage facilities are kept clean, ventilated, and disinfected.	7. Pollution prevention and control.	(Embrapa, 2007)
	9.9. Batch identification in coffee storage	Identify batches by production plot and origin and characteristics of the coffee: sweeping, cherry, harvesting method onto a cloth or machine, humidity, type, drink.	Signage materials, identification systems (linear, two-dimensional barcodes, *QR codes*, and others).	Evidence that coffee batches are identified with information that allows traceability, right down to the coffee plot, as well as indicating the characteristics of the product and the processes the coffee has undergone.	7. Pollution prevention and control.	(Embrapa, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
10. MONITORING PESTICIDE RESIDUES	10.1 Monitoring and prevention	Control and monitor pesticide residues in coffee beans.	Sampling, preparation, and handling equipment.	Evidence of implementation of the control and monitoring program.	7. Pollution prevention and control.	(Embrapa, 2007)
	10.2 Product sampling	Sample grains at different stages of the harvest and post-harvest, in accordance with the Sample collection manual of the national plan for the control of residues and contaminants in products of plant origin of the Ministry of Agriculture, Livestock and Supply in force.	Sampling, preparation, and handling equipment.	Field journals, or other devices, with sampling records.	7. Pollution prevention and control.	(Embrapa, 2007)
	10.3 Pesticide residue	Maintain a campaign on how to avoid pesticide residues in coffee beans.	Signage materials.	Evidence of campaigns.	7. Pollution prevention and control.	(Embrapa, 2007)

Appendix A3.

Perennial crops: Sustainable practices for cocoa

CNAEs:

- 01.35-1/00: Cocoa cultivation

Description:

Cocoa farming refers to the cultivation of the plant *Theobroma cacao*, whose seeds are used to produce chocolate, cocoa powder, and other derivative products. Cocoa is a crop of great importance to Brazil, not only for its economic and social contribution, but also for the environmental and cultural benefits it provides. Sustainable cocoa production has the potential to strengthen the rural economy, preserve the environment, and promote cultural appreciation, consolidating Brazil's role in the global market for high-quality cocoa and environmental responsibility.

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
1. PROPERTY MANAGEMENT	1.1. Production planning for the agricultural year	To take on this challenge, farmers need to prioritize basic technical changes. In this sense, it should establish the smallest operational area and its grouping as a "Homogeneous Area" and systematize data collection. Compiling the information will require internet access and the use of applications that facilitate the collection of data on the cocoa tree's vegetative and productive processes.	The Five-Year Cost Management Plan (Product Name) is a plan for estimating, allocating, and controlling costs, planning resources and production targets by using cocoa production technology packages (Product Type) that will enable farmers to manage their farm within effective cost management strategies and achieve	Establishment of an agricultural calendar / strategic planning	2. Climate change adaptation. 4. Conservation and sustainable management and use of soil and forests.	Processes and products in cocoa cultivation in the southeastern region of Bahia (CEPLAC)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		In order to make the regional platform for integrating digital services in cocoa farming viable, it will be necessary to provide devices that converge data into a digital system. This indicator measures the existence, quality, and application of strategic planning for cocoa production, taking into account agricultural practices adapted to the regional calendar. It evaluates the inclusion of sustainable actions, such as crop rotation, the use of AFSs and organic fertilization, as well as the allocation of resources for phytosanitary management and fertilization. It also considers the number of trainings carried out to help producers and the use of climate forecasts in planning.	production targets (main benefit).			
	1.2. Monitoring production and farming practices	The aim is for field data to help with the adoption of innovative solutions, the professionalization of farm activities and the sustainability of production processes. In other	Minute book, computer equipment (computer, cell phone, apps, internet), traceability system	Proportion of adequate records in relation to the total (%);	2. Climate change adaptation. 4. Conservation and sustainable management	(COCOAACTION et al., 2021)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		words, creating mechanisms that enable changes in the farm management process within effective strategies for managing costs and achievement of production targets. Promoting traceability, transparency, and the adoption of good practices in cocoa cultivation, in line with the principles of sustainability, keeping records of the operations carried out, describing the products, varieties, planting density, productivity, inputs used, management practices and conduct used throughout the production area, associated with the date and, when necessary, the name of the executor.		Percentage of cocoa batches traced back to origin.	and use of soil and forests.	(COCOAACTION et al., 2023)
	1.3. Expansion of cocoa plantations as an alternative for recovering degraded areas	Prioritizing and, ideally, restricting the expansion of cocoa plantations over anthropized and degraded areas, with a possible association with the Environmental Regularization Program (PRA) for	Mapping of degraded areas, land use maps, IT equipment (computer, internet, geoprocessing software), system/software for cross-	No overlap between areas of cocoa plantations and areas of native vegetation deforestation as of the established cut-off	1. Climate change mitigation. 3. Protection and restoration	(COCOAAC-TION et al., 2021) MAPA (2023).

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		compliance with Legal Reserve requirements. Contributing to the control of illegal and legal deforestation in cocoa production areas has the potential to increase the competitiveness of the product in Brazil and abroad.	checking data between deforestation and cocoa production areas	date (according to SICAR or MapBiomas data, for example); Adherence to the Environmental Regularization Program (PRA).	of biodiversity and ecosystems 4. Conservation and sustainable management and use of soil and forests.	

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
2. PROPAGATIVE MATERIAL AND PLANTING	2.1. Suitable propagative material	Use suitable, technically recommended propagative material of known origin (guarantee of provenance), taking into account the edaphoclimatic conditions of the region where it will be used, the incidence of pests and diseases, and its production potential. To meet this criterion, good practice include requesting guarantees from nurseries, such as invoices, registrations, and phytosanitary certificates, and seeking technical support when selecting varieties.	Seedlings, seeds, registered nurseries (RENASEM — National Registry of Seeds and Seedlings), technical assistance	Guarantee or certification of the origin of the propagative material used (e.g., National Registry of Seeds and Seedlings — RENASEM, National Register of Cultivars — RNC)	2. Climate change adaptation.	(COCOAACTION et al., 2021) (COCOAACTION et al., 2023)
	2.2. Planting in Agroforestry Systems (AFSs)	Promoting agroforestry practices in cocoa cultivation, integrating native trees and diversified crops to increase biodiversity, climate resilience, and productivity. Combining cocoa production with other plant species in Agroforestry Systems (AFSs) provides a variety of environmental services, such as carbon sequestration, nutrient	Seedlings/seeds, motorized auger, hoe, grub hoe, machete, hand-held brushcutter, cutting shovel, *matracas/saraquás* (traditional hand tools used for compacting soil and preparing planting holes for seedlings), stakes and seedling protectors, PPE, forest inventories and	Agroforestry System Certificate; Percentage (%) of areas of the property cultivated with AFSs; Average number of tree species per hectare in AFSs.	1. Climate change mitigation. 2. Climate change adaptation. 3. Protection and restoration of biodiversity and ecosystems	Executive Commission of the Cocoa Cultivation Planning (CEPLAC) MAPA (2023).

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		cycling, erosion prevention, water conservation, moisture retention and climate stabilization, the establishment of ecological corridors and the maintenance of biodiversity, among others. AFSs favor environmental conservation while ensuring productivity and a competitive model for cocoa producers, since cocoa trees also benefit from the environmental services they provide: shade, nutrients, water, and protection from insects and pests attacks, which reduces the need to use inputs, according to the Executive Commission for the Cocoa Cultivation Planning (Ceplac). Cocoa production in agroforestry systems also holds great potential for recovering degraded areas, helping to curb illegal deforestation, promoting reforestation and preserving biodiversity, a vocation that traces back to cocoa's Amazonian origins and its positive interaction with other species in the	production reports, certification of AFSs or equivalent systems, technical assistance		4. Conservation and sustainable management and use of soil and forests.	

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		forest environment, as seen with *cabruca* system in the Atlantic Forest.				
	2.3. Identification of key "companion" species and promotion of natural regeneration	This stage involves selecting native species that play important ecological roles and provide ecosystem services relevant to cocoa farming, such as providing shade, protecting soil and water, cycling nutrients, increasing pollination, improving the climate, providing food and/or shelter for local fauna. In addition, species that provide products, such as wood, fruit, oil, and medicinal products, can be selected, which can be consumed by producers and/or sold in regional shops. The identification and selection are based on ecological studies and local knowledge. Aspects such as the ability to adapt to local edaphoclimatic conditions should also be considered, prioritizing species that occur naturally in the	GPS, field guides, floristic inventory, technical assistance	GPS, field guides, floristic inventory, technical assistance	2. Climate change adaptation. 3. Protection and restoration of biodiversity and ecosystems 4. Conservation and sustainable management and use of soil and forests.	(IMAFLORA, 2022)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		region and are compatible with cocoa farming in terms of growth speed and stages, canopy formation and shading, root depth, and other factors. Throughout the cocoa production phases in AFSs, promoting/conducting natural regeneration by taking advantage of the seed bank of native species naturally present in the soil is a practice that can enhance local diversity.				
	2.4. Minimum tree density of native species in AFSs	Planting in diverse production systems, represented by the consortium of cocoa with other species, ensuring a minimum density and/or percentage of native species. As a benchmark, State Decree No. 15180/2014 establishes that, to be considered a *cabruca* system in Bahia, the cocoa plantation must have at least 20 individuals of native species per hectare, and a study (Santos et al., 2021) conducted on properties	Seedlings/seeds, monitoring sheets and spreadsheets, forest inventory	Tree density of native species per hectare; Percentage (%) of native species in the AFS.	2. Climate change adaptation. 3. Protection and restoration of biodiversity and ecosystems 4. Conservation and sustainable management and use of soil and forests.	(Santos et al., 2021)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		producing high-quality cocoa through *cabruca* systems in southern Bahia showed that the average density of native trees was 54 individuals per hectare. Another reference, Joint Normative Instruction SEDA/SEAGRI/EMATER No. 01/2020, which sets out the criteria and procedures for recomposing the Legal Reserve by planting cocoa in agroforestry systems in the state of Rondônia, establishes as a guideline that the area recomposed with exotic species, which must be combined with species native to the region, cannot exceed 50% of the total area recovered.				
	2.5. Monitoring floristic diversity	Inventory to assess and monitor floristic diversity, i.e., the combination of the number of species and their relative abundances present in the cocoa agroforestry system, as well as monitoring the evolution of	GPS, field guides, monitoring sheets, tape measures, camera, geoprocessing and data processing software, stakes for plot delimitation, human	Indices of floristic diversity; Frequency of monitoring actions conducted.	2. Climate change adaptation. 3. Protection and restoration of biodiversity and ecosystems	(IMAFLORA, 2022)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		vegetation structure throughout the ecological succession and phases of the agroforestry system.	resources with appropriate technical training		4. Conservation and sustainable management and use of soil and forests.	

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
3. PLANTING MANAGEMENT	3.1. Shade management	Implement pruning practices in accordance with CEPLAC's technical recommendations, taking into account the optimization of light, nutrition, and phytosanitary conditions, with a view to productivity and operational efficiency. It is essential that pruning management is carried out with sanitized materials to avoid the transmission of any diseases from one contaminated plant to another. In addition, pruning must be carried out in a way that avoids leaving "bruises" or "tears" in the bark of the branches, as they can serve as entry points for pests and diseases. It is important to maintain a calyx-shaped canopy and avoid overlapping of different cocoa trees (crown crossing). Attention should also be paid to the cocoa tree's "suckers" or "thief branches", which can be detrimental to productivity and should always be removed, whether from the base of the trunk	Pruning shears, pruning saw, sickle, machete, brushcutter, motorized pruner with pruning saw, chainsaw, stakes to guide growth, PPE, windbreaks	Shadow index	4. Conservation and sustainable management and use of soil and forests.	(COCOAACTION et al., 2021) (COCOAACTION et al., 2023)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		or the inner branches of the canopy. Pruning of trees that accompany the cacao tree or provide shade is necessary from their formation stage in order to prevent them from developing an overly dense canopy that could cause excessive shading in the future. It should be emphasized that pruning tall trees must be carried out using appropriate Personal Protective Equipment (PPE) and by a trained professional.				
	3.2. Management of invasive species	If invasive alien species are detected in cultivation systems, control methods should be adopted, prioritizing mechanical removal (i.e., physical extraction of individuals using hand tools or machinery) and biological control, including periodic monitoring of the area after control and proper disposal of plant residues resulting from control actions to prevent	Chainsaws, pruning saws, hoes, post hole diggers, pruning shears, brushcutters, PPE, bio-inputs, waste storage and transportation structures	Area (hectares) with management of invasive alien species	3. Protection and restoration of biodiversity and ecosystems 4. Conservation and sustainable management and use of soil and forests.	MMA (2023). MMA (2022).

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		recolonization by invasive alien species.				
4. SOIL HEALTH	4.1. Soil conservation techniques	Adopt soil conservation techniques when planting and managing cocoa, taking into account soil suitability, such as keeping the soil always covered, managing the different spontaneous sprouts, and planting different species to help conserve the soil. Mowing the undergrowth that grows between the plantations, combined with pruning the cocoa trees, helps create a layer of mulch that keeps the soil moist and promotes nutrient cycling. Soil conservation practices promote increased infiltration and soil water retention; reduced water loss through evaporation; prevention of	Rake, hoe, microtractor/motor cultivator, mulching material	Percentage (%) of cultivated areas applying soil conservation practices	4. Conservation and sustainable management and use of soil and forests.	(COCOAACTION et al., 2021) (COCOAACTION et al., 2023)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		compaction and erosion processes; increased organic matter content and nutrient availability; stimulation of the activity of beneficial microorganisms; deepening of cocoa roots; and reduced incidence of invasive plants, leading to greater productivity in productive areas at a lower cost.				
	4.2. Good agricultural practices for managing soil fertility and cocoa nutrition	Adopt good agricultural practices for soil fertility management and cocoa tree nutrition based on the results of soil and leaf analysis. Sampling the surface layer (0–20 cm or 0–10 cm) is essential for recommending acidity corrections and mineral and/or organic fertilizers, while sampling the subsurface layer (20–40 cm) allows the assessment of aluminum toxicity and recommendation of gypsum as a soil conditioner to promote deeper root growth. Surface sampling is recommended	Hiring of technical assistance and laboratory services for collection, analysis, and interpretation of physical-chemical and biological results from soil and leaf samples, organic and mineral fertilizers, bio-inputs, acidity correctors, and soil conditioners.	Results of physical, chemical, and biological analysis of soil and plant tissue; Soil fertility management plan in compliance with physical, chemical, and biological analyses and technical recommendations.	4. Conservation and sustainable management and use of soil and forests.	(Chepote et al., 2013) (COCOAACTION et al., 2021) (COCOAACTION et al., 2023) (IMAFLORA, 2022) (Souza et al., 2018)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		every 1–3 years, and subsurface sampling every 2–4 years. Fertilization should be carried out according to technical guidance, taking into account rainfall patterns and the crop's phenological stages. The composting of fruit husks and the uniform distribution of organic compost on the fields should be encouraged to reduce dependence on potassium mineral fertilizers, as well as the use of bio-inputs (e.g., biofertilizers and inoculants). In agroforestry systems, proper shade management can help improve the growing environment conditions and enhance nutrient cycling. Adopting good soil and crop fertility management practices can increase productivity and reduce the incidence of diseases and pests.				

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
5. IRRIGATION	5.1. Technical project for irrigation to minimize the volume of water used	If irrigation is necessary, it should be based on a technical assessment and project, which should estimate the amount of water needed for the crop in each plot. The abstraction of water for irrigation also depends on the requirement or waiver of a permit from the competent authorities, in accordance with current legislation. Good irrigation practices recommend, whenever possible, the use of techniques that minimize water consumption and avoid waste, such as drip systems instead of sprinklers, as well as the use of equipment such as a tensiometer, to monitor soil moisture and, based on this parameter, define the appropriate time and quantity for irrigation — it is advisable to keep track of the volume of water used in each irrigation. To subsidize irrigation, it is recommended to install a micro weather station that captures data	Irrigation systems, tensiometers, micro weather stations, technical assistance	Monthly volume of water used for irrigation	5. Sustainable use and protection of water and marine resources	(COCOAACTION et al., 2021) (COCOAACTION et al., 2023) Processes and products in cocoa cultivation in the southeastern region of Bahia (CEPLAC)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		such as ambient temperature, rainfall, and other information.				

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
6. PLANT HEALTH	6.1. Biological control and use of bio-inputs	Biological control involves introducing natural predators, parasites, or pest microorganisms to control pests and diseases that affect plantations. This technique is important in the context of promoting sustainable practices because it reduces the need for pesticides that cause adverse environmental effects and contributes to maintaining ecological balance, while often reducing the financial costs of pest or disease control. In the case of the cocoa tree, the use of biotypes of the microparasitic fungus *Trichoderma stromaticum* has been shown to be effective for biocontrol of witches' broom, caused by the fungus *Crinipellis perniciosa*, the most destructive disease for cocoa growing in Brazil.	Biocontrol agent (Tricovab biofungicide), other bio-inputs with proven efficiency, application system, PPE	Total area (ha) and percentage (%) covered by biological control; Effective use of Tricovab biofungicide; Incidence of witches' broom *(Moniliophthora perniciosa*) in the cultivated area.	3. Protection and restoration of biodiversity and ecosystems 7. Pollution prevention and control.	MAPA (2020). (Pinto; Melo; Santos, 2007)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	6.2. Cultural control	Cultural control, that is, the elimination of diseased branches and fruit, is an efficient strategy for controlling the spread of pests such as witches' broom. In the context of the Amazon, two phytosanitary prunings are recommended: the main pruning, which should be carried out between August and September, and another before the start of the rainy season, between October and December. Proper management after harvesting, such as removing the husks from the cocoa tree trunks, is also an important practice for preventing incidence of disease.	Pruning shears, pruning saw, sickle, machete, brush cutter, pole pruner with pruning saw, PPE	Number of phytosanitary prunings carried out during the year.	3. Protection and restoration of biodiversity and ecosystems 7. Pollution prevention and control.	MAPA (2020).
	6.3. Genetic Control	Use of disease-resistant cocoa cultivars.	Disease-resistant cultivars, technical assistance	Guarantee or certification of the cultivar used regarding disease resistance (e.g., National Cultivar Register — RNC)	2. Climate change adaptation. 3. Protection and restoration of biodiversity and ecosystems	Executive Commission of the Cocoa Cultivation Planning (CEPLAC)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
					7. Pollution prevention and control.	
	6.4. Integrated Pest Management (IPM)	A pest control system that seeks to preserve and increase the natural mortality factors of pests through the integrated use of different control methods selected based on regional specificities and technical, economic, ecotoxicological, and sociological parameters.	Technical assistance, bio-inputs, sprayers and drones, accessories for localized application, software for IPM registration and management	Record of pest management methods adopted	3. Protection and restoration of biodiversity and ecosystems 7. Pollution prevention and control.	MAPA (2020). (Picanço, 2010)
7. ENVIRONMENTAL MANAGEMENT	7.1. Proper waste management	Minimize the generation of waste and ensure proper disposal of generated waste, promoting the recycling and composting of organic waste and avoiding burning it.	Composting system, waste separation containers	Percentage (%) of waste recycled and composted	6. Transition to a circular economy 7. Pollution prevention and control.	(COCOAACTION et al., 2021)

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
8. SOCIAL MANAGEMENT	8.1. Accident prevention	Identify the activities that pose the greatest risk to workers and include training for specific and dangerous functions. Adopt measures to mitigate accidents and the unhealthiness of enclosed environments, including the use of PPE.	Specific and appropriate Personal Protective Equipment (PPE) for each activity (e.g., safety boots, helmet, gloves, goggles, ear protectors, leg protectors), training/capacity building	Number of accidents at work	8. Generate decent work and raising incomes.	(COCOAAC-TION et al., 2021)
	8.2. Promotion of cooperativism and associativism	Associativism and cooperativism, supported by the development of techniques and equipment for processing cocoa collectively, have the potential to optimize scale and management, reducing costs for producers and asymmetries in the chain, increasing productivity and quality gains, adding value, and ensuring social sustainability for production. In this context, it is also important to encourage the inclusion of rural youth and women in these arrangements.	Physical infrastructure for associations and cooperatives, IT equipment (computer, internet), technical assistance, equipment for collective beneficiation in cooperatives and associations (e.g., tools for breaking the fruit and removing the beans, fermentation troughs, barges or solar greenhouses for drying, squeegees for soil turning over, devices for measuring the moisture	Number of people registered with local associations and cooperatives; Percentage (%) of young people and women in the composition of local cooperatives and associations.	8. Generate decent work and raising incomes. 9. Reduction of socio-economic inequalities, considering racial and gender aspects	MAPA (2023). MAPA (2020). SENAR (2018).

Title of practice	Components of practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			content of the kernels, warehouses)			
	8.3. Access to qualified technical assistance	Training people who work in the cocoa harvesting and post-harvesting processes, through technical training focused on aspects related to the preparation and classification of the kernels, good harvesting and post-harvesting practices, aspects that influence the taste and purity of the kernels, physical and chemical characteristics that are essential to standardizing the quality of the raw material to be offered with a differentiated taste and aroma, has the potential to maximize quality gains and reduce losses.	Training and technical assistance	Number of technical training courses held; Percentage (%) of workers who have undergone technical training.	8. Generate decent work and raising incomes.	MAPA (2023).

Appendix A4.

Pasture systems: Sustainable practices for grazing livestock (beef and dairy)

CNAEs:
- 01.51-2/01: Raising beef cattle
- 01.51-2/02: Raising dairy cattle

Description:
Pasture-based beef and dairy cattle production systems consist of using natural or cultivated pastures as the animals' primary food source. This system is widely adopted in most regions of Brazil, where the climate and availability are conducive to efficient cattle farming. Cattle can include the species *Bos taurus* and *Bos indicus*. In short, pasture-based beef and dairy production systems are essential for Brazil, contributing to the economy while preserving traditions and promoting the resilience of rural communities.

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
1. PASTURE ESTABLISHMENT		Good pasture establishment contributes to soil carbon sequestration. Well-established pastures have higher primary productivity, contributing to the input of organic material into the soil. In addition, poor establishment is one of the main causes of pasture degradation. Subsequent cycles of pasture formation and degradation can lead to a reduction in vegetation cover and soil being turned over in shorter periods, promoting the process of organic matter loss and the release of carbon into the atmosphere. The carbon balance in the soil depends	Seeds and seedlings, soil analysis, correctives and fertilizers, purchase of machinery and agricultural implements, rental of machinery and agricultural implements, fuel, technical assistance, and labor training	Monitoring through proximal or satellite sensor imagery to indicate vegetation vigor, soil cover, and the presence of invasive plants during the pasture establishment period. The implementation period varies depending on the biome and	1. Climate change mitigation.	(Dias Filho, 2011)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		on the input of organic material and the processes of decomposition/mineralization and humification of organic matter. Most of the carbon that enters the soil comes from the photosynthetic process and is related to the primary productivity of plants. Carbon entering the soil is present in the form of above- and below-ground biomass residues, release of root exudates, and the leaching of soluble plant constituents by rainwater. The processes of decomposition/mineralization and humification of organic matter, in turn, are influenced by factors such as climate (mainly humidity and temperature), plant material composition (lignin content, polyphenols, C/N/P/S ratio), soil characteristics (texture, mineralogy, fertility, topography, microbiota), and management system. Systems that advocate mulching and less soil turning over, crop rotation, and green manuring, especially with legumes, tend to encourage the accumulation of organic matter in the soil. To ensure successful		production system. For permanent pastures in the semi-arid region, monitoring should be carried out for up to two rainy seasons, and for the rest of the country, for up to six months. In integrated systems, monitoring should be adjusted to the crop rotation cycle.		

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		pasture establishment, a minimum set of components must be adopted; otherwise, the sustainability of the practice as a whole cannot be guaranteed. This minimum set involves the selection of forage species and cultivars; the use of good quality seeds and seedlings in adequate quantity; soil correction and fertilization; preparation of the area for planting; techniques (e.g., planting in a row, etc.) and planting time; and weed control. In addition, some supplementary components of the practice can contribute to increasing the potential for soil carbon sequestration, such as the use of bio-inputs; the preservation or planting of trees and strips of native vegetation; the use of forage legumes intercropped with grasses or not; and crop-livestock integration techniques. As some components must be adopted together to ensure the benefits of the "pasture establishment" practice, the financeable items related to them have been associated with agricultural practices. For the other components, the				

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		financeable items have been associated individually (see the "financeable items" column).				
	1.1 Forage species and cultivars suitable for the climate, soil, topography, and production system used	Use of forage species and cultivars suited to the climate, soil, topography, and production system, in accordance with the recommendations of the genetic material's maintainer in MAPA's Cultivar Registration System and information from the literature. The use of species and cultivars suitable for the growing conditions is necessary to ensure the primary productivity and lifespan of the pasture, increasing the potential for soil carbon sequestration. In regions most affected by climate change, choosing genetic materials that are better adapted to prolonged droughts and/or extreme rainfall, and temperature events can also contribute to adapting systems to climate change. Whenever possible, priority should be	As some components must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice as a whole and not with the components individually	Monitoring by the invoice, together with information on the literature and the genetic material's maintainer in MAPA's Cultivar Registration System. Information on species/cultivars can be systematized in specific tools to facilitate monitoring, such as the *Pasto Certo* app.	1. Climate change mitigation; 2. Adapting to climate change.	(*Pasto Certo* app) (Tropical forages: an interactive selection tool) (RENASEM) (Peixoto, et al. 2000)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		given to using forage species that are native to the environment and/or have a low potential for invasion dispersal to other environments.				
	1.2 Seeds and seedlings of good quality and in adequate quantity	The use of good-quality seeds and seedlings in the amount recommended for the species/cultivar under the growing conditions is necessary to ensure the primary productivity and lifespan of the pasture, increasing the potential for soil carbon sequestration. Seeds and seedlings must be produced and used in accordance with the rules established by the National Seed and Seedling System. The quantity of seeds and seedlings should follow the technical recommendations for the species/cultivar and the specific growing conditions.	As some components must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice as a whole and not with the components individually	Certificate and/or term of conformity of the seed batch and Invoice, together with the recommended quantity of seeds and seedlings for the species/cultivar. Seed and seedling quantity recommendations can be systematized in specific tools to facilitate monitoring, such as the *Pasto Certo* app.	1. Climate change mitigation	(*Pasto Certo* app) (Tropical forages: an interactive selection tool) (Legislação Específica de Sementes e Mudas e Normas Relacionadas à Área) [Specific Seed and Seedling Legislation and Standards Related to the Area]

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.3 Correcting and fertilizing the soil at planting	Correcting and fertilizing the soil, based on the results of chemical analysis and technical recommendations for species and cultivars, is necessary to ensure suitable conditions for the initial development and establishment of the plants. Both contribute to increasing primary productivity and lifespan of the pasture, and consequently, the potential for carbon sequestration.	As some components must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice as a whole and not with the components individually	Results of chemical soil analysis, technical recommendation, and invoice for inputs. The minimum technical recommendations for correction and fertilization can be systematized in specific tools to facilitate monitoring.	1. Climate change mitigation	(*Pasto Certo* app) (*Tropical forages: an interactive selection tool*) (Legislação Específica de Sementes e Mudas e Normas Relacionadas à Área) [Specific Seed and Seedling Legislation and Standards Related to the Area]
	1.4 Area preparation and sowing or planting operations	Proper preparation of the area aims to ensure the right conditions for the germination and initial plant establishment, reduce competition with invasive plants and reduce erosion, helping to increase the primary productivity and lifespan of the pasture, consequently increasing the potential for soil carbon sequestration. The specific operations for preparing the area vary depending on the terrain (susceptibility to erosion) and the production system and should follow the	As some components must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice as a whole and not with the components individually	On-site visit	1. Climate change mitigation; 4 Conservation and sustainable management and use of soil and forests	(Andrade; Ferreira, 2019) (Souza; Malagutti, 2015) (Abdrade et al., 2015) (*Pasto Certo* app) (Vieira; Kichel, 1995) (Zimmer, et al. 1995)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		technical recommendations in force and/or those of a qualified professional.				
	1.5 Sowing or planting at recommended times for the region, depending on the temperature and rainfall regime	Planting or sowing at the recommended times aims to ensure the right conditions for germination and initial plant establishment, helping to increase the primary productivity and lifespan of the pasture, consequently increasing the potential for soil carbon sequestration. Specific planting or sowing recommendations vary depending on the region's climate characteristics, especially water availability, temperature, soil type, and species/cultivar.	As some components must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice as a whole and not with the components individually	Technical recommendations for the species or cultivar in the region and satellite image monitoring. Agricultural climate risk zoning for the planting season should be used whenever available. In the future, the ZARC could be extended to cover the main forage species/cultivars.	1. Climate change mitigation	(Risk Indication Panel — ZARC)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.6 Control of invasive plants in the pasture establishment phase	The control of invasive plants aims to ensure the right conditions for plant establishment and soil cover, helping to reduce the risk of degradation and increase the useful life of the pasture, consequently increasing the potential for soil carbon sequestration. When necessary, weed control during the pasture establishment phase can be carried out using mechanical, chemical, or physical methods, following specific technical recommendations for the area. In the case of chemical control, priority should be given to using products with a lower environmental impact and strictly following the application rules and recommendations.	As some components must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice as a whole and not with the components individually	Technical recommendation and purchase invoice for inputs.	1. Climate change mitigation	(Agrofit) (Rodrigues; Almeida, 2018)
	1.7 Use of bio-inputs in planting	Bio-inputs can have various effects, such as stimulating growth, increasing tolerance to water deficit stress in plants, promoting the solubilization of phosphorus in the soil, and the biological fixation of atmospheric nitrogen. The use of bio-inputs in pasture establishment helps to accelerate the initial development and	Purchase of bio-inputs	Invoice for the purchase of bio-inputs.	1. Climate change mitigation; 2. Climate change adaptation	(Leite et al., 2019) (Hungria, 2016)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		establishment of plants, increase primary productivity and the useful life of the pasture, while reducing dependence on chemical fertilizers. The effects observed on the speed of establishment, primary productivity, and lifespan of pastures help to increase the potential for soil carbon sequestration. Moreover, less dependence on chemical fertilizers can contribute to reducing emissions associated with both fertilizer synthesis and greenhouse gas losses related to their application. The use of bio-inputs that increase tolerance to water deficit can also contribute to adapting production systems to climate change, reducing pastures' vulnerability to the effects of Indian summer (veranico) and prolonged droughts during the establishment phase. The bio-inputs used must have proven efficacy through scientific studies.				

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.8 Forage legumes in pastures intercropped with grasses.	Legumes are capable of biologically fixing atmospheric nitrogen. The introduction of forage legumes intercropped with grasses helps to increase nitrogen availability in the system, primary productivity, and the useful life of the pasture, while reducing dependence on chemical fertilizers. Increasing the primary productivity and lifespan of pastures helps to increase the potential for soil carbon sequestration. Furthermore, less dependence on chemical fertilizers can contribute to the reduction of emissions associated with both fertilizer synthesis and GHG emissions associated with the application of these inputs. Intercropping also increases diet digestibility and animal performance, with a consequent reduction in methane emissions from cattle. Finally, introducing legumes into the production system improves nutrient cycling and resilience, and increases biodiversity.	Purchase of legume seeds and seedlings.	Purchase invoices for seeds and seedlings, on-site inspections, drone footage.	1. Climate change mitigation. 2. Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources	(Sistema Guaxupé) [Guaxupé System]

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.9 Crop-livestock integration	Crop-livestock integration is one of the techniques recommended for recovering degraded pastures. Crop-livestock integration exploits the synergy between crops, promoting increased primary plant productivity and full-time soil cover, which favors soil carbon sequestration. Grasses with deep root systems accumulate a large volume of root biomass, improving the physical, chemical, and biological characteristics of the soil, increasing soil water retention, and favoring weed and pest control, among other things. It also helps to reduce biotic and abiotic stresses on crops, making the production system more resilient to climate change scenarios.	Buying seeds and seedlings.	Remote sensing and on-site visits.	1. Climate change mitigation; 4 Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources	(Bungenstab et al., 2012) (Alvarenga et al., 2021)
2. RECOVERY, ENRICHMENT AND MANAGEMENT OF NATIVE GRASSLANDS UNDER GRAZING		Grassland ecosystems should produce many ecosystem services, and restoration plans for native grasslands under grazing should focus on their functional diversity. The degradation of native grasslands under grazing compromises the biodiversity and multifunctionality of the areas and is		Monitoring by images from proximal or satellite sensors that indicate vegetation vigor, soil cover, and the presence of invasive plants during the	1. Climate change mitigation; 2 Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4.	(Bioma Pantanal: Comunicado 104)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		generally related to overgrazing, depletion of the seed bank, low natural soil fertility and nutrient extraction, and climatic factors. Recovering and enriching these areas aims to re-establish their multifunctionality and contributes to maintaining biodiversity, conserving soil and water, and mitigating and adapting to climate change.		monitoring period. The monitoring period varies depending on the biome and production system, but it is recommended that it should not be less than five years.	Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources;	

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	2.1. Management of the Caatinga	In 2024, the first areas with arid climate characteristics in Brazil were detected, showing the advance of the desertification process in Brazilian Northeast. Overgrazing and inadequate land use contribute to the degradation of native grasslands in the Caatinga. Caatinga management techniques consist of manipulating the native vegetation while preserving its biodiversity and promoting an increase in forage supply for grazing herds during both dry and rainy seasons. Thinning the Caatinga aims to enhance the native herbaceous forage layer. The lowering of the Caatinga is intended to increase the forage supply for browsing animals. Enriching the Caatinga aims to increase the density of perennial forage species. These techniques help to reduce the degradation of native vegetation, which in extreme cases can lead to desertification.	Technical assistance and labor training, fencing equipment (bollards, wires, electric fencing equipment, rockers, etc.), water collection and distribution equipment (construction of dams, reservoirs, drinking fountains, pipes, collection and pumping equipment, floats, etc.), alternative energy generation for pumping water (e.g., solar panels), troughs, seeds and seedlings.	On-site visit.	1. Climate change mitigation; 2 Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources;	(Difusão de tecnologias apropriadas para o desenvolvimento sustentável do Semiárido Brasileiro) [Dissemination of appropriate technologies for the sustainable development of the Brazilian semi-arid region]

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	2.2. Restoring natural landscapes of native grasslands of the Pantanal	The proportion of native grassland on a property is one of the main indicators of natural suitability for raising beef cattle. In recent decades, these areas have been invaded by native shrub/ tree species, reducing the support capacity of the grasslands. Depending on the opportunistic species, there are specific control methods. Another factor in grassland degradation is overgrazing, which results in degradation and loss of resilience as the soil seed bank is depleted, aggravated by the reduction in soil fertility due to nutrients being extracted and not replaced, given that conventional fertilization is not viable in the region due to leaching. One of the sustainable practices is intercropping with leguminous plants such as Campo Grande stylo in sandy, flood-free areas. Another sustainable practice would be the use of bio-inputs, but the practical results are still incipient. Re-establishing these desirable plant communities with forage dominance (desirable state) is one of the objectives of ecosystem restoration/recovery. The practice of	Operations with cleaning and mowing machines. Construction of fences for better sizing of paddocks/winters, technical assistance, labor training, and landscape studies	Historical and recent satellite images. Operations with cleaning and mowing machines. Construction of fences for better sizing of paddocks/winters, technical assistance, and mapping of field areas	1. Climate change mitigation; 2 Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources;	(Santos et al., 2019). (Ravaglia et al.,2011). (Santos and Comastri Filho, 2012)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		restoring the fields must follow the legislation in force in each state (MS and MT). Preservation of the Pantanal's native vegetation contributes to soil and water protection and biodiversity preservation				
	2.3. Applying sustainability criteria and landscape studies to the introduction of exotic species in the Pantanal	Healthy grassland ecosystems should produce a wide range of ecosystem services, and restoration plans should contribute to increasing multiple services, focusing on functional diversity. Many field areas in the sandy Pantanal have low natural fertility, aggravated by overgrazing and loss of resilience due to seed bank depletion. As conventional fertilization is not viable in most parts of the region, especially in sandy soils, the use of deep-rooted grasses such as species of the *Brachiaria* genus can contribute to increasing soil carbon. However, their introduction must follow technical criteria, being applied especially in areas of low functional diversity and soils with low natural fertility. In general, the introduced exotic species mix with the	Preparation of the area; purchase of seeds; construction of fences to size the paddocks, construction of drinking fountains, troughs depending on the pasture planning, purchase of animals, technical assistance and labor training, mapping services.	On-site visit and satellite images.	1. Climate change mitigation; 2 Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources;	(Santos et al.,2022); (Santos et al.,2019); (Ravaglia et al.,2011).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		native ones, resulting in a mixed and more productive field. To do this, it is necessary to map/identify the types of landscapes on the property that can be cleared for cultivated pastures, respecting the limits established by law (Mato Grosso do Sul, 2015; Mato Grosso, 2022). As the Pantanal is considered a restricted use area under federal legislation (Law No. 12651 of 2012), such introductions must follow sustainability criteria and comply with the legislation in force in each state. The criteria-based definition of areas for the introduction of exotic species contributes to preserving the diversity of landscapes and native vegetation in the Pantanal, while protecting soil, water, and biodiversity.				

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	2.4 Restoration of the southern grasslands	The southern grasslands are characterized by a high diversity of species (around 500), especially of forage value for livestock production, and by their high degree of endemism. In recent decades, the degradation and/or conversion of fields for agriculture and forestry has accelerated. Recovery strategies depend on the area's history of use, which influences resilience and, therefore, the restoration strategy. Many field areas have been degraded by the use of fire and invasion by annoni grass (*Eragrostis curvula*), as well as by inadequate management and techniques for introducing inappropriate exotic species. When fertilized, southern fields show improvements in productivity and animal performance. The adoption of rotational stocking in southern fields contributes to the soil's physical, chemical and biological conditions.	Technical assistance, fencing equipment (bollards, wires, electric fencing equipment, rocker arms, etc.), water collection and distribution equipment (construction of dams, reservoirs, drinking fountains, pipes, collection and pumping equipment, floats, etc.), alternative energy generation for pumping water (e.g., solar panels), troughs, correctives and fertilizers; machinery and implements for controlling *annoni grass* and other invasive species	Satellite and on-site images	1. Climate change mitigation; 2 Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources	(Santos et al., 2008). (Carvalho, P.C.F.Nativão, 2019)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	2.5 Management of natural grazing fields to maintain high diversity of plant species	Pastures occupy a large area of land in Brazil, most of which is made up of a limited number of cultivars of exotic forage species. Grasslands with native vegetation are ecosystems found in all of Brazil's biomes, especially in the Pampa and Pantanal, where they provide a natural aptitude for animal grazing. In some ecosystems, such as Cerrado grasslands, trees are part of the system and should be preserved and/or their regeneration within pastures stimulated/allowed. These natural grazing fields are multifunctional and provide other services, besides providing food for the animals. Proper management of natural fields under grazing is necessary to ensure their high biological diversity maintenance and increase their resilience. The adoption of biodiversity conservation practices in pastures and landscapes can contribute to ecosystem services and the conservation of natural resources.	Technical assistance and training for the workforce, fencing equipment (bollards, wires, electric fencing equipment, rocker arms, etc.), water collection and distribution equipment (construction of dams, reservoirs, drinking fountains, pipes, collection and pumping equipment, floats, etc.), alternative energy generation for pumping water (e.g., solar panels), troughs, correctives and fertilizers; machinery and implements	On-site visits	2. Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems	. (Guia de melhores práticas, Manejo das pastagens [Best Practice Guide, Pasture Management], WWF); (Carvalho et al. Nativão, 2019)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
3. PASTURE MANAGEMENT		Proper pasture management contributes to soil carbon sequestration. Well-managed pastures have higher primary productivity, contributing to the input of organic material into the soil. On the other hand, incorrect management is one of the main causes of pasture degradation, increasing the risk of erosion and soil degradation. Subsequent cycles of pasture recovery and degradation can lead to a reduction in cover and the soil being turned over in shorter periods, which favors the process of organic matter loss. The carbon balance in the soil depends on the input of organic material and the processes of decomposition/mineralization and humification of organic matter. Most of the carbon that enters the soil comes from the photosynthetic process and is related to the primary productivity of plants. Carbon that enters the soil is present in the form of aboveground and root biomass residues, the release of root exudates and the leaching of soluble plant constituents by rainwater.	Technical assistance and training for the workforce, fencing equipment (bollards, wires, electric fencing equipment, rockers, etc.), water distribution equipment (reservoirs, drinking fountains, pipes, collection and pumping equipment, floats, etc.), alternative energy generation for pumping water (e.g. solar panels), troughs.	Monitoring by images from proximal or satellite sensors that indicate vegetation vigor, soil cover, and the presence of invasive plants during the monitoring period. The monitoring period varies depending on the biome and production system, but it is recommended that it should not be less than five years.	1. Climate change mitigation; 4. Conservation and sustainable management and use of soil and forests.	(Dias Filho, 2011)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		The processes of decomposition/mineralization and humification of organic matter, in turn, are influenced by factors such as climate (mainly humidity and temperature), plant material composition (lignin content, polyphenols, C/N/P/S ratio), soil characteristics (texture, mineralogy, fertility, topography, microbiota), and management system. Systems that promote soil cover and less turning over of the soil, crop rotation, and green manuring, especially with legumes, tend to encourage the accumulation of organic matter in the soil. Matching the stocking rate to the pasture's carrying capacity is fundamental to ensure the benefits of the practice. Therefore, a minimum set of components must be present for the practice to be considered sustainable: forage production planning and defoliation management (cutting or grazing). It is also important to note that more than 70% of pasture areas in Brazil is found on soils with low base saturation levels, presence of aluminum, low levels of				

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		phosphorus and/or organic matter. Maintaining primary productivity in these conditions depends on combining genetic material with soil fertility management strategies. Thus, it is interesting that some additional components are present to increase the potential for soil carbon sequestration in practice, such as soil correction and maintenance fertilization, use of bio-inputs, organic fertilization, green manure (including consortium or over-seeding with legumes), and precision agriculture. As the planning and management components of mowing or grazing must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice. For the components related to soil fertility, the fundable items were associated individually.				

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	3.1 Planning forage production	Planning the property's forage production aims to ensure the availability of food to meet the herd's demand throughout the year and avoid overgrazing, which is one of the main causes of pasture degradation in Brazil. Planning must take into account the herd's projected food demand throughout the year, considering the number and evolution of animal categories and the carrying capacity of forage production areas.	As some components must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice and not with these components individually.	Forage production plan with herd projections and definition of production sectors, compatible with information from the Livestock ZARC and other sources of information on the carrying capacity of pastures in the region.	1. Climate change mitigation; 4 Conservation and sustainable management and use of soil and forests;	(Guia de melhores práticas, Manejo das pastagens [Best practice guide, Pasture management], WWF)
	3.2 Defoliation management (cutting or grazing)	The regrowth vigor and primary productivity of forage plants are related to the combination of defoliation frequency and intensity. Management of defoliation by cutting or grazing aims to ensure suitable conditions for vigorous plant regrowth, increase primary productivity and prevent degradation of the area, thereby enhancing the potential for soil carbon sequestration. Defoliation management recommendations vary depending on the forage species/cultivar, making it	As some components must be adopted together to ensure the benefits of the practice, the fundable items were associated with the farming practice and not with these components individually.	Evidence of the adoption of defoliation management practices on farms, such as mapping pasture areas, the presence of trained staff to make management decisions, systems for monitoring and recording animal	1. Climate change mitigation; 4 Conservation and sustainable management and use of soil and forests;	(Peixoto, A.M.; Moura, J.C.de; Faria, V.P.de, 1997); (Carvalho et al. Nativão, 2019):

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		necessary to know the plant's characteristics and specific recommendations to properly determine pasture size. In general, the recommendations are expressed as limits for the intensity and frequency of plant defoliation (described by forage mass, height, leaf area index, number of days, etc.) The frequency and intensity of grazing and the size of the pastures must be consistent with technical recommendations in force for the species/cultivar and the characteristics of the production system and/or guidance from a qualified professional.		movements, and recommending the intensity and frequency of defoliation used.		

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	3.3 Soil correction	The regrowth vigor and primary productivity of forage plants are related to soil fertility and the availability of nutrients for plant growth. Surveys conducted by Embrapa indicate that more than 70% of pastureland in Brazil is found on soils with low base saturation levels and the presence of toxic aluminum. Soil correction aims to ensure adequate availability of nutrients for plant development and the reduction or elimination of toxic aluminum from the soil, preventing degradation of the area and increasing its primary productivity and the potential for soil carbon sequestration. Correcting the soil in the subsurface can also create conditions for deepening the root system, reducing the system's vulnerability to droughts and Indian summer (veranico) and helping it adapt to climate change. Soil correction recommendations vary depending on the forage species/cultivar, soil type, and production system and should follow the advice of a qualified professional.	In addition to the financeable items described for the practice, it should include: soil analysis, correctives, rental of agricultural machinery and implements, purchase of agricultural machinery and implements.	Result of soil analysis, technical recommendation, and invoice for inputs. The quantity of inputs purchased must be compatible with the size of the area and the recommended soil correction.	1. Climate change mitigation; 2 Climate change adaptation (in the case of sub-surface correction); 4. Conservation and sustainable management and use of soil and forests;	(Riberio, A.C.; Guimarães, P.T.G. & Alvarez V., V.H, 1999). (Cantarella, H. et al., 2022)); (Recomendações de adubação e de calagem para os Estados do Rio Grande do Sul e de Santa Catarina [Fertilization and liming recommendations for the states of Rio Grande do Sul and Santa Catarina], Sociedade Brasileira de Ciência do Solo, Núcleo Regional Sul, 2004); (Souza, D.M.G.de; Lobato, E., 2004) c

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	3.4 Soil maintenance fertilization	The regrowth vigor and primary productivity of forage plants are related to soil fertility and the availability of nutrients for plant growth. Most of the pastureland in Brazil is established on soils of low natural fertility, with low nutrient availability — especially phosphorus and nitrogen — for plant development. Fertilizing the soil aims to ensure adequate availability of nutrients for plant development. The effects observed on the primary productivity and lifespan of pastures contribute to increasing the potential for soil carbon sequestration. Soil fertilization recommendations vary depending on the forage species/cultivar, type of soil, and production system and should follow the advice of a qualified professional. The use of chemical and organic fertilizers must respect three premises: applying them under the right climatic conditions, in the right amount, and at the right stage of crop development. These premises are part of the nutrient balance concept, which, when respected, minimizes the potential	In addition to the financeable items described for the practice, it should include: soil analysis, fertilizers, rental of agricultural machinery and implements, purchase of agricultural machinery and implements.	Result of soil analysis, technical recommendation, and invoice for inputs. The quantity of inputs purchased must be compatible with the size of the area and the soil fertilization recommendation.	1. Climate change mitigation; 4 Conservation and sustainable management and use of soil and forests;	(Riberio, A.C.; Guimarães, P.T.G. & Alvarez V., V.H., 1999); (Cantarella, H. et al, 2022). (Recomendações de adubação e de calagem para os Estados do Rio Grande do Sul e de Santa Catarina [Fertilization and liming recommendations for the states of Rio Grande do Sul and Santa Catarina] 10.ed, Sociedade Brasileira de Ciência do Solo, Núcleo Regional Sul, 2004); (Souza, D.M.G.de; Lobato, E., 2004).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		negative impacts of fertilizer use, such as soil degradation, water pollution, and GHG emissions. The concept of nutrient balance is recognized internationally as an environmental management tool for farms.				

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	3.5 Use of bio-inputs	Bio-inputs can have various effects, such as stimulating growth, increasing tolerance to water deficit stress in plants, promoting the solubilization of phosphorus in the soil and the biological fixation of atmospheric nitrogen. The use of bio-inputs in pasture maintenance can help increase primary productivity and the useful life of the pasture, while reducing dependence on chemical fertilizers. The effects observed on the primary productivity and lifespan of pastures contribute to increasing the potential for soil carbon sequestration. On the other hand, less dependence on chemical fertilizers can contribute to the reduction of emissions associated with both fertilizer synthesis and the GHG losses related to the application of these inputs. The use of bio-inputs that increase tolerance to water deficit can also contribute to adapting production systems to climate change, reducing the pastures' vulnerability to the effects of Indian summer (veranico) and prolonged droughts. The bio-inputs used must have	In addition to the financeable items described for the practice, it should include: soil analysis, fertilizers, rental of agricultural machinery and implements, purchase of agricultural machinery and implements.	Invoice for the purchase of inputs	1. Climate change mitigation; 2 Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests;	h- (Desenvolvimento de pastagens inoculadas com a estirpe MAY1 de Azospirillum spp. no Pantanal, sub-região Desenvolvimento de pastagens inoculadas [Development of pastures inoculated with the MAY1 strain of Azospirillum spp. in the Pantanal, Nhecolândia sub-region], Brasil).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		proven efficacy through scientific studies.				
	3.6 Organic fertilization	Organic fertilization practices can help condition the soil, improving its chemical, physical and biological aspects. The application of organic fertilizers helps to increase nutrient availability in the system, primary productivity, and the useful life of the pasture, while reducing dependence on chemical fertilizers. The effects observed on the primary productivity and lifespan of pastures contribute to increasing the potential for soil carbon sequestration. On the other hand, less dependence on chemical fertilizers can contribute to the reduction of emissions associated with both fertilizer synthesis and greenhouse gas losses related to the application of these inputs. Finally, when organic fertilizer is the residue of farming activities, it can help increase the circularity of the systems and reduce emissions from manure.	In addition to the financeable items described for the practice, it should include: soil analysis, fertilizers, rental of agricultural machinery and implements, purchase of agricultural machinery and implements .	Evidence of adoption of the practices, such as the presence of a structure for collecting, treating, storing, and distributing organic fertilizers.	1. Climate change mitigation; 4 Conservation and sustainable management and use of soil and forests; 6. Transition to a circular economy (when the organic fertilizer is waste from farming);	(Riberio, A.C.; Guimarães, P.T.G. & Alvarez V., V.H, 1999); (Cantarella, H. et al., 2022). (Recomendações de adubação e de calagem para os Estados do Rio Grande do Sul e de Santa Catarina [Fertilization and liming recommendations for the states of Rio Grande do Sul and Santa Catarina] 10.ed, Sociedade Brasileira de Ciência do Solo, Núcleo Regional Sul, 2004). (Souza, D.M.G.de; Lobato, E., 2004)

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	3.7 Green manure	Green manure practices can contribute to soil conditioning, improving its chemical, physical, and biological aspects. In the specific case of leguminous plants, their ability to perform biological nitrogen fixation from the atmosphere stands out. Nitrogen availability is one of the main factors limiting plant growth in Brazilian pastures. The introduction of forage legumes into pastures, through intercropping or over-seeding, helps to increase the availability of nitrogen in the system and enhances primary productivity and the useful life of the pasture, while reducing dependence on chemical fertilizers. The effects observed on the primary productivity and lifespan of pastures contribute to increasing the potential for soil carbon sequestration. On the other hand, less dependence on chemical fertilizers can contribute to the reduction of emissions associated with both fertilizer synthesis and greenhouse gas losses related to the application of these inputs. As it protects the topsoil, it moderates soil temperature, reduces	Soil analysis, green manure seeds and seedlings, rental of agricultural machinery and implements, purchase of agricultural machinery and implements.	Evidence of adoption of the practice, such as invoices for the purchase of green manure seeds and seedlings and the availability of machinery for planting. On-site visits to check for the presence of green manures in pasture areas.	1. Climate change mitigation; 4 Conservation and sustainable management and use of soil and forests;	(Lima Filho, O.F.de et al., 2023). (ZIMMER, A. H.; KICHEL, A. N.; GROF, B. et all, 2007); (OLIVEIRA, P.P.A.; MATTA, F. P.; GODOY, R, 2017)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		evaporation by increasing water retention, improves soil structure and erosion control, and reduces nutrient leaching.				

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	3.8 Precision agriculture	Precision agriculture is a management strategy that takes into account temporal and spatial variability to improve the sustainability of agricultural production. Precision farming practices allow inputs to be applied in the right place, at the right time, and in the right quantities, increasing the efficiency of input use and farming operations. In pastures, precision agriculture techniques can be applied to soil fertilization management, weed, pest, and disease control, and defoliation management, helping to increase productivity and pasture longevity with more efficient use of inputs. The effects observed on the primary productivity and lifespan of pastures contribute to increasing the potential for soil carbon sequestration. In addition, the more efficient use of inputs helps to reduce water, soil, and air contamination.	Equipment or service rental for soil analysis and georeferenced identification of pest, diseases, and weeds, and map creation; purchase or rental of equipment for variable rate application of inputs.	Evidence that the practice has been adopted, such as a georeferenced map of soil fertility or the presence of pests, diseases, and weeds; recommendations for intervention techniques; and the availability of machinery and equipment for applying inputs at variable rates.	1. Climate change mitigation; 4 Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources; 7 Pollution prevention and control	(D'Oliveira, P.S. et al., 2023) A

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
4. TREE SPECIES IN THE PRODUCTION SYSTEM		The introduction of tree species into the system contributes to the aboveground carbon sequestration (primarily in the tree trunks) and to increasing the incorporation of organic material (tree roots and forage species) and soil carbon sequestration. The carbon balance in the soil depends on the input of organic material and the processes of decomposition/mineralization and humification of organic matter. Most of the carbon that enters the soil comes from the photosynthetic process and is related to the primary productivity of plants. The processes of decomposition/mineralization and humification of organic matter, in turn, are influenced by factors such as climate, plant material composition, soil characteristics, and management system. When introducing tree species, it is important to look at aspects such as: selection of forage and tree species; density and arrangement of tree species; and shade management. The density and arrangement of tree species and shade management should follow	Technical assistance and workforce training, soil analysis, correctives and fertilizers, rental of agricultural machinery and implements, purchase of agricultural machinery and implements, bio-inputs, seeds and seedlings, fencing material (bollards, wires, electric fencing equipment, rocker, etc.), water distribution material (reservoirs, drinking fountains, pipes, water collection and pumping equipment, floats, etc.), alternative energy generation for water collection, troughs, herbicides, purchase of supplements	Remote sensing; drone images; on-site visits to verify the presence of trees in the systems	1. Climate change mitigation; 2 Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests;	(Balbino, L.C.; Barcellos, A.O.; Stone, L.F. (Eds.), 2011); Bungenstab, D.J. et al, 2012);(PEZZOPANE, J. R. et al., 2020); (Montoya Vilcahuaman, 2000)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		current technical recommendations and/or guidance from a qualified professional to ensure proper development of the forage species, increasing primary productivity and the potential for incorporating organic material into the soil. The use of fast-growing tree species increases the rate of carbon sequestration in the tree trunks. The use of native tree species also contributes to maintaining biodiversity. The introduction of tree species also contributes to adapting systems to climate change. Future climate scenarios point to an increase in both the frequency of extreme events and ambient temperature. Windbreaks, live fences, strips of vegetation, and scattered trees in pastures reduce variations in the system's microclimate and provide greater comfort for the animals. It is important to avoid using tree species with invasive potential, such as *Mimosa caesalpiniifolia*.				

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	4.1 Integrated systems with a forest component (LFI or CLFI)	Crop-Livestock-Forest Integration (CLFI) systems are considered types of land use that integrate the tree component with agricultural/forage crops and/or animals that interact, resulting in environmental and economic benefits. The introduction of tree species into the system contributes to aboveground carbon sequestration (in the tree trunk) and belowground (in the roots), helping to regulate the climate. In addition, it can contribute to increasing the incorporation of organic material and carbon sequestration into the soil and neutralize methane emissions from grazing cattle through the production of carbon-neutral or low-carbon meat. These systems enable more efficient use of resources, land, and equipment, as well as economic viability and resilience by diversifying production. These systems can be composed of just one tree species or several tree species with different impacts on biomass production and nutrient cycling. The use of fast-growing, short-cycle tree species (improved species, use of clones) has	Technical assistance and training for the workforce, soil analysis, correctives and fertilizers, rental of agricultural machinery and implements, purchase of agricultural machinery and implements, bio-inputs, seeds and seedlings, fencing material (bollards, wires, electric fencing equipment, rocker, etc.), water distribution material (reservoirs, drinking fountains, pipes, equipment for collecting and pumping water, floats, etc.), alternative energy generation for water collection, troughs, herbicides, purchase of supplements	Remote sensing; drone images; on-site visits to verify the presence of trees in the systems	1. Climate change mitigation; 2 Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests;	(Balbino, L.C.; Barcellos, A.O.; Stone, L.F. (Eds.), 2011). M.; (Bungenstab, D.J. et al, 2012); PEZZOPANE, J. R. et al, 2020); (Montoya Vilcahuaman, 2000)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		high potential for carbon sequestration rates in tree trunks and economic returns. The use of native trees can generate both timber and non-timber resources. There is a high diversity of silvopastoral systems with multiple uses of forest and livestock and different combinations of these components. The mixture of different species promotes a diversity of environmental services, such as thermal comfort for the animals and resilience for the system. In the case of using native species, before planting, the producer must seek guidance from the competent state agency (State Environment Department) in order to register the planting, and, in the case of using the wood, they will need to obtain permission to cut, transport, and sell it from the competent state agency.				

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	4.2 Windbreakers	Future climate scenarios point to an increase in both the frequency of extreme events and ambient temperature. Windbreaks, live fences, strips of vegetation, and scattered trees in pastures reduce variations in the system's microclimate. However, these arrangements also have numerous other functions, such as erosion control, pest control, soil moisture retention, increasing biodiversity, protecting rural buildings, and landscaping aesthetics. Improved species such as eucalyptus and native species can be used, preferably with permanent leaves or a combination of species, adapted to the region, with canopies that are not too dense, forming a well-formed barrier. The use of scattered trees in pastures promotes thermal comfort for the animals, as well as numerous services such as incorporating nutrients into the soil and facilitating regeneration. In these cases, the maintenance or use of native species, especially nitrogen-fixing ones with a less dense canopy, favors forage plants. It is important to avoid	Technical assistance and workforce training, soil analysis, correctives and fertilizers, rental of machinery and agricultural implements, purchase of machinery and agricultural implements, bio-inputs, seeds and seedlings, fencing material (bollards, wires, electric fencing equipment, rocker, etc.), herbicides.	Remote sensing; drone images; on-site visits to verify the presence of trees in the systems	2. Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems (when introducing native tree species); 4. Conservation and sustainable management and use of soil and forests;	(Conceição, 1996). C. 4. (Montoya Vilcahuaman, 2000).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		using tree species with invasive potential, such as *Mimosa caesalpiniifolia*.				
5. ANIMAL MANAGEMENT AND NUTRITION		Increased productivity (weight gain, fertility, etc.) means that methane emissions are diluted per kilogram of product produced and reduces the number of animals required to meet the same demand for meat, milk, and wool. Increases in weight gain can be achieved by supplementing grazing animals with (1) urea salt, (2) low/medium intake protein and protein-energy supplements or (3) the use of high intake concentrate supplements, as well as (4) supplementation with roughage (hay, silage, grass, etc.). Even higher gains can be achieved with animals in (5) confinement. In all cases, it is possible to	Technical assistance and workforce training, structure for supplementing the animals (troughs, etc.), machinery and equipment, purchase of supplements; rental and/or purchase of agricultural machinery and implements, bio-inputs, seeds and seedlings, fencing material (mills, wires, electric fencing equipment, rockers, etc.), water distribution material (reservoirs, drinking fountains, pipes, equipment for collecting and pumping water, floats, etc.), structure of silos,	Report on the herd's zootechnical indices (utilization rate, age at slaughter of animals, age at first reproduction of females, milk yield per animal). Reports generated based on information from the agro-industry (slaughterhouses and dairies) and the herd registry at state agencies.	1. Climate change mitigation; 2. Climate change adaptation.	(FAO, 2023. *Pathways towards lower emissions -– A global assessment of the greenhouse gas emissions and mitigation options from livestock agrifood systems*). (Congio et al, 2021).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		include (6) feed additives that can improve performance and/or reduce methane emissions. The fertility of the animals can be increased by having the (7) females at calving in good body condition and maintaining this condition until the next calving, by good pasture management and mineral supplementation, as well as by using all the other ways of supplementing grazing animals or giving complete diets to females in confinement, including heifers, which can thereby (8)anticipate the age of first calving, which can also be achieved with all the forms of supplementation already mentioned on pasture and also with the use of (9) offering concentrated feed in pre-weaning creep-feeding (an option in which only the calf has access to the supplement), a valid option if subsequent weight gains are equal to or greater than those obtained in this phase. Increases in fertility can be obtained with the use of reproductive biotechniques such as (10) fixed-time artificial insemination (FTAI), (11) and	sheds and warehouses, tarpaulin for covering silos; purchase of raw materials, concentrated feed and food supplements; feed mill, electronic animal identification system, electronic troughs and drinkers, electronic corral scales and walk-through scales, software and management platform focused on precision livestock farming; feed additives; structure for confinement; vaccines and medicines, construction and adaptation of corrals; structure for artificial shade			

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		embryo transfer (ET), especially as they allow the use of (12) semen and eggs from genetically superior animals. Investing in improved animals in this way, or with the use of (13) improved bulls, is an important way for boosting productivity, however, it is important to note that the conditions of the production environment, especially in terms of nutrition and health, need to be suitable for the genetics being utilized. This also applies to the use of (14) industrial crossbreeding, in which a female of breed X is fertilized with semen from an animal of breed Y, in which X and Y have complementary characteristics, resulting in heterosis gains. (15) improved forage, suitable for the location and technological level, (16) improved confinement structure, including provision of shade.				

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.1 Supplementing grazing animals with urea salt	When combined with forage on pasture, it enables better performance compared to not using it. The concentration of minerals in the forage is not always sufficient to meet the nutritional requirements of the animals. In the dry season, even when selecting the best parts of the forage, the protein intake is below 7% on a dry basis, compromising the animal's intake. Providing a mineral salt containing approximately 30% urea, which corrects protein deficiencies, increases forage consumption and allows for weight maintenance or modest gains. Higher performance means greater methane dilution per kilogram of product and the need for fewer animals to meet the same product demand.	Purchase mineralization troughs; feed mill, urea salt	Evaluation of the animals' body condition, zootechnical indices, existence of troughs with mineral salt, invoices for the purchase of salt with urea or livestock urea	1. Climate change mitigation; 2 Climate change adaptation	(MEDEIROS, S. R. et al., 2015).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.2 Supplementing grazing animals with protein and/or energy supplements	When combined with forage on pasture, it enables better performance compared to not using it. The concentration of minerals in the diet is not always sufficient to meet the animals' nutritional requirements. Mineral deficiency causes reproductive and health problems and is often only noticed after a long period of malnutrition. In the dry season, even when selecting the best parts of the forage, the protein intake is below 7% on a dry basis, compromising the animal's intake. Providing a low-intake protein supplement (1 to 2 g/kg liveweight) 30%–50% protein (on a dry basis), by correcting the protein deficiency, leads to an increase in forage consumption and allows moderate weight gains in the dry season (200 to 400 g/head per day). For higher gains (450 to 650 g/head per day), protein-energy supplements can be used, with higher consumption (3 to 5 g/kg liveweight). Finally, supplements with concentrates can be used during the rainy season with 100 to 200 g/head per	Purchase mineralization troughs; feed mill	Evaluation of the animals' body condition, zootechnical indices, existence of troughs with mineral salt, invoices for the purchase of inputs	1. Climate change mitigation; 2 Climate change adaptation	(MEDEIROS, S. R. et al., 2015).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		day of additional gain compared to animals receiving only mineral salt. Higher performance means greater methane dilution per kilogram of product and the need for fewer animals to meet the same product demand.				
	5.3 Supplementing animals with roughage	Forage production in pastures is seasonal and varies according to the climate. During periods of reduced grass growth, supplementing animals with roughage leads to better performance compared to not providing supplementation. Various volume supplementation strategies can be adopted: (1) use pasture fencing during the rainy season to make use of the forage accumulated during the dry season, (2) produce preserved forage in the form of hay or silage. (3) plant winter forage species or forage with a low accumulation of stalks and good leaf retention. (4) use sugar cane or another forage crop as weeding (cut and supply)	Fertilizers and correctives, bio-inputs, seeds, silo structures, sheds and warehouses, canvas for silo covers; bags (for silo bags); machinery and equipment for harvesting and preserving forage,	Assessment of the animals' body condition, zootechnical indices, existence of feed in silos, sheds and warehouses	1. Climate change mitigation; 2 Climate change adaptation	

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.4 Introducing leguminous forage plants into the diet	Introducing legumes into the diet by intercropping with grass in pastures, using cultivars suitable for the specific situation and using the recommended management for each intercropping. One of the benefits of intercropping is its ability to reduce the need for nitrogen fertilization by taking advantage of the incorporation of biologically fixed atmospheric N and by eliminating the need for protein supplementation during droughts, avoiding all the emissions associated with the use of external products (fertilizers and supplements) that are no longer purchased. In addition, there are legumes containing secondary components (e.g., tannin) that can reduce methane emissions. Another way of using them is as protein banks, i.e., the use of exclusive legume areas for grazing for a period during the day, with less complex agricultural management, but without the advantages of positive interactions with the grass (for example, the use of the N fixed by them).	Fertilizers and correctives, seeds, fencing material	Assessment of the animals' body condition, zootechnical indices, the existence of grass-legume consortia and the % cover of each species; the existence of the protein bank, its condition and evidence of use	1. Climate change mitigation;	(Furtado, A. J.; Abdalla Filho, A. L.; Bruno, J. F. et al., 2023).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.5 Confinement	Confinement is an option used to achieve higher gains during drought periods and, at the same time, strategically reduce pasture stocking by removing the heaviest animals, which consume the most forage. It is used particularly for finishing animals, with the advantage that it can be done very assertively, since there is total control over the animals' diet, both in terms of investment and results, such as accurately determining the average slaughter date of the batches. Due to the high gains, confinement is not only more efficient but also allows greater fat deposition in weight gain, leading to faster finishing. Confinement has also been used to fatten replacement heifers to reach their first breeding weight at a younger age or to recover the body condition of females for better fertility rates. Higher performance of finishing animals, increased lifespan of dams with heifers calving at younger ages, and greater fertility of the herd result in greater dilution of methane per kilogram of product and the need for fewer	Buying troughs for confinement, fences; structures for silos, sheds and warehouses, tarpaulins for silo covers; bags (for silo bags); machinery and equipment for silage production and forage harvesting, machines for distributing the diet, feed mills	Assessment of the animals' body condition, zootechnical indices, existence of IPT-compatible trough structure, invoices for the purchase of inputs	1. Climate change mitigation; 2 Climate change adaptation	(MEDEIROS, S. R. et al., 2015);

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		animals to meet the same demand for products.				
	5.6 Feed supplementation of grazing animals using high quantities of concentrates, intensive pasture termination (IPT)	In this method, almost all of the animal's expected intake comes from the concentrate, with the forage in the pasture only guaranteeing a minimum intake of fiber to maintain rumen health, so it doesn't depend on a large mass of forage. Performance levels are the highest obtained with animals on pasture (~1.5 kg/head per day). Concentrate intake generally ranges from 1.7–2.0% of live weight. It is an option to be used for finishing animals with high weights, close to slaughter weight, as they are usually of shorter duration (45–60 days). The trough structure must be sufficient for all animals to have simultaneous access to the concentrate. Higher performance means greater methane dilution per kilogram of product and the need for fewer animals to meet the same product demand.	Purchase troughs; concentrate distribution machines, feed mill	Assessment of the animals' body condition, zootechnical indices, existence of IPT-compatible trough structure, invoices for the purchase of inputs	1. Climate change mitigation; 2 Climate change adaptation	(MEDEIROS, S. R. et al., 2015).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.7 Use of dietary additives proven to reduce methane emissions or improve performance	Additives are non-food substances that improve animal performance. By increasing performance, even if it doesn't reduce methane emissions, it dilutes them per kilogram of product produced. Some additives also reduce methane emissions (e.g., ionophores). There are also products (e.g., enzyme inhibitors) that do not alter performance but reduce methane emissions. It is important that additives are proven to be effective through scientific studies.	Purchase of additives	Purchase invoices for additives	1. Climate change mitigation;	(Berchielli, T.T., 2010).
	5.8 Use of co-products and by-products from regional industries	The use of co-products, by-products, and waste from industries in the region reduces competition for feed and reduces the carbon footprint, as they replace inputs that have a higher carbon footprint. For example, the carbon footprint of DDGS is 46 times smaller than the carbon footprint of the corn from which it is derived.	Trucks, trailers	Invoices for the purchase of co-products, storage locations for these inputs	1. Climate change mitigation	(PEIXOTO, A.M.; MOURA, J.C.; FARIA, V.P., 1997) S

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.9 Precision nutrition	Precision nutrition practices make it possible to better adjust the supply of nutrients to animals, increasing the efficiency of nutrient use and reducing both emissions per kilogram of product and the potential for environmental contamination from animal manure.	Electronic animal identification system, electronic feeding troughs and watering troughs, electronic chute scales and walk-through scales, software and management platforms focused on precision livestock farming	Invoices for the identification system and software purchased	1. Climate change mitigation; 2 Climate change adaptation	(MEDEIROS, S. R.; BARIONI, L. G.; GOMES, R. C. et al, 2014).
	5.10 Good health management practices recommended for the animal species used	Maintaining the animal's health ensures that its potential productivity, depending on the level of technology used, is maintained. Otherwise, methane emissions per unit of product would increase as more animals would be needed for the same demand. Practices must include the control of endo- and ecto-parasites and herd vaccination schedules.	Technical assistance and workforce training, purchase of medicines and vaccines	Animal health status, zootechnical indices, and invoices for the purchase of medicines, vaccines, and veterinary services	1. Climate change mitigation; 2 Climate change adaptation	(Pires, A.V., 2010) .

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.11 animal access to shaded areas and/or shelter from predators and climatic stress	When animals are under heat stress, they seek out shaded areas as a strategy to alleviate this discomfort. This improvement in well-being can result in better performance compared to not having the option of shade. Natural tree cover or synthetic structures help reduce heat stress and help in extremely cold conditions. This higher performance means a greater dilution of methane per kilogram of product and reduces the number of animals needed to meet the same product demand.	Technical assistance and workforce training, purchase of seedlings, inputs for planting trees, shade structure with shade cloth and other more specific materials for this.	Absence of heat stress symptoms (e.g., panting animals), zootechnical indices, existence of shaded areas	1. Climate change mitigation; 2 Climate change adaptation	(SANT'ANNA, A. C. , COSTA, M.P., MADUREIRA, A.P., 2014); .
	5.12 Use of infrastructure and equipment that promotes animal safety and avoids pain and suffering	Providing animal welfare helps to achieve better productivity. Adapting structures and equipment reduces stress during animal handling and the risk of injuries, which affect their productive performance, diluting methane emissions per unit of product and reducing the number of animals needed to meet the same demand. The farm must at least have a structure for containing animals during handling (e.g., a chute) and carry out rational animal handling (e.g., not using stings or shocks	Technical assistance and workforce training, shade structure with shade cloth and other more specific materials for this purpose, chute, rational management corral, protection corral	Absence of stress symptoms, zootechnical indices, existence of shaded areas, protection structures, containment and handling of the animals, proof of training in rational handling	1. Climate change mitigation;	(QUINTILIANO, M. H. , PÁSCOA, A.G.; COSTA, M.P., 2014).

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		to drive the animals). In places where predators (e.g., jaguars) are present, protective corrals should be installed to safeguard the herd. Higher performance means greater methane dilution per kilogram of product and the need for fewer animals to meet the same product demand.				
	5.13 Permanent access of animals to drinking troughs with clean, good-quality water	Access to clean drinking water is essential for animal production and reduces the risk of health problems. It is an animal welfare factor that guarantees production potential depending on the level of technology. Higher performance means greater methane dilution per kilogram of product and the need for fewer animals to meet the same product demand.	Material for water distribution (reservoirs, drinking fountains, pipes, collection and pumping equipment, floats, etc.), generation of alternative energy for pumping water (e.g., solar panels)	Absence of water stress symptoms, zootechnical indices, sufficient number of drinking fountains and water reserves	1. Climate change mitigation; 2 Climate change adaptation	
6. MANURE MANAGEMENT		Solid and liquid organic waste are sources of GHG emissions in animal production, especially in production systems that manage this waste. During storage/treatment and disposal in the soil as fertilizer, waste can emit CO_2, CH_4, and N_2O. The treatment of liquid waste	Technical assistance/project and workforce training, adaptation of structure for collecting and treating manure (catchment basin, etc.), biodigesters, biodigester installation project	Existence of a treatment structure on the property	1. Climate change mitigation; 6. Transition to a circular economy.	

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		by biodigesters is a way of mitigating GHG emissions in the form of methane (CH_4), which can be used as a source of thermal or electrical energy. Other technologies can also reduce GHG emissions from liquid waste: phase separation, agitation, and reduced hydraulic retention time. As for solid waste, composting is a technology to consider. When using waste as fertilizer, preference should be given to incorporation rather than surface application.				
7. USE OF FORAGE SPECIES ADAPTED TO CLIMATE CHANGE		The use of forage plants adapted to climate change scenarios reduces the risk of feed shortages for animals and pasture degradation. Future climate scenarios point to an increase in the frequency of extreme events, including periods of severe drought. Lack of water is one of the main abiotic stress factors observed in pastures, reducing forage production and plant persistence. Under prolonged extreme drought conditions, combined with other factors such as overgrazing, various pests may appear,	Technical assistance and workforce training, seeds and seedlings of adapted cultivars, purchase of fencing material (proper pasture management)	Invoices for seeds and seedlings, presence of the species on the property.	2. Climate change adaptation.	(Torres, 2022) (Vilcahuaman; Baggio, 2000) (Porfírio da Silva; Santos, 2010) (Bruziguessi et al., 2021)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		including defoliator caterpillars, brown stinkbugs, and others. The brown stinkbugs is most commonly found in sandy soils, where they move more easily. In addition to proper management practices, the choice of seeds and species adapted to drought and tolerance to these pests is extremely important.				
8. USE OF ANIMAL SPECIES AND BREEDS ADAPTED TO CLIMATE CHANGE		The use of species, breeds and strains of animals adapted to climate change scenarios reduces the risk of poor animal performance due to biotic and abiotic stress factors, including parasite infestation and the occurrence of diseases. Future climate scenarios point to an increase in both the frequency of extreme events and ambient temperature. The use of animals that are tolerant to heat stress and any adversity, more resilient and efficient, especially those raised on pasture, contributes to reducing methane emissions and the sustainability of the production system. Genetic improvement of the herd makes it	Superior dams and sires in terms of adaptation characteristics, technical assistance, semen, liquid nitrogen, semen bottles, and breeding protocols.	Invoices for the purchase of semen, breeding stock and the presence of species and breeds on the property.	2. Climate change adaptation.	(Pires, 2010)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		possible to adapt genetic resources to climate change scenarios in the medium and long term				
9. SOIL AND WATER CONSERVATION		Proper management practices contribute to the conservation and sustainable use of soil and water. Soil erosion leads to a loss of fertility and the area's productive potential, as well as the silting up of rivers and bodies of water. Soil and water management and conservation practices should be established according to the susceptibility to erosion characteristics of the land (including soil class, topography, slope and slope length, soil cover by pastures). Some recommended practices for cultivated areas include terracing, soil preparation and level planting, strip planting and ground cover. In the areas of tracks and roads, the route must be planned following the site's characteristics. In addition, berms and water and sediment catchment basins can be constructed to slow the water speed. The definition of conservation practices must follow	Technical assistance to map the topographical features of the property and identify the potential for rainwater collection and how to retain it; identify the best place to make contour lines and rural dams; design roads and fences in such a way as to minimize erosion processes, while keeping maintenance costs as low as possible (rental and/or purchase of machinery and equipment, material for dividing pastures (fences, water troughs, troughs, etc.), planialtimetric survey. Acquisition of native seedlings and seeds to restore permanent preservation areas and legal reserves.	Monitoring of erosion points by remote sensing; drone images; on-site visits; existence of soil conservation project with planialtimetric plan	4. Conservation and sustainable management and use of soil and forests.	(Spera et al., 1993) (Souza et al., 2021) (WWF; EMBRAPA, 2011)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		current technical recommendations and/or the advice of a qualified professional.				
	9.1 Use of terraces	Terraces reduce the speed of floodwater, preventing it from degrading the soil and carrying sediment to other places, including rivers and bodies of water. The definition of the type of terrace, its location, and size must follow current technical recommendations and/or the advice of a qualified professional. Considering the movement patterns of animals in pastures, it is important to establish a maintenance plan for the terraces over time to reduce the risk of breakage.	Technical assistance and workforce training, rental and/or purchase of machinery and equipment, planialtimetric survey	Remote sensing monitoring; drone images; on-site visits; existence of soil conservation project with planialtimetric plan	4. Conservation and sustainable management and use of soil and forests; 7. Pollution prevention and control	Spera, S.T. et al., 1993) Pr; (Souza, G.S. de) S9). (Bertoni, J.; Lombardi Neto, F., 1990) C. C s

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	9.2 Soil preparation and level planting	Soil preparation and level planting help to reduce the speed of floodwater, preventing it from breaking up the soil and carrying sediment to other places, including rivers and bodies of water.	Technical assistance and workforce training, rental and/or purchase of machinery and equipment, planialtimetric survey	On-site visits during operations	4. Conservation and sustainable management and use of soil and forests	(Spera, S.T. et al., 1993) P; (Souza, G.S. de) 1 C)
	9.3 Strip planting	Strip planting helps reduce the volume and speed of floodwater, preventing it from breaking up the soil and carrying sediment to other places, including rivers and bodies of water.	Technical assistance and workforce training, rental and/or purchase of machinery and equipment, planialtimetric survey	Remote sensing monitoring; drone images; on-site visits	4. Conservation and sustainable management and use of soil and forests	(Spera, S.T. et al., 1993) P; (Souza, G.S. de) e . (Bertoni, J.; Lombardi Neto, F., 1990) C

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	9.4 Soil cover	Plant or mulch cover prevents the direct impact of drops, which dislodge soil particles and promote erosion. In pastures, the choice of forage species and proper management of defoliation are fundamental to ensuring good soil cover and should follow current technical recommendations and/or the guidance of a qualified professional.	Technical assistance and training for the workforce, fencing equipment (bollards, wires, electric fencing equipment, rockers, etc.), water distribution equipment (reservoirs, drinking fountains, pipes, collection and pumping equipment, floats, etc.), alternative energy generation for pumping water (e.g., solar panels), troughs.	Remote sensing monitoring; drone images; on-site visits	4. Conservation and sustainable management and use of soil and forests; 7. Pollution prevention and control	(Spera, S.T. et al., 1993) P; (Souza, G.S. de) s d. (Bertoni, J.; Lombardi Neto, F., 1990)
	9.5 Road and animal track planning	Channeling the flow of floodwater on roads and animal track increases the risk of erosion. To reduce the risk of erosion, it is necessary to plan the layout of roads and tracks, especially concerning the length and slope of the ramps and the drainage system. Where necessary, water collection and sedimentation basins and berms should be constructed to slow the water speed.	Technical assistance and workforce training, technical engineering project for road design (for larger roads and traffic levels), rental and/or purchase of machinery and equipment, planialtimetric survey, paving material (gravel etc.)	Remote sensing monitoring; drone images; on-site visits. In the event of problems observed on municipal, state, or federal roads, the competent agency should be called in.	4. Conservation and sustainable management and use of soil and forests; 7. Pollution prevention and control	(Spera, S.T. et al., 1993) (Souza, G.S. de) (Bertoni, J.; Lombardi Neto, F., 1990)

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	9.6 Restricting animal access to permanent protection areas (PPAs)	Restricting animal access to PPA areas, including springs and water sources, hilltops and slopes with a gradient of more than 45°, aims to protect the soil and native vegetation and ensure the provision of ecosystem services. As cattle access for watering and low-impact activities is permitted by law, it is recommended that you contact the environmental agencies in each state to avoid degrading the existing vegetation. Depending on how the water is used, a permit is necessary.	Building fences, installing reservoirs and drinking fountains on the property, drilling a well. For slope recovery, implement terraces and retaining walls with deep-rooted plants.	Remote sensing monitoring; drone images; on-site visits	4. Sustainable use of the soil and conservation, management, and sustainable use of forests; 7. Prevention and control; 3. Protection and restoration of biodiversity and ecosystems;	(Spera, S.T. et al., 1993) ; (Souza, G.S. de) S. (Bertoni, J.; Lombardi Neto, F., 1990)
10. GOOD PRACTICES FOR THE USE OF PESTICIDES		The application of pesticides can affect the biology of pollinating insects and harm the development of regenerating individuals in forest regeneration areas. The rational use of pesticides, prioritizing application methods and types with lower potential impact, reduces the risks of environmental contamination and impact on pollinators, and contributes to the conservation and regeneration of native vegetation areas. It is also important to	Technical assistance and workforce training	Soil and water analysis report	4. Conservation and sustainable management and use of soil and forests; 7. Pollution prevention and control 3. Protection and restoration of	

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		reduce the appearance and spread of pesticide-resistant biotypes.			biodiversity and ecosystems	
11. FOREST PATCHES (CAPÕES)/FRAGMENTS/PATCHES OF NATIVE VEGETATION AND ECOLOGICAL CORRIDORS ON A LANDSCAPE SCALE		Pastures occupy a large area of land in Brazil, most of which is made up of a limited number of cultivars of exotic forage species. Maintaining forest patches (capões)/fragments/patches of native vegetation and ecological corridors on a landscape scale will contribute to the genetic flow between fragments and help preserve biodiversity.	Technical assistance and training for the workforce, soil analysis, correctives and fertilizers, rental of agricultural machinery and implements, purchase of agricultural machinery and implements, seeds and seedlings, fencing material (bollards, wires, electric fencing equipment, rockers, etc.), water distribution material (drinking fountains, pipes, pumps, etc.), troughs, herbicides	Remote sensing; drone images; on-site visit	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	
12. MIX OF SPECIES THAT COMBINE FUNCTIONAL CHARACTERISTICS AND PROVIDE GREATER RESILIENCE OF PASTURES		Pastures occupy a large area of land in Brazil, most of which is made up of a limited number of cultivars of exotic forage species. The formation of pastures with mixtures of species allows the functional characteristics of each group to be exploited, giving greater	Technical assistance and workforce training, soil analysis, correctives and fertilizers, rental of agricultural machinery and implements, purchase of agricultural machinery and implements, seeds and seedlings, fencing material	Drone images; on-site visit	2. Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems	–

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		resilience, especially in adverse soil and climate conditions.	(bollards, wires, electric fence apparatus, rockers, etc.), water distribution material (drinking fountains, pipes, pumps, etc.), troughs, herbicides			
13. ANIMAL REPRODUCTION		Increases in reproductive and productive efficiency can be obtained with the use of reproductive biotechniques such as (a) fixed-time artificial insemination (FTAI), (b) and embryo transfer (ET), especially as they allow the use of semen and oocytes from genetically superior animals.				
	13.1 Fixed-time artificial insemination (FTAI)	Increases in fertility can be achieved through the use of fixed-time artificial insemination (FTAI), which synchronizes the timing of insemination. It enables the use of superior genetic semen, improving the herd and delivering gains over time.	Hiring a trained technician, quality semen, adequate structure on the property (containment trunks, a suitable place to store the semen and specific equipment).	Invoices for the purchase of semen and veterinary products used in FTAI	1. Climate change mitigation; 2 Climate change adaptation	(Baruselli et al., 2021)
	13.2 Embryo transfer	Embryo transfer (ET), especially as it allows the use of semen and oocytes from genetically superior animals, accelerates animal breeding and results in a higher performance.	Hiring a trained technician, adequate structure on the property (containment trunks, specific materials and	Invoices for the purchase of embryos and veterinary products used in FTAI	1. Climate change mitigation; 2 Climate change adaptation	(BARUSELLI, Pietro Sampaio et al., 2007) S

Title of the practice	Components of Practice	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			equipment for embryo production).			

Appendix A5.

Planted forests: Sustainable practices for eucalyptus

CNAEs:

- 02.10-1/01: Eucalyptus cultivation

Description:

Planted forests are areas that have been reforested or afforested with trees grown intentionally for various purposes, such as the production of timber, paper, cellulose, resins, non-timber products, soil conservation, and environmental protection. Eucalyptus (*Eucalyptus spp.*) is one of the most widely cultivated tree species in Brazil, playing a key role in various aspects of the Brazilian economy, environment, and society.

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
1. ENVIRONMENTAL MANAGEMENT	1.1. Forest plantations in mosaic patterns	Forest plantations of different ages and genetic material that are interspersed with native forests in an organic way in the landscape. Forest mosaics are known for contributing to the maintenance and conservation of soils, water resources and the biodiversity that inhabits cultivated areas (agronomic or forestry). In addition, this concept provides other benefits, which are mainly carried out by tropical forests around the world, such as climate change mitigation; absorbing carbon dioxide; producing and releasing oxygen gas; protecting springs; preventing erosion and	Analysis and study services to size and optimize ecological corridors and compartmentalization, including road allocation and the need for firebreaks.	Commercial forests between fragments of native forests, forming forest connectivity corridors between fragments. Preservation of native forests and their natural resources; Regulation of water flow;	1. Climate change mitigation; 2. Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of biodiversity as well as water and marine resources.	(Banks-Leite et al., 2014)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		soil degradation; supplying forest products and providing shelter for various species.				
	1.2. Mapping risk areas and fire-fighting plan	The planning of annual actions to prevent and combat forest fires is closely linked to the prevailing climate in the region. It is recommended that planning actions take place between the end of the last fire season and the beginning of the next one, with the months of June to October being the most critical period. Planning should consider mapping of areas at risk for forest fires (roads, railroads, proximity to urban areas, transmission lines, type of vegetation, surrounding agricultural crops, history of fires, etc.). The plan must be agreed upon by all neighboring landowners and others involved to ensure the standardization of procedures and the chain of responsibility for implementation of the planning and the execution of the proposed actions.	Water tank; water truck; monitoring towers; blowers and flappers; construction of water storage tanks; contract to provide services for planning, training, monitoring and controlling forest fires; tractors and brushcutters to form firebreaks. Purchase of PPE.	Compatible infrastructure and resources for implementing the proposed fire prevention and fighting plan.	7. Pollution prevention and control.	(Te & Flo, 2013). (Ribeirio, 2004).

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.3. Planting forests in areas surrounding native forest fragments	Increased environmental pressure (winds, incidence of light and heat, among others) is a problem for maintaining the biodiversity and biological quality of native forest fragments. Planting forests in areas surrounding native forest fragments shifts the edge effect to the planted forest area, reducing the pressure from the external environment on the native forest fragment.	Analysis and study services to size and optimize ecological corridors and compartmentalization, including road allocation and the need for firebreaks.	Commercial forests planted in areas surrounding fragments of native forest.	3. Protection and restoration of biodiversity and ecosystems	(Lima-Ribeiro, 2008)
	1.4. Replacing fossil fuels	Replacing fossil fuel boilers with bioenergy boilers and encouraging the use of biodiesel-powered agricultural machinery.	Boilers powered by bioenergy, agricultural machinery powered by biodiesel, specialized consulting, training, and capacity building.	Infrastructure, agricultural machinery, and equipment compatible with the use of bioenergy.	2. Climate change adaptation.	(Bidarte et al., 2014)
2. GENETIC MATERIAL AND PLANTING	2.1. Suitable genetic material.	Adopt suitable genetic material based on the soil characteristics, the property's microclimate, and the use of the wood. Give preference to genetic materials that are resistant or tolerant to insect pests and diseases. Purchase seedlings from duly authorized producers or nurseries, requesting a health certificate.	Forest seedlings, specialized consultancy services.	Invoices, on-site verification.	4. Conservation and sustainable management and use of soil and forests.	(Santarosa; Penteado Júnior; Goulart, 2014) (Paiva et al., 2001)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	2.2. Spacing according to use	Spacing is one of the main management techniques aimed at quality and productivity of raw material. The spacing adopted for planting influences forest growth, the quality of the wood produced, the cutting age, thinning, management practices and, consequently, production costs. Generally, larger spacings are dedicated to timber production, while smaller spacings (higher population density) are recommended for pulp and energy production.	Consulting, training, and capacity-building services.	On-site verification. Planting density compatible with the capacity of the forest site, mainly due to water availability and forest use.	4. Conservation and sustainable management and use of soil and forests.	(Santarosa; Penteado Júnior; Goulart, 2014) (Paiva et al., 2001)
	2.3. Planting forest seedlings in pits	The technique of planting eucalyptus in pits begins with marking out the pits, followed by opening them up with diggers or augers. The depth ranges from 30 to 40 cm, providing enough space for proper root development. After opening the pit, fertilize the bottom to provide the seedling's initial nutrition. Next, the pit is covered with the removed soil. The seedling should be positioned so that it is close to ground level and lightly compacted to avoid air pockets that could compromise growth.	Motorized auger/soil drill.	Seedling planting using a motorized auger, due to land mechanization constraints or the unavailability of machinery (small forestry enterprises).	5. Sustainable use and protection of water and marine resources	(Paiva et al., 2001)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
3. SOIL FERTILITY AND PLANT NUTRITION	3.1. Soil fertility diagnosis and correction	Diagnosis involves analyzing the edaphic component in order to define an appropriate plan for correcting and maintaining soil fertility.	Soil analysis services; lime/gypsum distribution equipment; fertilizer spreaders; purchase of fertilizers, correctives and soil conditioners.	Chemical analysis of the soil. Base fertilization and top dressing, with NPK and micronutrients.	4. Conservation and sustainable management and use of soil and forests.	(Santarosa; Penteado Júnior; Goulart, 2014) (Paiva et al., 2001)
	3.2. Nutritional management of eucalyptus	Nutritional management of eucalyptus is a set of practices aimed at optimizing the nutrition of the forest stand. Through proper planning and the use of techniques such as soil and foliar analysis, correction and fertilization, it is possible to optimize plant nutrition and promote greater productivity in the forest stand.	Soil analysis, foliar analysis; macro and micronutrients required for correction. (Forestry fogger); Services via aerial drone for application.	Nutritional analysis of forest stands.	4. Conservation and sustainable management and use of soil and forests.	(Santarosa; Penteado Júnior; Goulart, 2014) (Paiva et al., 2001)
	3.3. Use of bio-inputs for growth promotion/ phytosanitary control	The technique of using bio-inputs consists of applying natural products or those derived from living organisms, such as microorganisms, biofertilizers and organic compounds, to contribute to the development of eucalyptus. Different types of bio-inputs can act in different ways, whether to increase the availability of nutrients in the soil or nutrient absorption, thereby improving the	Acquisition of bio-inputs; acquisition of bio-factory; specialized application and consultancy services.	Purchase and proper use of bio-inputs as prescribed by the manufacturer.	7. Pollution prevention and control.	(Vidal, 2020)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		nutrition of the forest stand. It can also act to strengthen the root system and induce resistance to pathogens. This sustainable practice can reduce production costs and promote greater planting resilience.				
4. SOIL AND WATER MANAGEMENT AND CONSERVATION	4.1. Minimum tillage	Soil management practice aimed at reducing the impact of tillage operations on soil structure. Minimum tillage limits soil turning over to the tree planting line, aiming to minimize erosion and reduce soil compaction, among other benefits.	Forest subsoiler or subsoiling services, specialized consultancy services.	Subsoiling with basic fertilizer in the furrow.	1. Climate change mitigation; 2. Climate change adaptation.	(Santarosa; Penteado Júnior; Goulart, 2014) (Paiva et al., 2001) (Gava, 2003)
	4.2. Planting on contour lines	A soil management technique in sloping areas aim to minimize the loss of soil, water, and nutrients through water erosion. The plantations follow contoured lines, taking into account the slope of the land, i.e., the lines are drawn along a constant altitude in order to reduce surface runoff and promote greater soil stability.	Terrace planning and construction services or the purchase of tractors and implements (disk plows) for proper terracing.	Reduction of surface runoff; Reduction of erosion.	1. Climate change mitigation; 2. Climate change adaptation.	(Santarosa, 2014) (Paiva, 2001)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	4.3. Use of integrated weed competition management techniques	The weed competition control technique in eucalyptus cultivation involves practices to minimize competition between weeds and eucalyptus for essential resources such as water, nutrients, and sunlight. This competition is detrimental to tree growth, especially in the early years of development, and to productivity at the end of the cycle. Management can include the use of selective herbicides, manual or mechanical weeding, covering the soil with organic materials, among others.	Tractors and pulverizers; backpack brushcutters; drones; herbicides .	Recommended herbicides for the crop, adequate infrastructure and equipment	4. Conservation and sustainable management and use of soil and forests.	(Santarosa, 2014)
5. INTEGRATED PEST CONTROL	5.1. Integrated ant control	The ant control technique in eucalyptus cultivation aims to control ant populations, which are major pests in the forestry sector. These ants cause serious damage by cutting leaves and compromising the growth of seedlings, affecting the productivity and economic profitability of the forest. The main aim of this technique is to protect trees, especially in the early stages of development, ensuring planting success.	Products registered for the crop; acquisition of services and equipment to identify the need for management and application, consultancy and specialized services.	Purchase and application of ant control products, according to technical guidelines	4. Conservation and sustainable management and use of soil and forests.	(Santarosa; Penteado Júnior; Goulart, 2014) (Paiva et al., 2001) (Filho, 2021)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.2. Integrated Pest Management — IPM	The Integrated Pest Management (IPM) technique in eucalyptus cultivation is a sustainable approach that aims to control pest populations in a balanced way, reducing the excessive use of pesticides. In IPM, constant monitoring of planted areas is combined with the use of biological, chemical, and cultural control methods to prevent infestation. This technique seeks to minimize both the environmental and economic impact.	Facilities for managing chemical waste; acquisition of equipment; inputs for pest/disease control. Specialized services/workforce, monitoring and application. Consulting and training.	Diagnosis (or evaluation of the agroecosystem), decision-making, and selection of control methods (IPM strategies and tactics).	4. Conservation and sustainable management and use of soil and forests.	(Lemes, 2021)
	5.3. Biological control of pests and diseases	Biological control involves the introduction of natural predators, parasites, or pest microorganisms in order to control pests and diseases that affect eucalyptus plantations. This technique is important in the environmental context because it reduces the use of pesticides and maintains ecological balance, as well as often reducing the financial costs of controlling a pest or disease.	Biological inputs; bio-factory, and specialized application services. Consultants.	Purchase and proper use of bio-inputs as prescribed by the manufacturer.	4. Conservation and sustainable management and use of soil and forests.	(Lemes, 2021)
6. HARVESTING	6.1. Keeping residues in the soil post-harvest	A practice that leaves residues such as bark, leaves and fine branches, including roots, thereby protecting the soil and incorporating organic matter, respectively.	Specialized consultancy services, rental of forestry machinery and	Keeping residues distributed in the harvested area, allowing nutrient	4. Conservation and sustainable management and use of soil and forests.	(Santana, 2009)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	- Sustainable harvesting		implements, training and capacity building.	cycling. No stump removal operation is carried out.		
	6.2. Production area compartmentalization (logistics, harvesting and production planning)	Practice of planning land use in a forestry production unit by defining the density of roads and their allocation, the size and shape of the plots, and planting planning taking into account the distribution of the age of the future forest and the volume to be produced, the direction of machinery movement for cutting, skidding and timber transportation machines. This organization of the production area facilitates tactical and operational planning, as well as its execution in an organized, efficient, and cost-effective manner, in addition to promoting a lower impact of machinery operations/vehicle traffic in the area and minimizing soil compaction, and the allocation of contour lines, contributing to soil and water conservation.	Specialized consultancy services, rental of forestry machinery and implements, training and capacity building. Relocation of roads.	Map or sketch of the farm. Allocation of roads, firebreaks and plots on the sketch, and compartmentalization execution based on the sketch.	4. Conservation and sustainable management and use of soil and forests.	(Castro, 2018)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	6.3. Planning harvesting operations	Forest harvesting involves the following stages: felling, extraction, loading, transportation, and unloading. Planning forest harvesting involves defining the type of harvesting module (whole trees or short logs), sizing the module (number of machines and/or professionals in each operation), the period between operations, and the route to be taken by the machines. It must be carried out in advance in order to minimize costs, increase operations performance, and reduce environmental impacts at the cutting, extraction and loading stages. Wood harvesting is a set of operations carried out to prepare and transport the wood to the warehouse, using pre-established techniques and standards.	Specialized consultancy services, rental of forestry machinery and implements, training and capacity building.	Forest felling, timber extraction, vehicle loading, main transportation, and unloading at the factory.	4. Conservation and sustainable management and use of soil and forests.	(Masioli, 2019).
	6.4. Skidding operation with equipment that minimizes soil compaction.	The skidding stage involves extracting or dragging the wood from the felling area to the point where it will be transported. Skidding is carried out by articulated forestry tractors or self-loading tractors, the most common models being *Skidder* and *Forwarder*. Carrying out this operation	Skidding implements and self-loading tractors	Infrastructure and equipment.	4. Conservation and sustainable management and use of soil and forests.	(Santos, 2019)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		with the right equipment minimizes soil compaction.				

Appendix A6.

Assisted Natural Regeneration (ANR) of native forests

CNAEs:

- 02.30-6/00: Activities supporting forestry production

Description:

Assisted Natural Regeneration (ANR) is an ecological restoration technique that facilitates degraded ecosystems recovery by promoting the natural regeneration of vegetation, with minimal human intervention. This process involves eliminating factors that prevent natural regeneration, such as competition from invasive species, fire, or overgrazing, and can include actions such as soil protection and pest control. ANR takes advantage of the regenerative capacity of native species already present, accelerating ecosystem recovery at low cost and with high environmental effectiveness.

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
1. FIRE PROTECTION AND FIGHTING	1.1. Firebreaks	Installation of strips of ground without vegetation, creating barriers to prevent the spread of fires. They should be established in strategic areas to prevent fire from advancing into areas under regeneration. The firebreak must be installed manually or mechanically along strips 5 to 10 meters wide. They must be periodically maintained to continuously remove vegetation.	Hoe, harrow, sickle, tractor blade, plow, Personal Protective Equipment (PPE) (helmets, goggles, mask or respirator, leather gloves, safety boots, ear protectors)	Days without fire outbreaks — Frequency of firebreak maintenance (number of interventions per year); Total length (in meters) of firebreaks installed in the regeneration area.	1. Climate change mitigation; 2. Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Souza, 2019)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.2. Plant fuel management	Plant fuel management involves removing highly flammable materials, such as dry leaves, fallen branches, and dead organic matter accumulated on the ground, which fuel fires. This management reduces the amount of fuel available for fires, reducing their intensity and spread. This practice is particularly important in areas where regeneration is in its early stages and vegetation is more susceptible to fire. This can be done by manually removing plant debris that could spread the fire within the area.	Sickle, machete, hoe, rake, PPE	Days without fire outbreaks — frequency of management carried out	1. Climate change mitigation; 2. Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Nunes, 2023) (Schmidt, 2016) (Hull, 2012)
	1.3. Fire prevention and fighting brigades	Fire brigades are local teams trained to prevent and fight forest fires. They play an essential role in preventing fires, quickly responding to outbreaks and minimizing damage. The involvement of the local community is fundamental to the success of these brigades, since	PPE, hand tools (shovels, rakes, sickles, machetes, hand blowers), direct combat equipment (backpack pumps, fire extinguishers, portable motor pumps and hoses, fire flappers) and communication	Days without fire outbreaks; number of trained and registered firefighters; number of community awareness events; area (ha) affected by fires in which the fire was extinguished.	1. Climate change mitigation; 2. Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems;	(Silva, 2003)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		local residents and workers have detailed knowledge of the area. Training should include firefighting techniques, integrated fire management techniques, prescribed burning and controlled burning, the use of safety equipment, first aid, and the creation of prevention strategies.	equipment (portable radios, satellite communication systems, whistles).		4. Conservation and sustainable management and use of soil and forests.	
	1.4. Community fire prevention and control brigades	Formation and operation of local brigades made up of members of the community itself, especially in areas of small rural producers, traditional, and collective territories. The brigades act in surveillance, prevention, and first response to fires, strengthening local knowledge and promoting community protagonism. The training includes direct combat, prevention, risk communication, use of PPE, and first aid.	PPE (helmets, gloves, boots, masks), manual tools (shovels, rakes, sickles, machetes, blowers), back pumps, fire flappers, radios or cell phones with communication in remote areas	Number of trained and active community brigade members — minimum of 3 per community At least 1 training session/year	1. Climate change mitigation; 2. Climate change adaptation; 3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Silva, 2003)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.5. Continuous monitoring and warning system	Continuous monitoring of fire-prone areas is essential for the early detection of fire outbreaks. A good monitoring plan should include regular patrols and an efficient communication system.	Drones, long-range surveillance cameras, observation towers, Geoprocessing and Geographic Information Systems (GIS) software, warning systems, communication radios, community warning systems, fire warning applications, vehicles with monitoring equipment, weather stations.	Days without fire outbreaks — Frequency of patrols carried out; Number of alerts recorded.	3. Protection and restoration of biodiversity and ecosystems	(Pereira, 2004) (Granemann, 2009) (Moreli, 2019)
2. ANT CONTROL	2.1. Survey on the presence of leaf-cutting ant colonies	The main leaf-cutting ants that can threaten the development of regenerating plants are those of the genus Atta (saúvas) and Acromyrmex (quenquéns). The first important action for their control is to identify active nests and locate their entrances, ensuring more targeted and efficient control. Colonies should be identified by species or genus, colony size, and location in the area.	Digging tools (hoes, shovels, and diggers), GPS, magnifying glasses, bio-inputs such as entomopathogenic fungi for the control of leaf-cutting ants	Indicator 1: Number of colonies mapped per hectare; Indicator 2: Percentage of identified colonies receiving management (%).	1. Climate change mitigation; 2. Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests.	(Boaretto, 1997); (IPEN, 2019)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	2.2. Biological control	Biological control involves the use of natural enemies of leaf-cutting ants, such as entomopathogenic fungi (*Metarhizium anisopliae* and *Beauveria bassiana*), which infect and kill the ants, or parasitoids that attack the queens of the colonies. This practice can be more sustainable and less damaging to the environment. Depending on the size of the area, manual or motorized applicators can be used to spray the fungal spores directly onto the ants' scouts or trails.	Application sprays, fungus transport boxes, PPE	Total area covered by biological control (in hectares).	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Della Lucia, 2011)
	2.3. Population monitoring	Monitoring aims to ensure that control practices are effective and prevent the reappearance of leaf-cutting ants in the regenerating area. It involves continuously observing and recording the presence and density of ant colonies. Monitoring also allows control techniques to be adjusted	Bait traps, field journals, GPS	Indicator 1: Frequency of observations made (number per month); Indicator 2: Average colony density per hectare before and after control.	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Zanetti, 2007)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		according to the dynamics of the ant population and the environmental conditions of the regenerating area.				
	2.4. Implementing physical barriers	Physical barriers are placed around seedlings and young plants to prevent leaf-cutting ants from reaching them. These barriers can be made of materials that prevent the ants from climbing or that divert them away from the plants. They are usually made of materials that prevent ants from accessing the foliage.	Protective plastics, PPE	Survival rate of plants protected with physical barriers after [specific period] (%)	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Almeida, 2013) (Moressi, 2019)
3. CATTLE MANAGEMENT	3.1. Prevent animals from entering the area by installing permanent, movable, or live fences	Limit the amount of livestock grazing in a given area to ensure vegetation regeneration. This can be done by implementing rotational grazing and relocating animals to other grazing areas. Prevent cattle (and other domestic animals) from accessing the regenerating area	Treated eucalyptus wood posts, barbed or smooth wire, wire tensioners, nails, staples, and hammers Materials for physical isolation of the area (e.g., fences), including posts, wire, and installation	Cattle density (number of animals/hectare); Percentage of regenerated area without cattle presence (%); Existence of functional isolation measures or registered territorial use agreements.	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Almario, 2021) (Twonsend, 2021)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		to ensure that vegetation can recover naturally. This can be done by fencing off the area and redirecting the animals to active grazing areas. Where applicable, rotational grazing can be adopted outside the regenerating area to reduce pressure on the soil. The focus is not on isolating the regenerating vegetation itself, but rather on conditioning or temporarily excluding activities that cause impact. Isolation can be total or functional, depending on the territorial context and land use agreements.	tools, according to local availability and technical feasibility.			
	3.2. Monitoring	Periodic monitoring of animal density to ensure that the density is appropriate for rotational management. Monitoring the re-establishment of native plants by measuring soil cover and analyzing plant diversity.	GPS, drones, PPE, monitoring spreadsheets	Frequency of measurements (monitoring actions per unit of time); Rate of increase in ground cover with native vegetation (%).	4. Conservation and sustainable management and use of soil and forests.	(Almario, 2021)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
4. ISOLATING THE AREA	4.1. Installation of protective fences	Delimitation of regeneration areas to prevent access by large animals such as horses and cattle. Isolating the area prevents trampling and consumption of recovering vegetation. Fences can be made of wire, built manually, or they can be living fences (regional natives with no invasive potential), installed by planting thorny plant species along the edge of the regenerating area.	Wire fences: treated eucalyptus wood posts, barbed or smooth wire, wire tensioners, nails, staples, hammers, planters, hoes, excavators, and PPE. Living fence: only seeds or seedlings of regional native thorny species with no invasive potential (e.g., *Erytrina velutina*) — the use of the species *Mimosa caesalpiniifolia*, widely used for this purpose, is prohibited.	Linear meters of fencing installed. Percentage of regenerated areas protected by fences (%).	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Nave, 2015)
	4.2. Regular fence maintenance	Over time, fences can wear out due to weathering, falling trees, or human and animal activities. Regular maintenance ensures the integrity of the insulation barrier.	Hammer, pliers, wrench, posts, wire, staples, PPE	Periodic maintenance records.	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Nave, 2015)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	4.3. Monitoring	Monitoring is a fundamental component in the practice of isolating the area. It ensures that the isolation is working as planned, allowing the vegetation to grow and regenerate naturally, while preventing outside interference, such as animals or people entering the area that could harm the process.	GPS, drones, cameras, PPE, monitoring spreadsheets	Recovered areas. Frequency of measurements (monitoring actions per unit of time); Rate of increase in ground cover with native vegetation (%).	4. Conservation and sustainable management and use of soil and forests.	(Brancalion, 2012)
5. ENRICHMENT WITH NATIVE SPECIES	5.1. Identification of key species	This stage involves selecting native species that play important ecological roles, such as improving soil fertility, providing food or shelter for fauna, and promoting ecological succession. Identification is based on ecological studies and local knowledge. These species can be chosen for their ability to adapt to the regenerating environment and promote local biodiversity. The species to be considered for planting for environmental purposes should	GPS, drones, field guides, spreadsheets, cameras	Number of key species identified and documented Proportion of selected species compatible with the local phytophysiognomy (%) Progress of ground cover by native regenerating species (%)	3. Protection and restoration of biodiversity and ecosystems	(Rodriguez, 2023)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		be chosen respecting the native phytophysiognomy and the locality. Preference should always be given to using local genotypes collected as close as possible to the planting site or in areas with similar bioclimatic conditions.				
	5.2. Structuring nurseries	Enable infrastructure for seedling production through the establishment of nurseries to supply seedlings to be used in the area.	Equipment for irrigation, fencing, shade cloth, trays, bags, substrate, wood for benches, fertilizers, shovels, hoes, scissors, transport trolleys, lighting equipment, security cameras.	Nursery installed and producing according to planned capacity	3. Protection and restoration of biodiversity and ecosystems; 8. Generate decent work and raising incomes.	
	5.3 Encouraging the formation of seed networks	Seed collector networks should be supported to supply seeds for (i) direct planting in the soil, (ii) planting with seed mounds, (iii) planting by aerial seed throwing and also for use in the production of seedlings in	Equipment for proper seed storage (cold rooms, wet rooms, dry rooms), PPE, scales, drums, transport trolleys.	Quantity of seeds collected (kg); quantity of seeds sold (BRL)	3. Protection and restoration of biodiversity and ecosystems; 6. Transition to a circular economy; 8. Generate decent work and raising incomes;	

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		nurseries, helping to promote the restoration chain.			9. Reduction of socio-economic inequalities, considering racial and gender aspects	
	5.4. Purchase of seeds or seedlings	After identifying the key species, it is necessary to obtain propagules (seeds or seedlings) from local nurseries or seed networks.	Holding nursery for seedlings, treated wood, protective screen, irrigation hose, shade cloth, seed cooler, seed house.	Quantity of seeds or seedlings purchased (number or kg).	3. Protection and restoration of biodiversity and ecosystems; 8. Generate decent work and raising incomes.	(Vieira, 2020)
	5.5. Targeted planting or sowing in areas with low density and low diversity of native species	Planting or sowing native species suitable for enrichment should be carried out in places where natural regeneration is limited by low species density or low diversity. Key species are planted in these locations in order to increase diversity and thus ensure a greater ecological impact.	Hoes, hand diggers, seedlings or seeds, hydrogel, natural/organic fertilizers, stakes and seedling protectors, PPE	Area planted with native species (hectares) and number of seedlings/seeds planted.	3. Protection and restoration of biodiversity and ecosystems	(Martins, 2017)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	5.6. Monitoring and adaptation	After planting, monitoring should be carried out to assess the establishment of the planted species and the progress of regeneration. The action must include an analysis of the plant's growth, health and vitality, and the presence of pests or diseases. If necessary, management adjustments should be made, such as replanting and pest control.	GPS, drones, tape measures, machetes, monitoring sheets, cameras or other equipment and materials needed to carry out the action.	Frequency of monitoring enriched areas (number of campaigns carried out).	3. Protection and restoration of biodiversity and ecosystems	(Brancalion, 2012)
6. CONTROL OF INVASIVE AND/OR EXOTIC SPECIES	6.1. Mapping and identification of invasive and/or exotic species	Mapping and identifying invasive species aim to detect and record the presence of species that can hinder the regeneration and establishment of native species, competing for resources such as water, nutrients and light, preventing the growth of desired plants, and thus altering the structure and functionality of the ecosystem. The correct identification of invasive species will guide the interventions needed to remove them.	GPS, drones, field guides, spreadsheets, cameras	Mapped area (hectares) and number of invasive species identified.	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Dechoum, 2013)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	6.2. Mechanical removal	Mechanical removal involves the physical extraction of invasive species using hand tools or machinery.	Chainsaws, pruning saws, hoes, diggers, pruning shears, brushcutters, PPE, foliage harvester with mulching system	Area with invasive species removed (hectares).	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(Brazil, 2020b) (Dechoum, 2013)
	6.3. Chemical removal*	Chemical control may be necessary to increase the efficiency of IAS management and minimize the need for frequent removals. Its use must strictly follow current legislation and environmental guidelines to avoid unwanted contamination	Authorized herbicides to control IAS, in accordance with environmental regulations. Personal Protective Equipment (nitrile or rubber gloves, chemical filter masks, goggles, waterproof apron, safety boots); Materials for applying herbicides: Backpack sprayers (manual or motorized), Plastic tarpaulins for soil containment and protection	Area with invasive species removed (hectares).	3. Protection and restoration of biodiversity and ecosystems	

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			Auxiliary tools: Machetes and axes for selective cutting, hoes and diggers for removing roots, pruning shears for manual control, materials for safe storage and disposal: containers suitable for transporting herbicides, containers for disposing of chemical waste, structures for safe storage in the field			
	6.4. Post-removal area monitoring	After the invasive species have been removed, periodic monitoring should be carried out to ensure that the plants do not recolonize the space and that the site continues to progress in natural regeneration.	Cameras or drones, monitoring and data management software, measuring equipment (tape measures or graduated rulers)	Frequency of monitoring campaigns carried out		(Brazil, 2020b)
	6.5. Planting or sowing native species for replacement	Planting or sowing native species where invasive species have been removed will ensure that the unwanted species do not return. This should be done	Seedlings/seeds, hydrogel, hand diggers, seed drills, protective stakes, organic fertilizers, PPE	Number of native seedlings/seeds planted for replacement.	3. Protection and restoration of biodiversity and ecosystems	(Chazdon, 2012)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		through the practice of enrichment, using seeds or seedlings adapted to the area's conditions. The species to be considered for planting for environmental purposes should be chosen respecting the native phytophysiognomy and the locality. Preference should always be given to using local genotypes collected as close as possible to the planting site or in areas with similar bioclimatic conditions.				
	6.6. Monitoring	Periodic monitoring of areas where invasive species have been removed to assess the effectiveness of the intervention and identify the need for corrective action, based on indicators of success such as the absence/presence of invasive species and the presence/absence of regenerating native species. Involving local communities in	GPS, drones, PPE, monitoring spreadsheets	Cover rate of native species in treated areas (%)	3. Protection and restoration of biodiversity and ecosystems	(Brancalion, 2012)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		the monitoring process can increase the ability to respond quickly in the event of re-infestation. Community monitoring includes training residents and farmers to recognize and report the presence of invasive species, broadening the scope of monitoring.				
7. MAINTENANCE OF REGENERATING INDIVIDUALS	7.1. Inventory to identify and map regenerating species	The inventory aims to record the presence of native species that are naturally regenerating, mapping their location and assessing their stage of growth. This survey provides essential information for managing the area and for subsequent interventions, such as protection and monitoring.	GPS, drones, tapes, field spreadsheets, PPE	Number of regenerating species identified and mapped.	3. Protection and restoration of biodiversity and ecosystems	(Chazdon, 2012)
	7.2. Protecting regenerating species	Protection involves creating physical barriers or using stakes to prevent trampling by animals or the accidental removal of plants during management	Protective stakes, machete, string, hammer, wire fencing: treated eucalyptus wood posts, barbed or smooth wire,	Proportion of regenerating individuals protected (%)	3. Protection and restoration of biodiversity and ecosystems;	(Chazdon, 2012)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		activities. The goal is to ensure that native seedlings and saplings can grow without interference.	wire tensioners, nails, staples, hoes, and PPE.		4. Conservation and sustainable management and use of soil and forests.	
	7.3. Weed competition control	Weed competition control aims to reduce competition between invasive species and native regenerants. This can be done through manual weeding, mechanical mowing, or mulching. The practice of crowning, which involves clearing the area around the base of the regenerating plant, is also used to avoid direct competition for resources such as light, water and nutrients.	Hoe, sickle, machete, brushcutter, mulching material such as straw or leaves, protective stakes, PPE, foliage harvester with mulching system	Area treated for weed competition control (hectares); proportion of regenerating individuals in the area (%)	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(De Moraes, 2013)
	7.4. Formative and conduction pruning	Formative and conduction pruning aims to guide the growth of regenerating plants, leading to the development of an adequate and strong structure.	Pruning shears, saw, machete, stakes to guide growth, PPE	Number of regenerating individuals managed with formative pruning	3. Protection and restoration of biodiversity and ecosystems; 4. Conservation and sustainable management and use of soil and forests.	(De Moraes, 2013)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	7.5. Monitoring	Continuous monitoring makes it possible to follow up the regenerating plants' development and identify potential issues, such as pests, diseases, or competition with other species. This involves regular field visits, recording growth and environmental conditions, and adapting management practices when necessary.	GPS, drones, observation sheets for collecting data in the field, monitoring software with satellite images	Frequency of monitoring regenerating individuals (number of campaigns per year)	3. Protection and restoration of biodiversity and ecosystems	(Brancalion, 2012)

Appendix A7.

Fishing: Sustainable practices in Pirarucu fishing

CNAEs:

- 03.12-4/01: Freshwater fishing

Description:

Fishing is the activity of catching fish and other aquatic organisms, such as crustaceans, mollusks, and marine plants, in aquatic environments, which can be freshwater or saltwater. The Pirarucu (*Arapaima gigas*) is one of the largest freshwater fish in the world, reaching lengths of up to 3 meters and weighing more than 200 kg. It is found mainly in the Amazon basin and is an iconic species representing the region's biodiversity. This fish is known for its tasty meat, which is highly prized on both local and national markets.

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
1. LAND MANAGEMENT	1.1 Community mobilization	The mobilization of riverine communities for the sustainable management of pirarucu is a voluntary process, decided at meetings where the advantages of conservation and income generation are assessed. Once it has been decided, social organization begins, with the community assuming responsibilities and tasks. This decision-making stage to join the management activity occurs only once, therefore, the submission of a pirarucu management plan	Fuel, boats, food, training, and technical assistance	Application submitted by the association to IBAMA to join the management	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	(Gonçalves, 2013)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		request to IBAMA serves as an indicator of the decision.				
	1.2 Community Organization	Organization of the community, dividing responsibilities and work among the members who participate in management. Each stage is planned collectively, including surveillance of the territory, surveying the fish stock — through counting and fishing (the planning of fishing by the communities is an annual stage).	Fuel, boats, food, training, and technical assistance	Proof that the annual fisheries planning meeting has been held	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	(Gonçalves, 2018)
	1.3 Land zoning	The territory is mapped and divided into zones, taking into account the definition of areas of use (subsistence and commercialization) and non-use (procreation). Management ponds are all those included in the zoned area (subsistence, marketing, and breeding). However, fishing is prohibited in	Images, maps, GPS, computers, Management Plan, participatory mapping tools	Pirarucu management plan approved by IBAMA	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources;	(Gonçalves, 2018) (Amazonas, 2015), (Issmael and Menezes, 2004)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		the breeding lakes, as they are protected to allow fish reproduction and parental care. It should be noted that this zoning stage occurs only once, but community surveillance is constant throughout the year.			8. Generate decent work and raising incomes.	
	1.4 Definition of Usage Rules	Drawing up the Internal Regulations — Survey/discussion and approval of rules — an important management tool.		Internal regulations approved by the community	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	(Silva, 2024), (Santos, 2023), (Gonçalves, 2018)
	1.5 Conflict Mediation	Identification of users and potential users of the fishing resource in the territory, negotiating the shared use of the territory, based on the definition of the rules of use.		Internal regulations approved by the community	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources;	(Silva, 2024), (Santos, 2023)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
					8. Generate decent work and raising incomes.	
2. PROTECTION AND SURVEILLANCE	2.1 Community Patrols	Surveillance strategies are established to protect the territory from invasion. The communities actively monitor the area to prevent illegal fishermen from entering and/or fishing, which would interfere with the recovery of stocks.	Community boats, fuel, food, community agents, surveillance infrastructure (floating boats, tents, identification shirts or vests, etc.), and communications equipment,	To be defined.	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	(Gonçalves, 2018), (Amazonas, 2015)
	2.2 Integration with supervisory bodies	Integration with agencies such as IBAMA, ICMBIO, IPAAM, and the Environmental Police for inspection.	Drones, surveillance boats, fuel, work equipment (flashlights, GPS, etc.)	To be defined.	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources;	

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
					8. Generate decent work and raising incomes.	
3. STOCKTAKING	3.1 Visual Fish Count	The pirarucu are counted by the communities with the help of technical support institutions. The methodology involves counting adults and juveniles of pirarucu in the lakes included in the zoned area. This data is sent to the management bodies of the territories (ICMBIO, FUNAI and SEMA) and IBAMA for evaluation. The annual count of adults and juveniles is one of the parameters that determines catch quotas.	Sheets, data logging, GPS, tablets, electronic spreadsheets	Report sent annually to IBAMA to request the annual quota	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	(Silva, 2024), (Santos, 2023), (Gonçalves, 2018), (Castello, 2004), (Silva et al, 2018)
4. SUSTAINABLE FISHING	4.1 Collective Capture of Authorized Quotas	Based on the counts, IBAMA authorizes the capture of up to 30% of the adult individuals counted. Each management area can request quotas per lake, community, or sector. Controlled fishing with a limit of 30% of adults counted. Fishing takes place during the dry season,	Fishing nets, identification seals, ice boat, stainless steel tables for cleaning fish	Quota authorization issued by IBAMA	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources;	(Silva, 2024), (Santos, 2023) (Gonçalves, 2018), (Queiroz and Sardinha, 1999)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		when fish are more concentrated in the lakes. Harvesting is planned according to the authorized quota. Organizing fishermen groups for controlled harvesting.			8. Generate decent work and raising incomes.	
	4.2 Biometric Data Registration	Collection of biometric data (weight, length, sex and gonadal stage) for each fish caught.	Scales, Record Sheets, tablets	Fishing record sheets	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	(Lopes and Queiroz, 2011)
	4.3 Use of suitable equipment	Use of boats and nets suitable for catching fish over 150 cm and sealing of the fish caught to guarantee the legality and traceability of the product.	Fishing boats, Fishing Nets, Seals	To be defined.	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources;	(Silva, 2024), (Santos, 2023)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
					8. Generate decent work and raising incomes.	
	4.4 Traceability in Monitoring	Application of identification seals on the individuals caught, ensuring continuous monitoring of the pirarucu caught. IBAMA issues guides for transportation and marketing from the fishing area to the last buyer, not involving the final consumer.	Seals, Registration Sheets, Tracking System	Registration sheets	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	(Silva, 2024), (Santos, 2023)
	4.5 Initial Processing	After being caught, pirarucu is cleaned and gutted. Biometric measurements, such as weight and length, are recorded, and each fish receives an identification seal, ensuring the traceability of the product.	Floating Reception and Pre-Beneficiation Units for Pirarucu (UFRPP) equipped with stainless steel evisceration benches, water treatment and solar energy system, basic floating units, fish evisceration benches, evisceration equipment (PPE, machetes, cleaning equipment, scales).	Registration sheets	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
5. TRANSPORTATION FROM THE MANAGEMENT AREA	5.1 River transport with ice	The fish are transported in boats equipped with ice from the managed areas to the warehouses.	Boats equipped with ice, Coolers	Registration sheets	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	
6. TRANSPORT TO THE REFRIGERATOR	6.1 Use of refrigerated trucks	Transportation of processed fish from warehouses to cold stores using refrigerated trucks.	Refrigerated trucks	Transport permit	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	
	6.2 Cold Chain Maintenance	Ensuring that the cold chain is maintained at all points of	Temperature Monitoring	To be defined.	3. Protection and restoration of	

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		transportation to the end consumer.			biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	
	6.3 Traceability Monitoring	Checking the seals and maintaining the traceability of each batch of pirarucu. IBAMA issues guides for transportation and marketing from the fishing area to the last buyer, not involving the final consumer.	Traceability Systems, Seals	Transport permit	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	
7. Commercialization	7.1 Negotiating in Business Rounds	Sale of pirarucu to previously negotiated buyers.	Negotiation Tools, Contracts	Invoices	3. Protection and restoration of biodiversity and ecosystems;	(Silva, 2024), (Santos, 2023)

Title of the practice	Practice component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
					5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	
	7.2 Marketing at Street Markets	Participation in local fairs and markets for direct sales to consumers. IBAMA issues transportation and marketing permits	Trade fair equipment, packaging.	Transport permit	3. Protection and restoration of biodiversity and ecosystems; 5. Sustainable use and protection of water and marine resources; 8. Generate decent work and raising incomes.	

Appendix A8.

Aquaculture: Sustainable production practices in excavated nurseries

CNAEs:

- 03.22-1/01: Freshwater fish farming

Description:

Aquaculture is the practice of cultivating aquatic organisms, including fish, crustaceans, mollusks, algae, and aquatic plants, in controlled or semi-controlled environments such as lakes, rivers, estuaries, ponds, and tanks. This activity can be carried out in fresh or salt water. Aquaculture production in excavated ponds consists of growing aquatic organisms, such as fish, shrimp and others, in artificial structures dug into the ground, known as ponds or excavated tanks. These ponds are supplied with water from natural sources, such as rivers, reservoirs, or wells, and are designed to allow control of environmental parameters such as temperature, oxygenation, water quality, and feeding, in order to optimize the development of cultivated organisms.

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
1. WATER QUALITY MANAGEMENT		The practice of Water Quality Monitoring is essential for successful fish farming and ensures the sustainable use of water resources by preventing water degradation in aquaculture systems, avoiding pollution and eutrophication. The daily control of variables such as	Technical consultancy services for monitoring and evaluating water quality and fish welfare; equipment and materials for monitoring water quality and bottom sediments in ponds (multi-parameter probes, portable spectrophotometers, water quality analysis	Monitoring through analysis of water quality parameters and their respective reports with data such as: Temperature, Dissolved Oxygen, Carbon Dioxide, pH, Turbidity, Transparency, N-Ammonia, N-Nitrite, N-Nitrate, P-Phosphorus.	4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources	(BOYD, Claude e; QUEIROZ, J. F.; McNevin, A., 2013). . (BOYD, Claude e ; Lim, C. ; QUEIROZ, J. F. ; Salie, K ; WET, L. ; McNevin, A., 2008) . (QUEIROZ, J. F. de., 2016). (FRASCÁ-SCORVO, C. M. D.; QUEIROZ, J.; LOSEKANN, M. E. 2011).

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		dissolved oxygen, ammonia, pH, temperature, carbon dioxide, turbidity, transparency, nitrite, nitrate, and phosphorus ensure that the ponds operate within the limits established by CONAMA Resolution 357/2005 and the recommendations of specialized literature. This practice prevents fish stress, reduces the occurrence of diseases, and maintains productive performance, promoting efficient and responsible production with less waste and negative impacts on adjacent bodies of water. Periodic biometrics	kits, thermometers, oximeters, pH meters, turbidimeters, Secchi disks, dredges for collecting sediments, etc.); systems or software for monitoring, evaluating and managing the main water quality parameters; data systems loggers for automating and monitoring the concentration of dissolved oxygen in the water and controlling the operation of mechanical aerators, among other aeration systems for increasing dissolved oxygen in the water; glassware and			(QUEIROZ, J. F. de; BOEIRA, R. C., 2016). 9 (QUEIROZ, J. F. de; BOEIRA, R. C., 2006). (QUEIROZ, J. F. de; BOEIRA, R. C.; SILVA, M. S. G. M., 2004). (QUEIROZ, J. F.; BOEIRA, R. C.; SILVEIRA, M. P., 2004). (QUEIROZ, J. F. de; BOEIRA, R. C., 2006). (QUEIROZ, J. F. de; BOEIRA, R. C., 2007) B. (QUEIROZ, J. F. de; BOEIRA, R. C., 2008). (RODRIGUES, A. P. O.; LIMA, A. F.; ALVES, A. L.; ROSA, D. K.; TORATI, L. S.; SANTOS, V. R. V. dos (Ed.), 2013). (QUEIROZ, J. F.; SILVEIRA, Mariana Pinheiro, 2006);

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		complement this process, providing information on fish health and helping to adjust management strategies, thereby contributing directly to the preservation and protection of water and marine resources and aligning with the TSB's objectives. Good management practices prevent negative impacts.	reagents for analyzing the water and sediments at the bottom of the ponds; refrigerators and freezers for storing reagents and water and fish samples; thermal boxes for transporting samples; portable electronic devices; solar panels and other clean energy sources; among others.			(FAO, 1998. (Chacon, J.O., Nepomuceno, F.H., Gurgel, J. J. S., Farias, J.O., Vasconcelos, E.A., Silva, J.W. B., Filho, P., Bastos, J.R., Merola, N., Vinatea, J.E., 1998).
	1.1 Temperature Monitoring	Temperature directly influences health, metabolism, and productive performance of fish. Abrupt variations can affect the chemical and biological composition of water and cause disease.				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		Monitoring the temperature helps to adjust the feed and feeding frequency, avoiding leftovers and ensuring proper growth. Temperatures below 18 °C (64 °F) reduce consumption and growth, while temperatures above 30 °C (86 °F) increase the toxicity of ammonia. It is recommended to use aerators, protect ponds with structures against sunlight and concentrate production in warm periods to avoid thermal stress. The ideal temperature for most tropical fish is between 25 °C (77 °F) and 28°C (82 °F).				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	1.2 Dissolved Oxygen (DO) Monitoring	Dissolved oxygen is vital for the respiration of fish and aquatic organisms. Levels below 3.0 mg/L cause stress, disease, and mortality. Constant monitoring prevents abrupt drops, common at night and on cloudy days, due to consumption by fish and phytoplankton. Mechanical aeration (2 hp per 0.5 ha) keeps the DO above 5 mg/L, ensuring fish productivity and health. Installing automatic controls for aerators at dawn prevents critical outages.				
	1.3 Carbon Dioxide (CO_2) Monitoring	Excess CO_2 affects the pH of the water and				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		the fish's ability to absorb oxygen, causing stress and disease. Concentrations above 20 mg/L are harmful, especially at high temperatures. Monitoring CO_2 helps to control its concentration and prevent excessive acidity of the water in the ponds. It is recommended to remove organic matter from the bottom, apply CaOH to neutralize CO_2, and avoid excess lime, which can increase the pH and ammonia toxicity.				
	1.4 pH Monitoring	The pH directly affects the alkalinity, hardness of the				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		water, and the availability of nutrients. Values outside the ideal range of 6.0 to 9.0 are detrimental to fish growth and survival. Monitoring enables the correction of acidic soils through liming, preventing nutrient buildup and stress on fish. A high pH (>8.5) increases ammonia toxicity, so it is important to reduce feeding and control excess phytoplankton using algaecides under technical guidance.				
	1.5 Turbidity and Transparency Monitoring	Turbidity and transparency indicate the amount of suspended solids and the density of				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		phytoplankton. High turbidity (>100 NTU) reduces light penetration, affecting photosynthesis and oxygenation, while low transparency (<20 cm) harms fish health due to the excess suspended sediment. Monitoring these parameters prevents sediment buildup and eutrophication. It is recommended to protect water intakes, control feeding, and perform liming to increase alkalinity and maintain water quality.				
	1.6 Ammonia Monitoring	Non-ionized ammonia (NH_3) is highly toxic and accumulates due to excess feed and				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		organic matter. Concentrations above 0.5 mg/L cause stress, disease, and mortality. Monitoring helps to adjust feeding and remove accumulated sediments. It is recommended to use aerators to keep ammonia under control and to monitor temperature and pH to avoid NH_3 formation, especially on hot days.				
	1.7 Nitrite and Nitrate Monitoring	Typical levels of nitrite and nitrate in surface water range from 0.005 to 0.5 mg/L. Normally, nitrite is not a problem in fishponds, because nitrite will be readily converted into				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		nitrate. However, nitrite can accumulate in the water due to a lack of dissolved oxygen, making the environment unsuitable for fish. In this situation, nitrite is not converted into nitrate and interferes with the fish's ability to absorb dissolved oxygen. Constant monitoring prevents buildup caused by low oxygenation and excess organic matter. It is recommended to add sodium chloride (NaCl), increase water exchange or activate mechanical aerators when the nitrite concentration exceeds 1.0 mg/L and				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		maintain the pH around 7.0 to reduce toxicity. Water changes and liming help to maintain adequate levels, ensuring fish health and pond productivity.				
	1.8 Phosphorus Monitoring	Phosphorus is essential for the growth of phytoplankton, but in excess, it causes eutrophication and deterioration of water quality. Monitoring prevents imbalances and ensures the efficient use of feed. It is recommended to use 100–200 mg/L of gypsum (calcium sulphate) to precipitate				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		phosphorus and control phytoplankton. Maintaining adequate levels prevents excessive algae proliferation and improves the environmental management of ponds.				
2. EFFLUENT TREATMENT MANAGEMENT		In the cultivation of fish in excavated ponds, water pollution from system effluents is one of the main environmental concerns. To meet this challenge, the adoption of Good Management Practices (GMPs) and the implementation of effluent treatment technologies, both mechanical and				(BOYD, C. E., J.QUEIROZ, J.LEE, M.ROWAN, G.N.WHITIS, and A.GROSS. 2000). . (BOYD, Claude e ; QUEIROZ, J. F. ; WHITIS, Gregory N ; HULCHER, Richard ; OAKES, Perry ; CARLISLE, Jimmy ; ODOM, Dickie ; NELSON, Marshall M ; HEMSTREET, William G, 2003). (QUEIROZ,

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		biological, play a crucial role in mitigating impacts. These strategies contribute significantly to Climate change adaptation, promoting techniques that increase the resilience of production systems and reduce environmental vulnerabilities, ensuring greater sustainability. They also promote the sustainable use and protection of water and marine resources by minimizing water body contamination and preserving essential aquatic resources. Another important aspect is				J. F.; ALVES J.M.C ; LOSEKANN, MARCOS ELISEU ; FRASCÁ-SCORVO, C.M.D. ; SCORVO FILHO, João Donato ; FERRI, G. H. ; ISHIKAWA, M. M., 2021 . (ISHIKAWA, M. M. ; QUEIROZ, J. F. ; NASCIMENTO, J. L. ; PADUA, S. B. ; MARTINS, M. L., 2020) .

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		the prevention and control of contamination through the adoption of measures that reduce pollutant generation or properly treat effluents before disposal, avoiding water body degradation and negative impacts on the surroundings. These actions strengthen the sustainability of aquaculture and promote harmonization between aquaculture production and environmental conservation.				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	2.1. Construction of effluent treatment systems	The construction of aquaculture effluent treatment systems is essential to meet the CONAMA Resolution 357/2005 requirements, which establishes quality standards for effluent discharged into water bodies. These systems make it possible to monitor and adjust parameters such as nutrients (nitrogen and phosphorus), suspended solids, BOD, pH, and other indicators, ensuring that the treated effluent is within legal limits. In addition, they help reduce effluent generation by optimizing water use, enabling its reuse within the production	Services and projects for the construction of effluent treatment systems; services and equipment for earthworks, construction of ponds, monks, sedimentation basins, filters; backhoe tractors, trucks, water pumps, motor pumps, etc.; machinery, equipment and materials for compacting the dykes, waterproofing and correcting soil acidity (HDPE geomembranes, waterproofing tarpaulins, agricultural limestone, etc.); materials to protect the sides and top of the dykes (slabs of	Monitoring of aquaculture effluent parameters in accordance with CONAMA Resolution No. 357/2005 Volume of effluent/kg fish produced Volume of solids (sediment, total suspended solids) generated/kg fish produced	2. Climate change adaptation; 5. Sustainable use and protection of water and marine resources; 7. Pollution prevention and control	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		system, which reduces pressure on water resources and improves environmental sustainability. In this way, these systems ensure the protection of receiving bodies of water and compliance with current environmental legislation.	grass, stones, and gravel); protection with vegetation of the areas of the watershed and near the nurseries; construction of dykes and ditches to contain and disperse water (surface runoff); gates and structures for supplying, draining and controlling the maximum water level in the ponds; sedimentation basins and drainage channels like wetlands; fences to protect and contain animals; sheds for storing chemicals, fuel, therapeutic products, fertilizers, limestone, feed, and others; a shed for machinery, vehicles,			

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			and field equipment; substrates for microbial growth for biological filters; aerators; probiotics or other inputs for maintaining biofilters (biological filters); renewable energy system for operating the effluent treatment; structure for reusing wastewater after the effluent has been treated. Training in closed aquaculture systems, including integrated systems, water, and effluent quality.			

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	2.2 Monitoring effluents and effluent treatment systems	Monitoring effluents in aquaculture is essential to ensure compliance with CONAMA Resolution No. 357/2005, which establishes quality parameters for effluents discharged into water bodies. This process involves regular measurement of indicators, allowing for early detection of possible irregularities and the adoption of corrective measures. In addition to ensuring that effluent returned to the environment meets legal standards, monitoring helps optimize water use by encouraging practices such as reuse, reducing waste and	Consultancy and service provision for projects to characterize and monitor the quantity and quality of effluents; personal protection and first aid equipment and materials; material and equipment for monitoring and assessing the quality of water and effluents (multi-parameter probes, thermometers, oximeters, pH meters, water quality kits, Secchi disc, dredges for collecting sediments, etc.); software and hardware for automating effluent monitoring;	Monitoring of aquaculture effluent parameters in accordance with CONAMA Resolution No. 357/2005 Volume of effluent/kg fish produced	2. Climate change adaptation; 5. Sustainable use and protection of water and marine resources; 7. Pollution prevention and control	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		contributing to the sustainability of aquaculture production and preservation of water resources.	laboratory for water analysis.			
3. FEED MANAGEMENT		Feed management involves three fundamental aspects: feed quality (manufacturing methods, composition, digestibility, stability in water and buoyancy, amount of fine materials, nutrient levels appropriate to the species being cultivated, phosphorus and nitrogen percentages); distribution of the feed to the animals			4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources	(QUEIROZ, J. F.; ALVES J.M.C ; LOSEKANN, MARCOS ELISEU ; FRASCÁ-SCORVO, C.M.D. ; SCORVO FILHO, João Donato ; FERRI, G. H. ; ISHIKAWA, M. M., 2021) - (CYRINO, J. E. P. et al, 2010). (ISHIKAWA, M.M.; QUEIROZ, J.F.; NASCIMENTO, J.L.; PÁDUA, S.B.; MARTINS, M.L, 2020). (CODEVASF, 2019). (SENAR - National Rural Learning Service, 2019): .

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		(amount of feed, feeding frequency and feed distribution methods); and storage (storage methods and location, so that the quality of the product can be maintained). Other aspects, such as stocking density, control of feed and nutrient consumption, the abundance of phytoplankton and macrophytes, the accumulation of organic matter, the toxicity of ammonia and nitrite, and the adoption of disease prevention practices, also interfere with fish productivity and well-being.				(BOYD, C. E.; QUEIROZ, J. F.) : (CYRINO, J. E. P.; URBINATI, E. C.; FRACALOSSI, D. M.; CASTAGNOLLI, N. (Org.), 2004). . (MARTINS, M.L, 2004). (RANZANI-PAIVA, M.J.T.; TAKEMOTO, R.M.; LIZAMA, M.de los A.P., 2004) . (TAVARES-DIAS, M.; MONTAGNER, D., 2015) (TUCKER, C. S.; HARGREAVES, J. A., 2008) practices for aquaculture. Oxford: Wiley-Blackwell, 2008. 592 p. (LEGENDRE, M., et al., 1995) (SANTOS, M.M; CALUMBY, J. A.; COELHO FILHO, P. A.; SOARES, E. C.;

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		Adopting the right feed management for the species grown and the type of production system contributes directly to preventing and reducing negative impacts, such as eutrophication of water bodies and waste of water resources, ensuring the balance of aquatic ecosystems. Feed management is therefore aligned with the sustainable use and protection of water resources, as it promotes practices that minimize pollution and preserve water quality. It is therefore essential to determine the				GENTELINI, A.L., 2015) (RODRIGUES, A. P. O.; LIMA, A. F.; ALVES, A. L.; ROSA, D. K.; TORATI, L. S.; SANTOS, V. R. V. dos (Ed.), 2013). . (Queiroz, 2021) (Cyrino, 2010) (Ishikawa, 2020) (Sandoval, 2019) (Rodrigues, 2013)

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		balance between increasing production and maintaining water quality and fish welfare. The break-even point depends on the characteristics of the ponds, the species grown, the management used, and the production system adopted.				
	3.1. Ensuring feed quality	Feed is the primary food source for fish and represents around 70% of production costs. Using good-quality extruded feed is crucial to prevent eutrophication and ensure good fish performance. Feed with 4.5 to 5.1% nitrogen and 0.6 to 1.0% phosphorus is	Equipment and machinery for feed production; field equipment for biometric assessments, harvesting, transportation, and monitoring fish health (nets, traps, thermal boxes, scales, magnifying glasses, microscopes); feed; services for analyzing	Monitoring of feed quality and/or zootechnical parameters and their respective reports with data such as: Total Weight Gain (TWG): Average weight of fish at the beginning and end of the cycle (g). Daily Weight Gain (DWG): Weight difference divided by		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		ideal for tilapia. Feed quality has an impact on total weight gain (TWG), apparent feed conversion (AFC) and survival rate (SR). Unsuitable feed increases waste and solids in the water, damaging the environment and causing stress to the fish. Good practices include using certified feed, adjusted to the growth stage and species. This improves zootechnical performance and reduces waste and pollution costs. Diets based on plant-based ingredients and the use of ingredients from the processing of animal waste or	feed quality and its nutritional composition; feed digestibility analysis; technical advisory services to monitor good feed management practices, equipment for analyzing feed quality (Near Infrared Spectrometer (NIR), scales, greenhouses, muffles, chromatographs, among others).	the number of days (g/day). Apparent Feed Conversion (AFC): Ratio between feed consumed and weight gain. Survival Rate (SR): Percentage of fish alive at the end of the cycle (%). Crude Protein (CP) content: Checking 28–32% CP in the feed for growth. Nitrogen and Phosphorus Levels: Feeds should contain 4.5–5.1% nitrogen and 0.6–1.0% phosphorus. Visual and sensory evaluation: Check the appearance, smell, and texture of the feed to avoid spoilage.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		other crops, in relation to animal-sourced ingredients such as fishmeal, and purchased from local markets, favor a lower carbon footprint.				
	3.2. Proper feed storage	Inadequate storage compromises the quality of the feed, affecting fish growth and water quality. Feed should be stored indoors in a dry, well-ventilated area and protected from sunlight. Exposure to humidity, high temperatures, and contaminants reduces shelf life and nutritional efficiency. Bags should be kept on pallets and consumed on a first-	Sheds and silos for storing feed; systems for controlling storage temperature and humidity conditions; among others.	Monitoring of feed storage quality parameters and their respective reports with data such as: Warehouse temperature and humidity: Keep below 30 °C (86 °F) and humidity below 60%. Pest Inspection: Presence of insects and rodents. Expiration Date: Check and record dates to ensure use before expiry. Stock Organization:		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		in, first-out basis. It is essential to check the expiration date and the labels on the packaging. Correct storage prevents losses, contamination by insects or rodents, and ensures a high-quality feed supply for the fish.		Proper rotation (FIFO — First In, First Out). Ventilation Conditions: Closed, dry and well-ventilated warehouses. Packaging Integrity: No tears, holes, or contamination. Labels and Composition: Checking the nutritional information on the packaging.		
	3.3. Stocking density monitoring and water quality monitoring	Stocking density influences feed supply and water quality. High densities increase oxygen demand and waste production, affecting the balance of the system. Monitoring parameters such as	Technical advisory services to monitor good production management practices; inputs to maintain water quality conducive to fish; equipment, software and computerized	Monitoring of production parameters and their respective reports with data such as: Stocking Density: Measured in kg/m³ to avoid excess. Dissolved Oxygen (DO): Keep above 5.0		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		pH, alkalinity and dissolved oxygen avoids problems such as the accumulation of organic matter and dangerous variations in DO. It is recommended to avoid excessive stocking and to use aerators at night to keep oxygen above 3 mg/L. Good practices include liming acidic soil and daily water quality monitoring to prevent mortality and ensure a balanced environment.	systems for monitoring water quality; equipment and field equipment for biometric assessments, harvesting, transportation, and monitoring fish health (nets, seine nets, thermal boxes, scales, magnifying glasses, microscopes).	mg/L. Water pH: Between 6.5 and 9.0 Total Alkalinity: Maintain between 40–50 mg/L. Ammonia and Nitrite Levels: Ammonia ≤ 0.5 mg/L and nitrite ≤ 1.0 mg/L. Monitoring Frequency: Water quality parameters should preferably be checked daily.		
	3.4. Feed management and control of the abundance of phytoplankton and macrophytes	Good feed management improves productivity and avoids environmental impacts. Procedures such as biometric	Technical advisory services for monitoring zootechnical performance; software and computerized	Monitoring of water quality and/or zootechnical parameters and their respective reports with data such as: Regular Biometrics:		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		assessments every two weeks help to adjust the feed supply based on the weight of the fish. Monitoring the growth of phytoplankton is essential for controlling the oxygenation and water pH. An excess of phytoplankton increases the toxicity of ammonia and the risk of eutrophication. It is recommended to distribute the feed evenly and avoid leftovers to prevent the build-up of organic matter. The use of aerators and adjustments to the feed rate help to maintain water quality and ensure	systems for monitoring weight gain, feed conversion ratio, condition factor, survival; software for monitoring and evaluating the productivity/profitability and sustainability of fish production; inputs for maintaining water quality conducive to fish; equipment, software and computerized systems for monitoring water quality; automatic feeders, tractors and appropriate vehicles for distributing feed in ponds; dinghies or small rafts for distributing feed in large ponds.	Every 15–21 days to adjust the feed. Water Transparency: Measured with a Secchi disk (20–30 cm). Feed Consumption: Percentage of biomass offered as feed. Phytoplankton Growth: Monitor water color (too much = deep green water). Dissolved Oxygen: Check levels daily, especially at night. pH and CO_2: Maintain pH between 6.5 and 9.0 and avoid an excessive increase in CO_2. Presence of Macrophytes: Observe growth and control when necessary.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		good production performance.				
	3.5. Feeding according to spontaneous consumption	Controlled feed supply reduces waste and improves water quality. Feeding the fish slowly allows them to consume the feed in 5 to 10 minutes, avoiding nutrient leaching. It is recommended to divide the feed into several daily portions and adjust based on biometrics. Excess feed causes accumulation of organic matter and eutrophication. Monitoring the fish's behavior and the visibility of the Secchi disk helps to adjust the supply. Practices such as feeding	Software for monitoring and evaluating the productivity/profitability and sustainability of fish production; equipment, software and computerized systems for monitoring water quality; automatic feeders, tractors and appropriate vehicles for distributing feed in the ponds; dinghies or small rafts for distributing feed in large ponds.	Monitoring of feed and/or water quality parameters and their respective reports with data such as: Consumption Time: The feed should be consumed in 5–10 minutes. Appetite Observation: Check the fish's behavior during feeding. Secchi Disk Visibility: Keep it above 30 cm. Leftover Feed: Absence of uneaten feed on the surface or in the corners of the ponds. Feeding Frequency: Feed 2–3 times a day for fish over 200g. Uniform Distribution:		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		downwind and avoiding feed accumulating near pond edges maintain feed efficiency and water quality.		Ensure even distribution of feed. Feed Conversion Ratio (FCR): Monitor and adjust to avoid waste.		
	3.6. Control of organic matter accumulation and ammonia and nitrite toxicity	The accumulation of organic matter increases the concentration of ammonia and nitrite, harming fish health. Nitrite concentrations above 1.0 mg/L cause stress and mortality. Drying out the bottom of the ponds between cultivation cycles for 2 to 3 weeks helps to decompose waste. Removing 10 to 15 cm of the top layer of sediment avoids anaerobic zones. Applying gypsum and	Machinery and tractors to remove the sediment layer; equipment, software and computerized systems to monitor water quality; inputs to maintain water quality that is suitable for fish.	Monitoring of water quality parameters and preparation of ponds and their respective reports with data such as: Ammonia Levels (NH_3): ≤ 0.5 mg/L. Nitrite Levels (NO_2^-): ≤ 1.0 mg/L. Bottom Drying: Performed between cycles for 2–3 weeks. Sediment Removal: Removal of 10–15 cm of the top layer of sediment. Dissolved Oxygen Concentration: Keep above 5.0 mg/L.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		positioning aerators correctly prevents residue build-up. Monitoring and controlling these parameters are essential to prevent pollution and ensure a healthy environment for fish.		pH: Between 6.5 and 9.0 to avoid ammonia toxicity. Gypsum Application: 100–200 mg/L to precipitate phosphorus and control phytoplankton.		
	3.7. Fish health maintenance, welfare, and disease prevention	Fish health depends on quality feed and good water quality. The use of biomarkers and bioindicators, such as gill alterations and fish behavior, helps to detect problems early on. It is recommended to dry and disinfect the ponds between cycles using 10 mg/L of active chlorine. Applying limestone (3 to 4 tons/ha) helps to	Technical advisory services to monitor zootechnical performance, welfare and health management of production; fish blood analyses; water quality inputs; field equipment and materials for biometric assessments, harvesting, transportation, and fish health monitoring	Monitoring of water quality and/or zootechnical parameters and their respective reports with data such as: Hematological Biomarkers: Blood analysis to detect diseases. Visual Inspection: Monitor fish gills, fins, and behavior. Mortality Rate: Record and investigate causes.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		raise the pH and reduce diseases. Good practices include using salt (60 mg/L) to control parasites and following professional recommendations for treatments. Preventing disease avoids production losses and promotes fish welfare.	(nets, seine nets, thermal boxes, scales, magnifying glasses, microscopes); planning and infrastructure to implement a biosecurity plan.	Use of Salt (Sodium cChloride): Preventive treatments (60 mg/L in nurseries). Water Parameters: Dissolved oxygen, pH, ammonia and nitrite within safe limits. Biometrics: Regularly to assess weight gain and health. Diagnosis and Treatment: Apply products under the guidance of trained professionals.		
4. SANITARY MANAGEMENT		The most common sanitary and environmental problems during fish production are often related to inadequate management of water and feed quality; and, in addition, the lack of				(LIMA, A. F.; SILVA, A. P. da; RODRIGUES, A. P. O.; SOUSA, D. N. de; BERGAMIN, G. T.; LIMA, L. K. F. de; TORATI, L. S.; PEDROZA FILHO, M. X.; MACIEL-HONDA, P. O.; FLORES, R. M. V., 2024) . . (AQUINO-

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		technical support, poor diagnosis of diseases, the use of medicines without proven efficacy and without the supervision of trained professionals, as well as inadequate disposal of sick or dead fish. Diseases can be infectious, caused by parasites, bacteria, fungi, and viruses, or be associated with poor water quality, inadequate management and climatic factors such as droughts, excessive rainfall, or sudden changes in temperature. For this reason, preventive measures, such as continuous				PEREIRA, S.L.; CHAGAS, E.C.; MACIEL, P.O.; BENAVIDES, M.V.; MAJOLO, C.; BOIJINK, C. de L.; TAVARES-DIAS, M.; ISHIKAWA, M.M.; FUJIMOTO, R.Y.; BRANDÃO, F. R.; SOUSA, K. L. de; Morais, M. da S.; Martins, V.F. da S., 2016) (Ministry of Agriculture, Livestock and Supply. Aquicultura com sanidade: programa nacional de sanidade de animais aquáticos de cultivo manual orientado aos produtores [Aquaculture with health: a national program for the health of farmed aquatic animals].

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		monitoring of fish health, feeding behavior, and regular biometric assessments, are essential to prevent mortality outbreaks and economic losses. An accurate diagnosis and monitoring by a trained technician are essential to define the type, concentration and duration of treatment. Fish welfare is influenced by multiple factors, including water quality and the presence of pollutants around the ponds. Adopting practices based on Good Management Practices (GMP), such as choosing the right location for nurseries				Secretary for Agricultural Defense. – Brasília : MAPA/AECS, 32p., 2020). FUJIMOTO, R.Y.; (ISHIKAWA, M.M.; IWASHITA, M.K.P.; MACIEL, P.O.; BENAVIDES, M.V.; HIDE, D.M.V.; SILVA, R.V.B.; SANTOS, B.J.; PAIXÃO, P.E.G.; JUNIOR, E.C.C.; CHAGAS, E.C.; DOMPIERI, M.H.G, 2015.

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		and preventing erosion, is crucial to mitigating environmental impacts. In addition, production success depends on buying quality fry, proper transportation and acclimatization, monitoring water quality, regular biometrics, and efficient harvesting. Fish presenting abnormal behavior, reduced or interrupted feed consumption and lack of growth between biometrics can indicate health problems. Simple preventative strategies help avoid disease, preserve fish welfare, and ensure				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		the quality of the final product. In this context, feed management is essential to optimize feed conversion and minimize waste, preventing nutrient accumulation that can lead to pond eutrophication and deteriorate water quality. Feeding management practice is directly aligned with the sustainable use and protection of water resources, as it promotes the efficient use of inputs, reduces the release of nutrients into the water and avoids waste. In addition, by controlling feed supply and				

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		monitoring water quality, this practice contributes to the sustainability of aquatic ecosystems, ensuring that aquaculture production does not cause negative environmental impacts .				
	4.1. Use of chemicals, medicines and parasiticides	The use of chemical products in aquaculture includes fertilizers, correctives, disinfectants, medicines, and parasiticides. These products control diseases and improve water quality, but they must be used with caution to avoid environmental and	Consultancy from veterinarians or specialized technicians; appropriate room and other infrastructure for basic laboratory analysis, maintenance of live animals, safe storage of medicines and other chemical products and animals for analysis; personal protective equipment	Reports and records of actions such as: Use of products prescribed by trained technicians. Monitoring fish health (monthly necropsy reports, hematological and enzymatic biomarkers). Safe storage of chemicals and proper disposal.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		fish health impacts. Fertilizers such as nitrates are common, and limestone is used to correct acidity. Antibiotics should only be applied with a technical prescription, as residues can contaminate the water and fish. It is recommended to wear PPE during application and follow the dosages indicated on the labels. Disposal must be done correctly to avoid contamination. It is important to monitor biomarkers to assess the efficacy and impact of these products.	(PPE) and collective protective equipment (CPE).	Correct use of PPE during handling. Product application and water quality monitoring reports.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	4.2. Use of hormones and probiotics	Hormones such as 17-methyltestosterone (MT) are used for sex reversal in tilapia but can cause environmental pollution. Probiotics, on the other hand, are biotechnologies that improve fish health and water quality, reducing disease and increasing productivity. It is important to record the use of hormones and probiotics and monitor their effects. Probiotics promote the microbiological balance of ponds by helping break down organic matter. Applying hormones should be done under technical supervision	Consultancy services, veterinarian or specialized technician to follow up and monitor the health and well-being of fish; hormones and probiotics; freezer and refrigerator for safe storage; microscope and reagents for monitoring biomarkers; room or appropriate location for analysis of the main agents causing fish diseases (parasites, fungi, bacteria, viruses, etc.); electricity generator, air conditioning, refrigerator, freezer; magnifying glass, microscope, scale, oven, centrifuge,	Reports and records of actions such as: Detailed use of hormones and probiotics. Monitoring hematological and biochemical biomarkers. Observation of the effects on fish health and growth. Record of hormone and probiotic application methods.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		to avoid contamination. Proper practices ensure better zootechnical and sustainable results.	reagents and glassware suitable for analyzing parasites, clinical signs of disease, hematological analysis, and others; tanks and aquariums for quarantine; heaters and thermostats for heating and maintaining water temperature; radial air blowers; personal protective equipment; water disinfection equipment; automatic vaccination equipment; among others.			

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	4.3. Sanitary management and reducing environmental impacts	Sanitary management includes the purchase of healthy fry, quarantine, acclimatization, control of invasive fish species, and management of water and food quality. It is essential to avoid the accumulation of sediment and predators in the ponds. Nurseries should be leveled with a 2% slope to facilitate drainage and harvesting. Structures such as sluices must prevent cross-contamination. Drying and disinfecting the nurseries between cycles helps to eliminate pathogens.	Quarantine tanks; equipment for draining and drying ponds; aerators and radial air blowers; tools and implements for removing sediment.	Reports and records of actions such as: Regularization of the pond slope to avoid water accumulation. Sediment removal and erosion control. Monitoring water quality and fish health. Correct fertilizer application and macrophyte control.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		Controlled fertilizer application and sediment removal prevent environmental impacts. Good practices ensure the sustainability and productivity of fish farming.				
	4.4. Location and impacts of pollutants	The location of the ponds directly influences water quality and production success. Areas close to sources of pollution, such as industries and farms, increase the risk of contamination. Fertilizer and pesticide spills can compromise fish health. It is recommended to avoid locations with	Environmental consultancy services; plant curtains to protect ponds; equipment for analyzing water quality (pH, ammonia, nitrite).	Reports and records of actions such as: Preliminary analysis of water quality before stocking. Implementation of vegetation barriers to prevent pollutants. Continuous monitoring of water quality. Pollution sources identification and control report.		

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		steep slopes and to establish vegetation barriers to protect against erosion and pollution. Preliminary water quality analyses help identify risks before stocking. Proper location planning prevents environmental damage and ensures a suitable environment for fish.				
	4.5. Food safety	Contamination of water by fecal coliforms compromises food safety and can cause diseases such as cholera and typhoid fever. This risk increases in areas close to livestock, farms, and urban centers. Water quality	Equipment for microbiological analysis of water (microscope, reagents, ovens, equipment for collecting, preparing, and analyzing samples); isolation tanks for contaminated fish, contracting services	Reports and records of actions such as: Regular tests for fecal coliforms (MPN/100 ml). Monitoring the presence of other animals near the ponds. Contamination source control reports.		

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		should be monitored regularly, especially the MPN (Most Probable Number) of coliforms. It is important to avoid nurseries near sources of contamination. Good handling practices prevent water contamination, ensuring safe, high-quality fish for consumers.	to carry out microbiological analysis, and a water filtering and treatment system.			
	4.6. Transportation and quarantine of fry	The transportation and quarantine of fry are essential to ensure their survival and health. Acclimatization reduces stress and improves adaptation to the new environment. Transport bags should	Quarantine tanks and aquariums; equipment for transporting fry (transport boxes, oxygen pumps, suitable packaging), heaters and thermostats for acclimatization. PPE.	Reports and records of actions such as: Record of the origin of the fry with health certificates. Duration of quarantine and acclimatization for the fry. Observation of the		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		be placed in the ponds for 30 minutes to even out the temperature. The 15-day quarantine helps to identify and treat possible diseases before final stocking. Careful handling, fasting for 12 hours before transportation, and the use of salt (6g/liter) during transportation prevent losses. These practices ensure a good survival rate and a healthy start to the production cycle.		fry's behavior during transport		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	4.7. Preparation and disinfection of production units	Disinfecting the ponds after each production cycle eliminates pathogenic organisms. Salt baths of 2 to 10 g/L are effective and cost-efficient. Nets and equipment should be washed, exposed to the sunlight, and dried before reuse. The application of disinfectants and the removal of organic matter prevent future contamination. Proper disinfection practices prevent disease outbreaks and maintain the sanitary quality of ponds, ensuring a safe environment for fish farming.	Disinfection equipment; disinfectant products; tools and equipment for cleaning ponds and equipment. PPE.	Reports and records of actions such as: Record of disinfection activities in ponds, equipment, materials, and personnel. Monitoring the effectiveness of the treatments applied. Frequency of disinfections between production cycles.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	4.8. Prevention and treatment of infections caused by pathogens	Preventing infections includes maintaining water quality, adjusting stocking density, and providing good-quality feed. Monitoring fish health with hematological biomarkers helps to identify diseases early. Separating sick animals and treating them according to the diagnosis is fundamental. Employees should be trained in handling and hygiene practices. Avoiding stress and predators in ponds contributes to fish welfare and reduces the incidence of disease, ensuring sustainable production.	Consultancy services by a specialized technician to monitor the health and well-being of the fish; magnifying glass, microscope and reagents for diagnosis; equipment for monitoring water quality.	Reports and records of actions such as: Monitoring parasite abundance, hematological biomarkers, and parasite fauna. Record of treatments applied and diagnoses made. Frequency of training for employees.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	4.9. Disposal of Dead Fish	Dead fish should be removed immediately to prevent deterioration in water quality. The decomposition of carcasses increases bacteria and can contaminate ponds and adjacent water bodies. Monitoring parameters such as dissolved oxygen and pH helps to identify problems. Suspending feeding until the cause of mortality is identified avoids waste. Disposal should be carried out in appropriate locations to avoid pollution and unpleasant odors. These practices minimize	Tools for collecting and disposing of dead fish; personal protective equipment (PPE); incinerators or septic tanks for safe disposal.	Reports and records of actions such as: Mortality records and identified causes. Frequency of removal of dead fish from ponds. Reports on the disposal methods adopted.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		environmental and health impacts.				
	4.10. Quality of the final product	Fish quality depends on water management, feeding, and harvesting. Avoiding the presence of animals near the ponds reduces contamination. The stocking density must be appropriate for the species and growth stage. Chemical products must be stored correctly to avoid fish contamination. Staff training is essential to	Consultancy on good handling practices, processing and fish quality analysis; storage and transportation equipment (freezers, coolers); ice factory; chemical inputs.	Reports and records of actions such as: Monitoring water quality and fish health. Final product traceability records. Reports on harvesting frequency and processing quality.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		ensure good handling and processing practices. High-quality fish, with traceability and nutritional value, increases market acceptance and adds value to the final product.				
5. MEASURING SUSTAINABILITY		Sustainability in aquaculture is assessed by indicators that consider the social, economic, and environmental axes, allowing for accurate diagnoses and the formulation of public policies. On the economic side, this measurement ensures the viability of enterprises, promoting profitability, the				(Valenti, W. C., Kimpara, J. M., Preto, B. L., & Moraes-Valenti, P.2018) *Technical guidelines for responsible fisheries: Improving governance in aquaculture employment – A global assessment. Rome: Food and Agriculture Organization of the United Nations.* (FAO *Fisheries and*

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		efficient use of financial resources, and the valuation of ecosystem services. On the social side, local development aims for fair pay, the creation of decent jobs, and the inclusion of vulnerable groups, reducing socio-economic and regional inequalities.				*Aquaculture Technical Paper No*. 575. 2014
	5.1. Business Plan including economic feasibility study	Measuring economic sustainability in aquaculture enterprises is fundamental to align production with the principles of sustainable development and the TSB objectives. This analysis uses clear quantitative	Rural land. Hiring technical and legal advisory services for environmental regularization and licensing, technical advisory for access to credit, sustainability certification, acquisition of financial management	1. Ratio between Net Revenue and Initial Investment (RII) - Description: It measures the use of initial capital efficiency in relation to the net revenue generated. - Better Performance: A higher value indicates	5. Sustainable use and protection of water and marine resources; 6.Transition to a circular economy; 8.Generation decent work and raising incomes;	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		indicators that can be applied across various scales, including farms, regions, and sectors. In addition, carrying out an economic feasibility analysis and drawing up a business plan are important steps to ensure the efficient use of financial capital and the profitability of the enterprise.	software integrated with production and marketing with monitoring of indicators, investments in sustainable production infrastructure (e.g.: RAS systems, renewable energy), hiring consultants for risk management, hiring services to analyze environmental and social externalities, investments in productive diversification systems in aquaculture (multitrophic, polyculture) and other segments and services on the property, training in	greater efficiency in the use of the initial investment. 2. Internal Rate of Return (IRR) - Description: Evaluates the annual rate of return on investment, considering cash flows and externalities. - Better Performance: The higher the IRR, the better, as it indicates greater profitability. 3. Payback period - Description: Indicates the time needed to recover the capital invested. - Better Performance: A shorter period is		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			strategic market management and export compliance, development of socio-economic impact studies, financial support for participation in fairs, events and networking platforms, investments in equipment and infrastructure for digital inclusion, development of traceability systems and digital certification, creation of a fund for reinvestment in innovation and continuous improvement, contracting services for regional feasibility analyses,	ideal, as it means faster recovery of the investment. 4. Benefit-Cost Ratio (B/C) - Description: Compare the benefits generated with the total costs of the activity. - Better Performance: A value greater than 1 is ideal, indicating that the benefits outweigh the costs. 5. Net Present Value (NPV) - Description: Calculates the total value of future cash flows discounted to the present. - Better Performance: A		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			partnerships with research institutions, training in financial literacy.	positive NPV is desirable because it shows that the enterprise is economically viable. 6. Net Profit (NP) - Description: It measures the amount remaining after all costs have been deducted from total revenue. - Better Performance: Higher profits indicate greater efficiency and viability. 7. Negative Externalities (NE) - Description: Quantifies the negative impacts of the activity on third parties (e.g., pollution).		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				- Better Performance: A lower value is ideal, indicating less negative impact. 8. Positive Externalities (PE) - Description: It measures the benefits generated for third parties, such as ecosystem services. - Better Performance: A higher value indicates a greater positive contribution from the activity. 9. Annual Income (AI) - Description: It represents the sum of the profits and the opportunity cost generated each year. - Better		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				Performance: Higher values are desirable, reflecting greater financial stability. 10. Permanence of the Producer in the Activity (PA) - Description: Calculates the average time that producers remain active in the aquaculture sector. - Better Performance: A higher value reflects the stability and sustainability of the sector. 11. Risk Rate (RR) - Description: Measures the number of risk factors associated with the enterprise.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				- Better Performance: Lower values indicate less vulnerability to risk. 12. Product Diversity (PD) - Description: Indicates the number of different products marketed. - Better Performance: Greater diversity is ideal, as it reduces dependence on a single product. 13. Market Diversity (MD) - Description: It measures the number of markets explored by the enterprise. - Better Performance: Greater market diversity increases resilience		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				and stability. 14. Invested Capital Generated by Activity (ICGA) - Description: It assesses the proportion of reinvested capital generated by the activity itself. - Better Performance: A high value indicates greater financial independence and sustainability.		
	5.2. Environmental sustainability study: level of use of space, water, energy, and materials	Facilities and equipment for controlling the entry and exit of biological agents (physical barriers, water filters). Health and water quality monitoring systems.	Recirculation aquaculture systems (RAS) or others that promote minimal water use, water implementation of technologies for nutrient reuse, acquisition of	1. Use of space (S) - Measures the area used per unit of production (ha or m^2/kg). - Better performance: Less space is used per kg of fish produced,	1. Climate change mitigation; 2. Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		Vaccines, probiotics, immunomodulators, and bio-inputs. Automated feeding systems with the inclusion of bio-inputs. Studies and development of new functional inputs (e.g., probiotics). Specific consultancy in the area. Courses to implement good management practices and the use of bio-inputs.	equipment for environmental monitoring, installation of effluent treatment systems, hiring consultants to analyze environmental impacts, acquisition of software to monitor environmental indicators, investments in infrastructure for the use of renewable energy, training in the sustainable management of natural resources, contracting services to quantify environmental externalities, installation of technologies to monitor GHG	indicating greater efficiency. 2. Water dependency (W) - Evaluates the volume of water consumed per unit of production. - Better performance: Lower water consumption per kg of fish produced, especially if the water is returned to the clean environment. 3. Energy Use (E) - It measures the total energy applied to the system per unit of production. - Better performance: Lower energy use per kg of fish produced with		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			emissions, implementation of systems to track and manage waste, acquisition of equipment to reduce the accumulation of waste in the sediment (e.g., machinery, bio-inputs) hiring consultants to mitigate impacts on biodiversity, hiring services to meet environmental programs such as PES (payment for environmental services), investment in biodegradable, recyclable or conventional plastic-free materials, young forms with genetics compatible with the installation site, projects, training and	high production efficiency. 4. Proportion of Renewable Energy (PRE) - Indicates the fraction of renewable energy used in the system. - Better performance: Higher proportion of renewable energy used per kg of fish produced. 5. Use of Nitrogen (N) - Measures the amount of nitrogen applied per unit of production. - Better performance: Lower use of nitrogen per kg of fish produced,		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			equipment to promote renewable energies such as photovoltaics and biodigesters, native and autochthonous species, containment screens against aquatic organisms escaping into natural water bodies.	reflecting efficiency in management. 6. Use of Phosphorus (P) - Measures the amount of phosphorus applied per unit of production. - Better performance: Lower phosphorus use per kg of fish produced, indicating efficiency.		
	5.3. Environmental sustainability study: level of efficiency in the use of materials and energy	This component refers to promoting maximum efficiency in the use of materials and energy in aquaculture production. It is recommended to optimize processes for better use of energy (in all its	Same as eligible items 5.2	7. Energy Efficiency (EE) - It measures the proportion of energy recovered in production in relation to the energy applied. - Better performance: Greater energy efficiency per kg of fish produced.	1. Climate change mitigation; 2. Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		forms, such as raw energy from food that is converted into raw energy from fish), prioritizing energy from renewable sources, and of the materials used, ensuring greater productivity with lower waste, which results in an environmental impact, in line with the objectives of sustainable aquaculture.		8. Nitrogen Use Efficiency (NUE) - It measures the proportion of nitrogen incorporated into the biomass in relation to that applied. - Better performance: Greater efficiency in the use of nitrogen per kg of fish produced. 9. Phosphorus Use Efficiency (PE) - Measures the proportion of phosphorus incorporated into the biomass in relation to that applied. - Better performance: Greater efficiency in the use of		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				phosphorus per kg of fish produced. 10. Production Actually Used (PU) - It measures the proportion of biomass used for productive purposes, taking waste into account. - Better performance: Greater use of biomass per kg of fish produced.		
	5.4. Pollution level study	It is essential for sustainable aquaculture to minimize the release of pollutants, preventing impacts such as eutrophication, organic pollution, siltation, global warming, chemical contamination	Same as eligible items 5.2	11. Eutrophication Potential (PEN and PEP) - It assesses the load of nitrogen and phosphorus released into the environment per unit of production. - Better performance: Lower	1. Climate change mitigation; 2. Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		(including hormones and heavy metals), and acidification.		nutrient release per kg of fish produced. 12. Organic Pollution Potential (OPP) - Measures the load of organic matter released into the environment. - Better performance: Lower organic matter release per kg of fish produced. 13. Siltation Potential (PS) - Evaluates the load of suspended solids released into the environment. - Better performance: Lower release of suspended solids per kg of fish produced.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				14. Global Warming Potential (GWP) - Measures GHG emissions per unit of production. - Better performance: Lower GHG emissions per kg of fish produced. 15. General Chemical Pollution (GCP) - It assesses the amount of chemicals applied, such as herbicides and antibiotics. - Better performance: Lower use of chemical products per kg of fish produced. 16. Hormone Pollution (HP) - It measures the amount of hormones		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				released per unit of production. - Better performance: Lower use of hormones per kg of fish produced. 17. Heavy Metal Pollution (HMP) - Evaluates the load of heavy metals applied to the system. - Better performance: Lower use of heavy metals per kg of fish produced. 18. Acidification Potential (AP) - It measures the release of acid gases (ammonia, nitrogen oxides and sulphur) into the environment. - Better performance: Lower		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				release of acid gas per kg of fish produced.		
	5.5. Study of the level of accumulated material within production systems	Aquaculture should minimize the accumulation of pollutants as much as possible in production systems, and it is important to monitor the accumulation of phosphorus, organic matter, and particulate matter. These accumulations have negative environmental impacts on the environment in which the aquaculture enterprise is located.	Same as eligible items 5.2	19. Phosphorus Accumulation (PA) - Measures the amount of phosphorus accumulated in the system's sediment. - Better performance: Lower accumulation of phosphorus per kg of fish produced. 20. Accumulation of Organic Matter (AOM) - Evaluates the amount of organic matter accumulated in the sediment. - Better performance: Lower accumulation of	1. Climate change mitigation; 2. Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				organic matter per kg of fish produced. 21. Accumulation of Particulate Matter (APM) - Measures the amount of particulate matter accumulated in the sediment. - Better performance: Lower particulate matter accumulation per kg of fish produced.		
	5.6. Study of the risk of cultivated species to biodiversity	Aquaculture can be done with different species and production systems. It is important to prevent the escape of cultivated organisms into natural environments, in order to ensure the genetic conservation	Same as eligible items 5.2	22. Cultivated Species Risk (CSR) - It assesses the risk that cultivated species pose to local biodiversity. - Better performance: Lower risk to the environment and biodiversity (use of	1. Climate change mitigation; 2. Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		and biodiversity of native fauna and flora. Therefore, the risk of the cultivated species is assessed. Some biomes prohibit the cultivation of certain species, such as tilapia in the Amazon region.		native species and a closed system) CSR = Cultivated species risk: 1 = local lineage (open or closed system) 2 = species from the same basin (closed system) 3 = species from the same basin (open system) 4 = invasive species, sites with reduced genetic variability, or hybrids (local or invasive species) in an open system 5 = invasive species, sites with reduced genetic variability, or hybrids 6 = transgenic variety of any species in a closed system		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
				7 = transgenic variety of any species in an open system The lower the value, the better.		
	5.7. Social sustainability study	Local economic development in aquaculture is fostered through fair compensation to local workers and companies, strengthening the regional economy and boosting community growth. The creation and quality of jobs are stimulated by the generation of direct and indirect opportunities, ensuring decent working conditions and respect for workers' rights. To	Training in aquaculture, technical assistance and consultancy in aquaculture, technical and educational training programs, training in the safe operation of equipment, contracting services for the preparation of aquaculture executive projects and business plans, acquisition of production management software, consultancy services for the	1. Development of the local economy 2. Use of local labor 3. Labor remuneration per unit of production 4. Investment to generate direct employment 5. Investment in total job creation 6. Proportion of self-employment 7. Staying in business 8. Work required per unit area occupied 9 Labor required per unit of production 10 Local consumption of production	2. Climate change adaptation; 9.Reduction of socio-economic inequalities, considering racial and gender aspects	

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		ensure safety at work, protective measures are implemented, such as the use of personal protective equipment (PPE) and training in occupational safety, reducing the risks for employees. In addition, local consumption and food security are priorities, ensuring that part of the production is accessible to the local population, encouraging domestic consumption and contributing to the food security of communities. Income equity and social benefits are promoted through policies that	implementation of policies to increase wages, inclusion, and sustainability, construction of ergonomic infrastructure, acquisition of personal protective equipment (PPE) such as life jackets, goggles, non-slip boots, protective clothing, gloves, , lab coats and helmets, installation of risk area signage, acquisition of fire extinguishers and first aid kits, installation of adequate lighting in the workplace, construction of rest areas for workers, start-up programs aimed at young people and women,	11 Pay equity 12 Proportional labor costs 13 Income distribution 14 Access to health programs 15 Education 16 Participation in community activities 17 Gender inclusion 18 Racial inclusion 19 Age inclusion 20. Work safety		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		guarantee fair income distribution, equal pay and expanded access to essential services such as health and education. Social inclusion is a central concern, as it seeks to integrate historically vulnerable groups such as women, young people, the elderly and ethnic minorities, ensuring their participation in the opportunities and benefits generated. Finally, production practices respect local traditions, habits, and cultures, promoting the harmonious and sustainable integration of communities into the production process.	development of marketplaces to sell aquaculture products, digital platforms to connect local producers and consumers, social inclusion programs for minorities and vulnerable groups, support for social entrepreneurship initiatives, promotion of fairs and community events to strengthen the local economy.			

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
6. MANAGEMENT OF PRODUCTION SYSTEMS		Sustainable aquaculture begins with the sustainability of production itself. Rural properties must adopt safe production systems from a productive, profitable, social, and environmental point of view. Cultivation, defined by its daily, sporadic, or even emergency practices, must follow a pattern that seeks this sustainability. The choice of species to be cultivated aims to obtain a product that has a consumer market, attractive price, profitability, and the lowest possible environmental impact. The choice of			2. Climate change adaptation; 4. Conservation and sustainable management and use of soil and forests; 5. Sustainable use and protection of water and marine resources; 9. Reduction of socio-economic inequalities, considering racial and gender aspects	*Food and Agriculture Organization* (FAO). *Guidelines for Sustainable Aquaculture* (GSA). *The FAO Code of Conduct for Responsible Fisheries (FAO)*.

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		rearing structure aims for the lowest fixed cost within the total production cost, while ensuring the best use of water and land resources, taking into account local conditions and variations in temperature and water supply throughout the year. The structure can also prevent the impacts of climate change on temperature and water availability. The stocking density and daily management practices and subdivisions of the rearing phases reduce the variable costs of production and shorten the production cycle,				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		making the farm more profitable and reducing the waste of inputs and water resources.				
	6.1. Definition of the species to be produced	The right species should generate the greatest possible profit at the growing site and the lowest possible environmental impact. First of all, the cultivated species must be permitted in the growing region (IBAMA Ordinance no. 145-N, of October 29, 1998). The species	Larvae; post-larvae; fry and juveniles, and aquatic organisms.	Production of species with good acceptance and market value, which compensate for the cost of production and low environmental risk.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		is the first item assessed in environmental licensing. Exotic species can be allowed or prohibited by the competent environmental agencies, depending on the state. In addition to being permitted, the aquatic organism produced must have a consumer market, a low production cost, and a market price that is relatively higher than its production cost and lower than the price of the same species from extractive fishing; otherwise, farming will be unviable.				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	6.2. Production structure	The production structure aims to provide the lowest possible fixed cost in production according to local costs and the availability of water resources, labor, buildings, machinery, electricity, and land. Regions with abundant water and land, limited electricity availability, and higher construction costs should adopt systems with larger, more horizontal structures that require less investment and machinery, and masonry constructions. Large excavated tanks/nurseries, fewer fish per area,	Technical and executive project for the production system (ponds, elevated tanks, RAS, etc.); production regime (semi-intensive, intensive, consortium, etc.); detailed dossier on the characteristics of the property area (water sources — quantity and quality); description of the infrastructure available on site (electricity, communication, water and sewage networks, etc.), type of soil and correction of compaction acidity; distance from the consumer market; project and architectural design	Structures suited to the region's reality that minimize yearly climatic variations, ensuring optimal animal development and comfort. That ensures quantity and quality of water and provides a low fixed cost of production; and a low environmental impact. Nurseries with slopes and bottoms compacted preferably with a steamroller.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		and minimal electrical structures. Regions with limited available land and water resources should adopt more intensive, more vertical systems that use less area and labor while incorporating some machinery and electricity to make their production viable. Large or medium-sized excavated tanks/nurseries , higher quantities of fish per area, and the aid of electrical equipment. Regions facing a shortage of water and land must adopt more intensive and expensive structures made of masonry,	of the production system (ponds, supply and drainage channels); tractors and steamrollers for building tanks/nurseries ; hydraulic piping; water collection and distribution system. Also eligible for financing are pumps, motor pumps, etc.; earthmoving work and the construction of tanks and dams; buildings and structures; and the electricity grid.			

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		ferrocement, which requires a large use of equipment and electricity, verticalizing their production as much as possible and directing greater efforts towards recirculating and using water, being totally dependent on a constant supply of electricity. To make this increased variable cost of water and electricity feasible, this type of farm must work with as many fish as possible per area. Earthen nurseries should have their slopes and bottoms compacted to prevent water loss.				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	6.3. Production practices	Practices are the set of management measures provided for routine or emergency production. Stocking density — The number of fish that should be raised per area. Cultivation divisions — How many stages should be divided, all cultivations of different species follow at least two divisions: Rearing and fattening. Rearing takes the fry from their most fragile stage to a larger size, commonly referred to as the juvenile stage, so they can proceed to fattening with the highest possible survival. Fattening	Tractors for tank repairs and production routines; vehicles and thermal boxes suitable for transporting fish; automatic feeders; refrigerators and freezers; aerators; biomass prediction systems and scales for biometrics; trucks for transporting inputs and production; trawls; tongs; traps; boxes and buckets; personal protective equipment; technical consultancy and training.	Systems that optimize input and labor use, resulting in lower variable production costs. Reducing risks related to water quality and disease; using appropriate stocking densities for the species and expected final biomass; proper feed management with appropriate feed frequency and rations; a system divided into at least two phases: rearing and fattening; adoption of best management practices (BMPs); access to inputs and to the buyer market.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		brings the juvenile up to harvest size. The harvest size should be calculated by subtracting the market price from the total production cost for each size class of animal. The weight/size of the animal where the cost of production is furthest from the market value should be the harvest weight/size. The two phases have different structures, feed management and stocking densities. Both phases have their water and feed management routines already described in previous items.				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
7. USE OF DIGITAL TECHNOLOGIES		Digital technologies are essential tools for modernizing and increasing the efficiency of aquaculture. They include digitalization to improve productivity, product traceability, efficient resource management, and environmental monitoring. These technologies help production systems to adapt to climate change, allowing for real-time adjustments based on environmental data. They promote the inclusion of aquaculture farmers in less developed regions, facilitating access to training and			2. Climate change adaptation;	*Food and Agriculture Organization* (FAO). *Guidelines for Sustainable Aquaculture* (GSA).

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		basic services through digital platforms. The technologies also facilitate the training and capacity building of aquaculture farmers, as well as allowing the exchange of information between stakeholders through digital platforms, promoting more sustainable and collaborative practices.				
	7.1. Use of Artificial Intelligence (AI)	AI encompasses systems capable of learning and making decisions based on large volumes of data, optimizing processes, predicting future scenarios, and automating complex	General: Computers — Smartphones, tablets, and other mobile devices. Digital literacy training. ICT development service.	Number of ICT equipment used Number of internet access points (routers, antennas) installed or upgraded Percentage of production area covered by quality		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		tasks. Some TSB applications are: Forecasting climate patterns, modeling land use and natural resource scenarios, identifying diseases in crops and aquaculture, optimizing supply chains and suggesting more sustainable practices.	Routers, antennas, and other connectivity devices. - Artificial Intelligence (AI) - AI training programs - Predictive analysis software - High-performance computers	connectivity Average internet connection speed in production and processing areas Reduction of downtime over the year" Number of predictive analytics software deployed and in effective use Number of professionals and technicians trained in AI Percentage of automated or AI-supported decision-making compared to total management decisions		
	7.2. Use of the Internet of Things (IoT)	IoT are physical devices connected to the internet,	- Internet of Things (IoT)	Number of sensors installed (water quality, fish health,		

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		equipped with sensors and actuators, capable of collecting, transmitting, and processing information in real time. Some TSB applications are: Environmental monitoring, aeration control, feeding, safety in aquaculture systems, intelligent energy management, detection of pollutants in water and atmosphere, monitoring the health of aquatic ecosystems.	- Sensors for monitoring water, atmosphere, and fish health - IoT connectivity systems - Feed and aeration automation equipment - Maintenance services for IoT technologies	etc.) Percentage of tanks or ponds monitored in real time Response time to sensor-generated alerts (e.g., thermal inversion detection) Availability rate of IoT systems (uptime)		
	7.3. Use of Blockchain	Blockchain is a distributed ledger technology that guarantees the security,	- Blockchain - Blockchain solutions for traceability (software licenses,	Number of batches or transactions tracked via blockchain Percentage of production certified		

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		transparency, and traceability of transactions and information by means of chained blocks and advanced cryptography. Some TSB applications are: Traceability of aquaculture products, certification of origin and good practices, guarantee of compliance with socio-environmental standards, fair and auditable commercial transactions.	specialized consultancies)	based on blockchain records Average time to verify and audit information throughout the production chain		
	7.4. Use of Big Data and Data Analysis	Big Data and Data Analytics represent a set of technologies and methods for collecting, storing, and analyzing large volumes of data, extracting useful	- Big Data and Data Analysis - Data analysis software - Data analysis	Volume of data processed and analyzed monthly (GB, TB) Number of reports or insights generated from data analysis Number of staff		

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		insights for decision-making. Some TSB applications are: Socio-economic analysis, detection of trends in sustainable production and consumption, evaluation of the impact of public policies and management practices, identification of critical areas for conservation actions, as well as territorial planning and mitigation of environmental risks.	training programs - Computers, servers, and storage equipment - Specialized consultancy	trained in data analysis Reduction in decision-making time due to the availability of up-to-date analysis		
	7.5. Use of Digital Platforms	Digital platforms are online environments that connect different actors, facilitating the exchange of information, access to	- Digital Platforms - Digital data management	Number of active users on the platform (producers, technicians, companies) Usage rate of		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		services, and collaboration. Some TSB applications are: Online learning and training environments, marketplaces for sustainable economic products (green marketplaces), cooperation networks between rural producers, traditional communities, and researchers, and participatory governance systems.	platforms - Consultancy and extension in digital technologies - Training in digital technologies applied to aquaculture	platform features (e.g., access to reports, data updates, discussion forums) Percentage of producers using the platform for production or marketing planning Level of user satisfaction with the platform experience (satisfaction survey)		
	7.6. Use of Mobile Applications	Mobile Applications (Apps) are applications designed for smartphones and tablets that provide quick access to information and services, even in remote areas. Some	- Mobile Applications - Consulting and extension in digital technologies - Training in digital technologies applied	Number of applications developed and installed/ Number of application downloads/installatio ns Average frequency of app use (daily,		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		TSB applications are: Technical support for aquaculture producers (guidance on management, diseases, and climatic conditions), facilitation of access to financial and health services, promotion of digital inclusion of isolated communities, receipt of environmental alerts (such as droughts, floods, or diseases), and encouragement of citizen participation in the preservation of natural resources.	to aquaculture	weekly, or monthly interactions) Percentage of producers accessing technical assistance or guidance via mobile apps		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
8. USE OF DECARBONIZATION TECHNOLOGIES		Climate-resilient infrastructures, combined with climate risk studies, ensure Climate change adaptation, protecting aquaculture operations against extreme events. Efficient management through Aquaculture Development Zones (ADZ), Aquaculture Management Areas (AMA), and Aquaculture Opportunity Areas (AOA) minimizes resource use conflicts and environmental vulnerabilities, while co-management models promote collaboration between communities,			1. Climate change mitigation; 5. Sustainable use and protection of water and marine resources; 6. Transition to a circular economy	*Food and Agriculture Organization* (FAO). *Guidelines for Sustainable Aquaculture* (GSA). (Valenti, W. C., Kimpara, J. M., Preto, B. L., & Moraes-Valenti, P. 2018). (Boyd, C. E., & McNevin, A. A. 2007).

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		governments and other actors, reducing risks and promoting social inclusion while ensuring adaptation to climate change. Aquaculture insurance offers financial protection against natural disasters and diseases, encouraging investment in the sector. The use of recirculating aquaculture systems (RAS), bioflocculation, integrated multi-trophic systems (IMTA), renewable energies and the application of methodologies such as life cycle analysis (LCA) or other environmental accounting (energy				

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		synthesis, sustainability indicators, ecological footprint) contribute to climate change mitigation, reducing emissions and promoting efficient practices and monitoring throughout the value chain. These systems optimize the use of water, preserving water resources and ensuring the sustainability of aquatic ecosystems. In addition, the reuse of waste and nutrients in production processes promotes the Transition to a circular economy, reducing waste and				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		environmental impacts.				
	8.1. Health management and environmental quality	Adoption of biosecurity to prevent diseases. Use of bio-inputs and alternatives to antimicrobials to reduce environmental impacts and improve the health of organisms.	Facilities and equipment for controlling the entry and exit of biological agents (physical barriers, water filters). Health and water quality monitoring systems. Vaccines, probiotics, immunomodulators, and bio-inputs. Automated feeding systems with the inclusion of bio-inputs.	Number of facilities with physical barrier systems implemented. Percentage of tanks or nurseries monitored for water quality and organism health. Reduction in the incidence of diseases in aquatic organisms (%). Quantity of bio-inputs used per production cycle (kg or units). Reduction in the use		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			Studies and development of new functional inputs (e.g., probiotics). Specific consultancy in the area Courses to implement good management practices and the use of bio-inputs.	of antimicrobials (%). Survival rate of organisms (%). Number of training sessions held on good management practices. Percentage of producers trained (%).		
	8.2. Climate-resilient infrastructures	Construction of elevated ponds. Implementation of flood-resistant embankments and stormwater drainage systems. Preparing risk assessments to predict and mitigate climate risks.	Construction of elevated ponds: Materials for building elevated tanks (cement, high-density plastic). Adapted recirculation and drainage systems. Flood and drainage resistant embankments: Flood containment infrastructures (dikes,	Raised ponds: Number of elevated ponds built. Percentage of aquaculture areas with elevated systems in place (%). Resistant barriers and drainage: Length (in meters) of flood-resistant barriers built. Number of		

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			floodgates). Stormwater drainage systems. Climate risk assessment: Hiring consultants to analyze climate risks. Climate risk modeling tools and software.	stormwater drainage systems installed. Climate risk assessment: Number of climate risk assessments carried out. Frequency of updating mitigation plans (years). Reduction of losses related to extreme weather events (%).		
	8.3. Integrated and territorial management	Designation and management of Aquaculture Development Zones (ADZ), Aquaculture Management Areas (AMA), and Aquaculture Opportunity Areas (AOA) to reduce conflicts of use and ensure environmental sustainability.	Aquaculture Development Zones (ADZ), Aquaculture Management Areas (AMA), and Aquaculture Opportunity Areas (AOA): Geospatial mapping and environmental impact studies. Development of shared infrastructures	Aquaculture zones (ADZ, AMA, AOA): Total area designated as ADZ, AMA, or AOA (hectares). Number of environmental impact studies carried out in aquaculture areas. Co-management models: Number of co-management		

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		Implementation of co-management models, promoting collaboration between local communities, governments, and other actors.	in ADZs and AMAs (irrigation canals, safe waste disposal areas). Co-management models: Workshops and training for local communities on co-management practices. Participatory management tools (collaborative software, digital platforms). Hiring specialized consultants.	meetings or workshops held. Percentage of local actors involved in decisions (%). Number of conflicts resolved or avoided in shared-use areas.		
	8.4. Mitigation and energy transition	Use of renewable energies (solar, wind) for aquaculture operations, reducing GHG emissions.	Renewable energies: Solar panels, wind turbines, and storage batteries. Hybrid energy systems (solar/wind). Feasibility studies for implementing clean energy in aquaculture	Renewable energies: Percentage of aquaculture farms using renewable energy sources (%). Reduction in energy consumption from non-renewable sources (kWh).		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			farms. Energy efficiency: Energy-efficient equipment (water pumps, aerators, motors).	Amount of energy generated by installed renewable systems (kWh/month). Energy efficiency: Reduction in energy consumption per unit of production (%). Number of energy-efficient appliances installed.		
	8.5. Financial security and incentives	Creation of aquaculture insurance to mitigate the financial risks of natural disasters and diseases. Economic incentives to encourage investment in sustainable practices.	Aquaculture insurance: Cover for natural disasters and diseases. Implementation of guarantee funds for small producers. Economic incentives: Subsidies for the adoption of sustainable technologies. Specific credit lines for innovation in the	Aquaculture insurance: Number of insurance policies issued. Percentage of aquaculture producers covered by insurance (%). Economic incentives: Total value of subsidies granted (in local currency). Number of producers benefiting from specific credit lines.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			aquaculture sector, in line with the Ministry of Fisheries and Aquaculture's National Aquaculture Plan.	Adoption rate of sustainable technologies due to incentives (%).		
	8.6. Analytical tools and sustainability	Application of life cycle analysis (LCA) or other environmental accounting methodologies to identify, monitor and reduce emissions along the value chain	Life cycle analysis (LCA): Tools and software for environmental analysis (e.g.: SimaPro, OpenLCA). Specialized consultancies for environmental impact assessment along the value chain. Emissions monitoring: Analysis, services, and	Life cycle analysis (LCA) or other environmental accounting monitoring: Number of analyses carried out per year. Percentage of aquaculture operations monitored by environmental accounting tools (%). Emissions monitoring:		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			equipment for measuring GHG (sensors, laboratory analysis, consultancy). Infrastructures for real-time data collection (IoT). Environmental certifications: Compliance training programs with certifications (e.g.: ASC, BAP).	Amount of GHG emitted per ton of production (CO_2e/ton). Number of sensors or monitoring devices installed. Environmental certifications: Number of environmental certifications granted (e.g.: ASC, BAP). Percentage of producers complying with certification standards (%).		
	8.7. Resilient production technologies	Implementation of recirculating aquaculture systems (RAS), bioflocculation, aquaponics, integrated multitrophic aquaculture system (IMTA) to save water	Recirculating aquaculture systems (RAS): Filters, pumps, water quality control systems. Bioflocculation and aquaponics: Infrastructure for	Recirculating aquaculture systems (RAS): Number of RAS installed. Reduction in water consumption in aquaculture systems (%).		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		resources and improve their quality.	biofloc production (tarpaulin, greenhouse, inputs for biofloc blooms, aerator). Integrated equipment for aquaponics systems (tanks, filters, plant cultivation systems, animal and plant seeds). Integrated multi-trophic aquaculture(IMTA): Tanks, cages, enclosures, screens for different species in integrated cultivation. Support infrastructure (floating platforms, feeding systems, aeration). Inputs such as seeds and diets.	Bioflocculation and aquaponics: Number of farms adopting bioflocs or aquaponics. Increase in productivity per unit area (%). Integrated multi-trophic aquaculture(IMTA): Number of IMTA systems implemented. Diversity of species cultivated in multi-trophic systems (number of species). Reduction in organic waste discharged into the environment (%).		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
9. REPRODUCTIVE MANAGEMENT		Good production and supply of young forms are essential for the sustainability of aquaculture: Larvae and fry. They should be from species recommended for the region; of good genetic quality; well-nourished and without health problems. Measures include selective breeding to increase productivity. Genetic monitoring tools are recommended to ensure genetic integrity in seed supply chains, especially to avoid inbreeding. The use of individually marked female broodstocks with a good genetic profile is			5. Sustainable use and protection of water and marine resources;	*Food and Agriculture Organization* (FAO). *Guidelines for Sustainable Aquaculture* (GSA). *Global Plan of Action for the Conservation, Sustainable Use and Development of Aquatic Genetic Resources for Food and Agriculture* (FAO, 2021)

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		indispensable. This item is aligned with: *Global Plan of Action for the Conservation, Sustainable Use and Development of Aquatic Genetic Resources for Food and Agriculture* ; CBD *Kunming-Montreal Global Framework* ; *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization*. It is highly recommended to use improved fry when they exist. For well-nourished fry, it is necessary to maintain low stocking densities in broodstock tanks with properly fed broodstock, and to				

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
		provide high-protein feed for larvae and fry.				
	9.1. Guaranteed good genetics	Individually marked (chipped) female broodstocks with a pedigree map should be used to avoid inbreeding. If possible, it is recommended to work with improved genetic material.	Genetic kinship mapping service; reproduction service; chips and their respective readers; improved breeder semen; computers for using genetic maps; consulting and training.	Breeders of good genetic quality; suitable breeding laboratories; ideal stocking density for breeders; individual marking of female broodstocks (chipping). Training for the reproduction technician; quarantine when introducing new female broodstocks to the farm; proper feed management for female broodstocks and fry; appropriate hormones; well-prepared tanks for receiving larvae and fry.		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
	9.2. Good condition of female broodstocks	The good condition of the female broodstocks comes from good nutrition with top quality feed and animal welfare in a low-stress, low-density ponds.	Female broodstocks from other farms; construction and earthmoving services to adapt tanks; feed; aerators.	Same as the implementation indicators in item 9.1		
	9.3. Larviculture and nursery	Larviculture and nursery must be carried out in tanks suitable for this purpose, with the appropriate initial fertilization and the supply of feed suitable for this stage, with a minimum of 40% crude protein.	Hormones to induce reproduction; fish egg incubators; wet laboratory shed for reproduction; hydraulic pumps and water tanks; construction and earthmoving services to adapt tanks; hydraulic pumps and pipes; sex reversal hormones; high-protein feed; quicklime; agricultural limestone; chemical and organic fertilizers,	Same as the implementation indicators in item 9.1		

Title of the practice	Practice Component	Description	Eligible items	Implementation indicators (monitoring)	Link to TSB Objectives	Scientific reference
			grain bran to induce primary production; probiotics; insecticides and sterilizing agents to clean incubators.			

Appendix A9.

Measures qualified according to a specific approach for adaptation to climate change (Objective 2)

Measure	Threat	Criteria
AG1. Local climate projections	Cold stress	Directly qualified
AG2. Water filtration technologies	Water stress	Directly qualified
AG3. Implementation of cover cropping cultivation systems	Heat stress	Directly qualified
AG4. Creation of escape routes for wildlife	Damage caused by forest fires	Directly qualified
AG5. Establishment of firebreaks	Damage caused by forest fires	Directly qualified
AG6. Rural insurance	Water stress Heat and cold stress Flood damage Damage caused by forest fires	Directly qualified

Measure	Threat	Criteria
AG7. Desalination and reuse of wastewater	Water stress	Revise and apply the corresponding criteria defined (Objective 2) for the activities in CNAE E — Water, sewage, waste management, and decontamination.
AG8. Development and expansion of the use of genetic materials resistant to pests and diseases or adapted to water stress and/or heat stress and/or salinity	Water stress Flood damage	Directly qualified
AG9. Diversified agricultural systems designed to promote pollinator populations	Heat stress	Directly qualified
AG10. Degraded areas recovery	Water stress Heat stress	Demonstrate climate risk reduction or improved resilience through: • For low or moderate risk: presentation of a qualitative and/or quantitative study; • For high risk: implementation of a vulnerability assessment following the full process described in the specific methodology in Annex A2. Risk levels must be determined according to sections 1.1 and 1.2 of Annex A2.

Measure	Threat	Criteria
AG11. Expansion of the technical assistance and rural extension network, associated with the practices listed in this methodology, such as the practices of the ABC+ Plan	Heat and cold stress Flood damage Damage caused by forest fires	Directly qualified
AG12. Improvement or establishment of early flood warning systems	Flood damage	Directly qualified
AG13. Rainwater harvesting	Water stress	Directly qualified
AG14. Implementation of slope stabilization techniques (e.g., biodegradable geotextiles, live stakes, brush mattresses) to control erosion	Flood damage	Directly qualified
AG15. Implementation of controlled environment farming with cooling/ventilation	Heat stress	Directly qualified
AG16. Implementation of coral reef restoration projects using native heat-tolerant species	Heat stress	Directly qualified

Measure	Threat	Criteria
AG17. Implementation of evacuation procedures (contingency plans)	Cold stress Heat stress Damage caused by forest fires Flood damage	Directly qualified
AG18. Implementation of water reuse, recycling and treatment systems on the farm	Water stress	Directly qualified
AG19. Restoration of watersheds and aquifers	Water stress	Review and apply the corresponding criteria defined (Objective 2) for activities in the CNAE E sector — Water, sewage, waste management and decontamination activities. Alternatively, demonstrate climate risk reduction or improved resilience through: • For low or moderate risk: presentation of a qualitative and/or quantitative study; • For high risk: implementation of a vulnerability assessment following the full process described in the specific methodology in Annex A2. Risk levels must be determined according to sections 1.1 and 1.2 of Annex A2.

Measure	Threat	Criteria
AG20. Improvement of water storage and distribution systems for wildlife (e.g., catch basins, drinking fountains)	Water stress	Directly qualified
AG21. Installation of HVAC (heating, ventilation, and air-conditioning) and cooling systems in storage spaces	Heat stress	Directly qualified
AG22. Implementation of forest mosaics and species corridors	Heat stress	Directly qualified
AG23. Implementation of early warning systems for climate extremes	Water stress Flood damage Damage caused by forest fires	Directly qualified
AG24. Medical supplies at farm level	Flood damage Heat stress Cold stress Damage caused by forest fires	Directly qualified

Measure	Threat	Criteria
AG25. Mobile health units	Flood damage Heat stress Cold stress Damage caused by forest fires	Directly qualified
AG26. Monitoring temperature and evapotranspiration data	Water stress	Directly qualified
AG29. Promotion of increased water storage and the use of alternative sources, such as rainwater harvesting and reuse, for irrigation and animal hydration	Water stress	Directly qualified
AG30. Protection of wildlife habitats	Heat stress Water stress Water stress	Directly qualified
AG31. Power backup systems	Flood damage Heat stress	Directly qualified
AG32. Reinforcement of roofs, doors, and warehouse structures	Flood damage	Directly qualified

Measure	Threat	Criteria
AG33. Relocation of agricultural operations to adapted areas	Water stress Flood damage	Directly qualified
AG34. Soil analysis to optimize the use of inputs	Water stress	Directly qualified
AG35. Groundwater preservation measures	Water stress	Directly qualified
AG36. Strengthening of community fire brigades	Damage caused by forest fires	Directly qualified
AG37. Storage of production on the property	Water stress	Directly qualified
AG38. Use of controlled irrigation systems	Water stress	Directly qualified
AG39. Use of geospatial information and time series	Cold stress Water stress Flood damage	Directly qualified
AG40. Measures to ensure worker health and safety	Heat stress	Directly qualified

Measure	Threat	Criteria
AG41. Any activity or other measure that potentially contributes to the sector's adaptation.	Multiple	Demonstrate climate risk reduction or improved resilience through: • For low or moderate risk: presentation of a qualitative and/or quantitative study; • For high risk: implementation of a vulnerability assessment following the full process described in the specific methodology in Annex A2. Risk levels must be determined according to sections 1.1 and 1.2 of Annex A2.