Techical Manual

RESEARCH PROGRAM ON
Climate Change, Agriculture and Food Security

CGIAR

CCAFS

World Agroforestry Centre

# METHODOLOGICAL GUIDE

## Community participatory inventory and prioritization of climate-smart crop-livestock agroforestry technologies / practices

ENGLISH VERSION

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# Summary

This guide addresses the issue of identifying priority interventions for communities in the face of climate change. The manual is about participatory approach of inventorizing and prioritizing climate-smart crop-livestock-agroforestry and social technologies / practices. The guide provides a step by step guidance on how project/extension workers can work with communities and other development stakeholders in the target sites to identify practices that can help local communities to better adapt to climate variability in production.

The guide was developed within the framework of a project "Building resilient agro-sylvo-pastoral systems in West Africa through participatory action research" (BRAS-PAR)" which is one of the flagship 2 projects funded by the CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS).

The flagship 2 of CCAFS, which is about climate-smart technologies and practices, addresses the challenge of how to transition to a climate-smart agriculture (CSA) at a large scale for enabling agricultural systems to be transformed and reoriented to support food security under the new realities of climate change. Led by ICRAF-WCA/Sahel, the BRAS-PAR project is being implemented by a consortium of National research institutes in Burkina Faso, Ghana, Niger and Senegal, IUCN, and ILRI.

**Key words**: Adaptation, Climate-Smart, Climate change, Climate variability, Food security, Mitigation





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# List of acronyms and abbreviations

| | |
|---|---|
| **CCAFS:** | Climate Change, Agriculture and Food Security |
| **CGIAR:** | Consultative Group on International Agricultural Research |
| **CIAT:** | International Center for Tropical Agriculture |
| **CSA:** | Climate-Smart Agriculture |
| **CSIR-SARI:** | Savanna Agricultural Research Institute of the Council for Scientific and Industrial Research |
| **DANIDA:** | Danish International Development Agency |
| **EU:** | European Union |
| **FAO:** | Food and Agriculture Organization of the United Nations |
| **ICRAF:** | World Agroforestry Centre |
| **ICRISAT:** | International Crops Research Institute for the Semi-Arid Tropics |
| **IFAD:** | International Fund for Agricultural Development |
| **IICT:** | Instituto de Investigação Científica Tropical |
| **ILRI:** | International Livestock Research Institute |
| **INERA:** | Institut de l'Environnement et de Recherches Agricoles |
| **INRAN:** | Institut National de Recherche Agronomique du Niger |
| **IPCC:** | Intergovernmental Panel on Climate Change |
| **ISRA:** | Institut Sénégalais de Recherche Agricole |
| **IUCN:** | International Union for Conservation of Nature |
| **MEA:** | Millenium Ecosystem Assessment |
| **NGO:** | Non-Governmental Organization |
| **SDC:** | Swiss Agency for Development and Cooperation |





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# Preamble

This manual has been produced within the framework of the project: Building resilient agro-sylvo-pastoral systems in West Africa through participatory action research (BRAS-PAR)". BRAS-PAR is one of the flagship 2 projects funded by the CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS). The flagship 2 of CCAFS, which is about climate-smart technologies and practices, addresses the challenge of how to transition to a climate-smart agriculture (CSA) at a large scale for enabling agricultural systems to be transformed and reoriented to support food security under the new realities of climate change. Led by ICRAF-WCA/Sahel, the BRAS-PAR project is being implemented by a consortium of National research institutes in Burkina Faso, Ghana, Niger and Senegal, IUCN, and ILRI. This project seeks to develop up-scalable technological and social innovations of climate-smart agriculture for integrated crop-livestock-tree systems through improved understanding of farmer's perceptions and demands, by addressing barriers to adoption taking into consideration gender and social differentiation.

One of the three activities of the project is to strengthen the capacity of key actors through multi-stakeholders platforms and the key element of this activity is engaging different key actors and the local communities to make inventory of promising climate-smart crop-livestock-agroforestry practices and to prioritize these practices for testing and evaluation through participatory action research. The stakeholders include farmers, extension services, development agencies (e.g. NGO), private sector, researchers and governmental agencies.





# 1. Introduction

This guide describes a simple method for community participatory inventory and prioritization of climate-smart agriculture practices/technologies and social innovations.

It aims at:

(i) engaging key stakeholders in inventorizing promising climate-smart crop-livestock-agroforestry practices that fit their local context;

(iI) prioritizing the promising climate-smart technologies based on a set of criteria pertinent to climate smart agriculture (food security, adaptation and mitigation) and which are feasible in the local farmers' context.

(iii) making an inventory of key crop-livestock-agroforestry value chains and their actors. This is just a rapid identification of promising value chains and a detailed study is to follow later.

# 2. Definition of key terms used in the document

In this guide, the terminologies such as adaptation, mitigation and ecosystem services are used as defined by Bayala et al. (2016):

***Adaptation*** is referred to as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC, 2007).

***Mitigation*** refers to actions that limit the magnitude and/or rate of long-term climate change; it generally involves reductions in human (anthropogenic) emissions of greenhouse gases and may also be achieved by increasing the capacity of carbon sinks, e.g., through reforestation (IPCC, 2007).

***Ecosystem services*** refers to the benefits people obtain from ecosystems which are grouped into four broad categories: *provisioning*, such as the production of food and water; *regulating*, such as the control of climate and disease; *supporting*, such as nutrient cycles and crop pollination; and *cultural*, such as spiritual and recreational benefits (MEA, 2005).

***Climate-smart agricultural production*** is defined by FAO (2013) as agricultural production activities that composed of three pillars: (1) sustainably increasing

agricultural productivity and incomes; (2) adapting and building resilience to climate change; and (3) reducing and/or removing greenhouse gases emissions, where possible. Therefore, for a technology to be considered climate smart, it has to contribute to food security through increased productivity and income generation, adaptation and mitigation strategies. The technologies should also be proven up-scalable and economically viable.

*A list of crop-livestock-agroforestry technologies that could be climate-smart as adapted from the publication by IUCN (Savadogo et al., 2011) is provided in Annex to this guide. The list should not be read to the participants but should only serve as a guide. It will be good for the workshop team to familiarize themselves with this informative publication.*

# 3. Community participatory inventory of the climate-smart technologies/practices

The inventory of the CSA practices/technologies should be conducted during a community workshop (Photo 1).

## 3.1. Identification of workshop participants

The workshop should gather:

- At least 30 adult participants (over 18 years) from the target communities;
- At least 30% of communities participants should be women who have a good knowledge of the biophysical and socio-institutional contexts of the sites;
- All key social groups/ethnic groups in the community including crop and livestock farmers;
- Representatives from the community should form at least 50% of the workshop participants;
- At least 2 representatives (with background in agronomy, livestock and agroforestry) from:
    - research institutes,
    - development agencies (NGOs),
    - private sector and
    - Government agencies.
- The workshop team should consist of a team leader, a facilitator and 2 rapporteurs. Their role is described in Table 1 below.





**Table 1: Roles of the Workshop team**

| Team member | Role |
|---|---|
| Team Leader | Introduces the workshop and the agenda for the day. Explains the objectives of the project, has the responsibility for the management of the workshop and acts as a contact point between community and the rest of the team. He/She is responsible for quality control and the final production of the workshop report. |
| Facilitator | Explains and guides the discussion during the workshop. Ensure all participants are getting an equal chance to participate, especially women and try as much as possible to ensure that the sitting arrangements allow for interactions among the participants. It will be advantageous for the facilitator to understand the local language. |
| 2 Rapporteurs (note-takers) | They have the responsibility of tracking and documenting in details the content of the discussions. The note takers should also record any controversies during the discussions, contentious issues, how group makes decisions or reached consensus. The note takers should remind the facilitator if any issues that are supposed to be covered have been left out. |

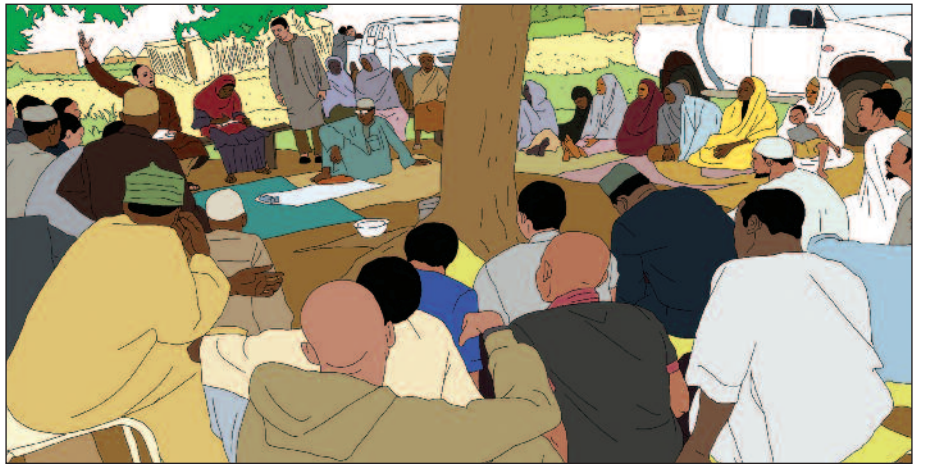

Figure 1: Participants at prioritization exercise of climate-smart crop-livestock-agroforestry technologies/practices.

The names of the workshop participants should be recorded together with their gender and institution of origin. An example of how to record the names of the participants is given Table 2.

### Table 2: List of participants

| Name | Sex | Institution |
|---|---|---|
| | 1=Male;<br>2= Female | |
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |
| 8. | | |
| ... | | |
| ... | | |
| ... | | |

### 3.2 Collecting general Information on the target site

After introducing the project and explaining the objectives of the workshop, it is essential to collect general information on the village using Table 3. This information is necessary to better contextualize the responses of the participants regarding the inventory of climate-smart crop-livestock-agroforestry practices.

### Table 3: Preliminary information on the village (project site)

| | |
|---|---|
| Name | |
| Dominant ethnic group (s) | |
| Total population | |
| Total number of households | |
| Number of female headed households | |
| Proportion of households growing crops and keeping livestock | |
| Proportion of households growing crops only | |
| Proportion of households keeping livestock only | |
| Proportion of the households engaged in agroforestry practices | |
| Proportion of households engaged in non-agricultural activities only e.g. commerce | |
| Average size of crop farm per household | |
| Dominant crops grown in the village | |
| Dominant livestock species in the village | |
| Average livestock number per household | |
| Access to market (0=Poor; 1=Fair; 2=Good; 3= Very good) | |
| State of infrastructures (school, health centre etc.) | |
| in the community (0=Poor; 1=Fair; 2=Good; 3= Very good) | |
| Pressure on crop land in the community (1=Low; 2=Average; 3=High; 4= Very high) | |





### 3.3. Conduct of the inventory

The conduct of the inventory workshop entails:

(i) explaining to the participants the technologies that could be considered "climate-smart" (Photo 2);

(ii) asking the participants to mention technologies that have proven successful and beneficial in terms of improving household food security, adaptation to climate change and mitigation;
Attendants should be asked to bear in mind technologies/practices from all domains namely agronomic, soil and water conservation / water storage, livestock and forestry-agroforestry, social practices, etc. (Table 4a, b, c, etc.).
You can start with crop-related technologies, and then followed by livestock and agroforestry.

(iii) For each mentioned technology, the participants should be asked to elaborate on the benefits and constraints for its implementation, and reasons for being considered climate-smart;

(iv) At completion of the inventory, the results should be presented to the participants to ensure that nothing is missing.

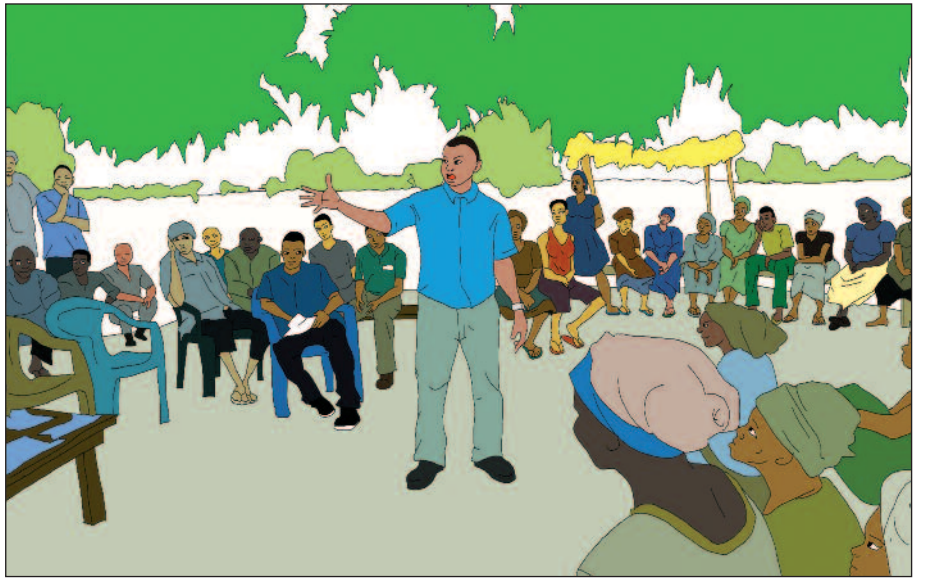

Figure 2: A facilitator explaining a point to community members during the inventory workshop.

### Table 4a: Inventory of promising climate smart agronomic practices (including soil and water)

| Technology/ social practices | Benefit | Constraint | Reason for climate smartness |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |

### Table 4b: Inventory of promising climate smart livestock practices

| Technology/ social practices | Benefit | Constraint | Reason for climate smartness |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |

### Table 4c: Inventory of promising climate smart agroforestry practices

| Technology/ social practices | Benefit | Constraint | Reason for climate smartness |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |





## Example of inventory exercise at Doggoh, Jirapa district in Ghana

| Technology | Benefit | Constraints to adoption | Reason for climate smartness |
|---|---|---|---|
| Pass-on-the-gift (Credit in kind) sheep (Social innovation) | • Easy source of up scaling livestock rearing<br>• Poverty reduction<br>• Source of manure<br>• Lower mortality rates<br>• Higher fertility rates,<br>• Improvement in animal and herd performance<br>• Extra income and food<br>• Rich and diversified diets<br>• Growth in animal-source foods<br>• Preventive health measures such as vaccinations to control disease, stress reduction (provision of shade and water) | • Inadequate veterinary services<br>• High cost of treatment and housing<br>• Vaccine against The PPR (peste de petits ruminants) virus that infects primarily Goats and Sheep and is a major impediment to small ruminant production<br>• Challenges are scarcity of high-quality vaccines in the communities and dissemination of vaccine in a cost-effective manner. | • Healthy stock with reduced mortality risks<br>• Food security strategy through poverty reduction. |
| Fodder production (Cajanus cajan) | • Animals do not roam far<br>• Provide protein to animals<br>• Provides nutrients to the land<br>• Reliable source of animal feed | • Labour intensive<br>• Often grazed by free roaming livestock<br>• Little or no cultivated pastures<br>• Bulk of current forage resource are from natural rangelands | • Improved quality feeds and products mitigating emissions<br>• Forage quality improvement.<br>• By enhancing forage production, more organic matter is returned to soils, which, in turn, increases the amount of organic carbon stored in the soil |
| Semi-intensive housing | • Know where about of live stock<br>• Manure is secured<br>• Sick animals are easily identified<br>• Highly protected from thieves<br>• Lower mortality rates<br>• Higher fertility rates,<br>• Improvement in animal and herd-performance<br>• Preventive health measures such as vaccinations to control disease, stress reduction (provision of shade and water) | • Difficulties in bringing livestock home every evening<br>• limited expertise<br>• Poor feed quality (low feed digestibility). | • Adaptation strategy.<br>• Reduction in disease and pest incidence<br>• Prevent excessive/extreme weather events<br>• Minimizes deforestation and land degradation |
| Grazing management | • Able to manage limited land.<br>• Increased mobility of animals | • Areas allocated for livestock are over utilized due to insufficient land.<br>• Poor feed quality (low feed digestibility).<br>• Vegetation loss due to overgrazing<br>• Increases deforestation and land degradation<br>• Deforestation is a land-use change process that can generate most GHG emissions | • Adaptation strategy in livestock feeding<br>• Grassland carbon sequestration could offset emissions<br>• The impact of better grazing management (increased mobility, and a better balance between grazing and rest periods) can have a positive impact on forage production and soil carbon sequestration.<br>• Forage quality improvement |
| Supplementary feeding (Acacia fruits) | • Enhance faster growth of livestock | • Not easily available | • Adaptation strategy against limited access to feed.<br>• Forage quality improvement |

# 4. Prioritization of the climate-smart crop-livestock-agroforestry practices/technologies

In this session, the inventoried climate-smart crop-livestock-agroforestry practicesare to be prioritized by assessing each identified practice against seven criteria (Table 5). In the context of climate change, it is recognised that technology innovations alone are insufficient, and we suggest to include social innovations. In fact, social innovations emerge as networks generating innovative solutions for climate change adaptation and mitigation (Feola et Nunes, 2014).

## 4.1. Criteria to be used for the prioritization exercise

(i) ability to sustainably improving agricultural productivity;
(ii) market value of the different products generated by the technology;
(iii) viability as adaptation strategy;
(iv) potential for reducing greenhouse gas emissions (mitigation);
(v) potential for up-scaling;
(vi) economic viability (cost and benefit) /income generation and
(vii) impact on ecosystem services.

## 4.2. Procedure for conducting the prioritization

(i) Participants are first asked to score each identified technology/practice for each criterion on a scale of 0 (none/not at all) to 10 (Excellent/highly suitable) (Photo 3).

**Table 5. Framework for technology and social practices prioritization**

| **Technology/ social practices** | **Criteria** (score 0 (none/not at all) to 10 (Excellent/highly suitable) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Food security | | Adaptation | Mitigation | Others | | | Score total |
| | Productivity | Income | Adaptation | Mitigation potential | potential for up-scaling | economic viability | impact on ecosystem services | |
| 1. | | | | | | | | |
| 2. | | | | | | | | |
| 3. | | | | | | | | |
| 4. | | | | | | | | |
| … | | | | | | | | |
| … | | | | | | | | |

Repeat the table separately for the different categories (agronomy, livestock, agroforestry, etc.)





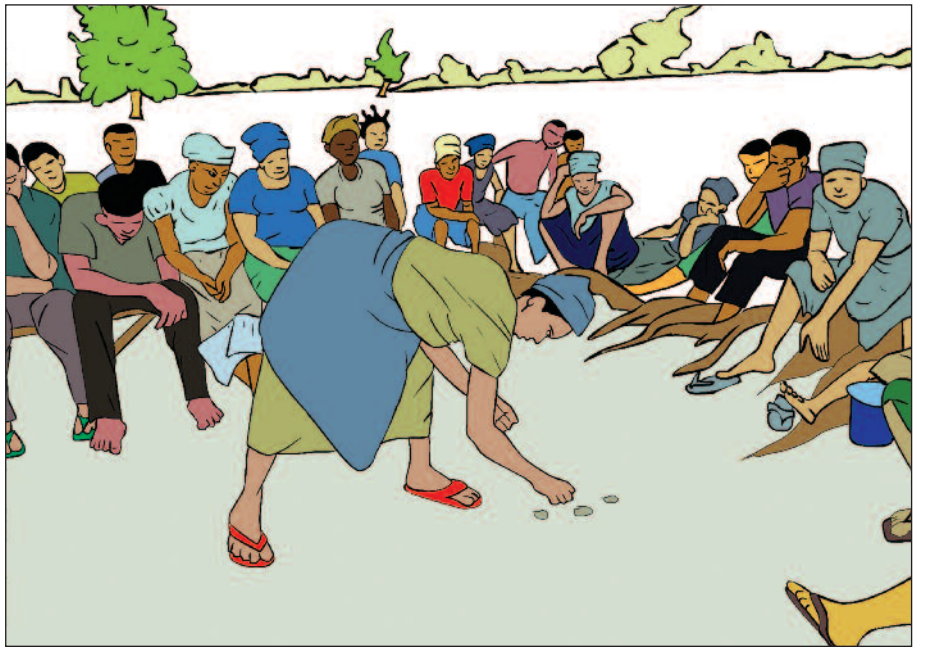

Figure 3: A woman scoring for a technology during the inventory workshop.

(i) In case of disagreement among the participants in the scoring of each technology, all groups in the workshop are asked to provide a score.
(ii) Then the modal value (score that was most frequent) is retained.
(iii) The scores for different criteria for each technology are then summed-up and the results announced to the participants.

It is critical here to prevent any group from dominating in giving score for the technologies. Technologies/social practices with higher score should be considered as promising and used for the next assessment regarding the identification of the key value chains which the scaling up of the technologies/social practices should focus on. However, attention should be paid to the adaptation and mitigation score for final decision on which technology to screen for their value addition.

Example of prioritization of promising climate smart agronomic practices at Bompari, Lawra district, Ghana.

| Technology | Criteria (score from 0 (none/not at all) to 10 (excellent/highly suitable) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Food security | | | Adaptation | Mitigation | Others | | | |
| | Productivity | Income | | Adaptation | Mitigation | Up-scaling | Economic viability | Ecosystem services | Total score |
| Tie ridges | 10 | 8 | | 9 | 8 | 10 | 9 | 7 | 61 |
| Crop rotation | 9 | 10 | | 8 | 7 | 10 | 8 | 7 | 59 |
| Earth-Bunding | 9 | 8 | | 7 | 7 | 9 | 9 | 8 | 57 |
| Intercropping | 9 | 9 | | 8 | 7 | 10 | 7 | 5 | 55 |
| Improved varieties | 9 | 9 | | 10 | 8 | 5 | 6 | 7 | 54 |
| Crop residue retention | 8 | 8 | | 9 | 6 | 10 | 5 | 7 | 53 |
| Composting | 9 | 5 | | 10 | 8 | 6 | 8 | 5 | 51 |
| Minimum tillage | 8 | 7 | | 8 | 6 | 7 | 7 | 6 | 49 |
| Mulching | 5 | 6 | | 7 | 7 | 8 | 7 | 7 | 47 |





# 5. Rapid identification of key crop-livestock-agroforestry value chains

This short session identifies key crop-livestock-agroforestry value chains, ranking them and identifying the main actors together with their level of influence on the value chain. It also identifies interventions needed to make the value chain operational (Table 6).

**Table 6. Template for participatory value chain analysis**

| Value Chain | Rank | Main actors | Influence of the main actors | Intervention needed |
|---|---|---|---|---|
| | | | (1. Weak; 2. Modest; 3. Strong; 4. Very strong /dominant) | |
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

# 6. Selecting scalable technologies/social practices from the inventory

(*Follow up of the results from the inventory and prioritization*)

Once the prioritization is completed, the cost-benefit analysis of the selected options (Andrieu et al., 2017) will help coming up with a limited number that will be up-scaled through improved understanding of farmer's perceptions and demands, by addressing barriers to adoption taking into consideration gender and social differentiation.

This will be done either by strengthening the capacity of the key stakeholders on the short list of options retained or testing and evaluating them (fine tuning to local circumstances) through participatory action research. The stakeholders include farmers, extension services, development agencies (e.g. NGO), private sector, researchers and governmental agencies.





# Literature

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## Guide to climate smart crop-livestock-agroforestry practices

Annex 1 : (adapted from Savadogo et al., 2011)

| Technology | Soil and water conservation | Agroforestry | Crop | Water storage | Livestock |
|---|---|---|---|---|---|
| 1. Stone bunds | X | | | | |
| 2. Dugout (bouli) | X | | | X | |
| 3. Zaï pit | X | | | | |
| 4. Half-moon | X | | | | |
| 5. Mulching | X | | X | | |
| 6. Improved fallow | | X | | | |
| 7. Rehabilitation of floodplain | X | | | X | |
| 8. Pruning | | X | | | |
| 9. Farmer Managed Natural Regeneration | | X | | | |
| 10. Reforestation/afforestation | | X | | | |
| 11. Wind break | X | X | | | |
| 12. Fire belt | | X | | | |
| 13. Forest management | | X | | | |
| 14. Protected community forest | | X | | | |
| 15. Well (shallow/deep) | | | | X | |
| 16. Small reservoir | | | | X | |
| 17. Collection of rainwater | | | | X | |
| 18. Improved crop varieties | | | X | | |
| 19. Drought tolerant crop varieties | | | X | | |
| 20. Composting | X | | X | | |
| 21. Intercropping | | | X | | |
| 22. Zero/minimum tillage | | | X | | |
| 23. Vegetable production (off season) | | | X | | |
| 24. Fodder harvesting and storage | | | | | X |
| 25. Planted fodder (e.g. dual purpose crop varieties) | | | | | X |
| 26. Planting vegetation strips (e.g. with *Andropogon gayanus*) | X | | | | X |
| 27. Live fences | | X | | | X |
| 28. Supplementary feeding | | | | | X |
| 29. Animal fattening | | | | | X |
| 30. Crop residue treatment (physical e.g. chopping or chemical e.g. adding urea) | | | | | X |
| 31. Corralling to deposit manure on crop field | | | | X | X |
| 32. Transhumance | | | | | X |
| 33. Grazing management | | | | | Xv |

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# METHODOLOGICAL GUIDE

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