



THINK NAMIBIA Sustainable Forest Management

FACT SHEET ON:

Agroforestry

The purpose of this fact sheet is to share information on agroforestry and the beneficial role it can play in Namibia.

INTRODUCTION

Agriculture in Namibia is largely based on monoculture, or the cultivation of a single crop in a given area. However, this makes farmers even more vulnerable to climate change and adverse weather patterns.

Agroforestry moves away from monocropping farm practices to a more sustainable approach that combines trees, plants, and animals. Agroforestry has been successfully tried and tested in many parts of the world, including sub-Saharan Africa. Today the World Bank estimates that over a billion people worldwide are using agroforestry practices.

WHAT IS AGROFORESTRY?

Definition

Agroforestry combines agriculture (crops and livestock) with forestry (trees). It is a type of intercropping where trees are grown on pastures or among crops to provide many benefits such as enhanced plant resilience, increased biodiversity, and more productive and climate-friendly use of the land compared to a monoculture system. The trees themselves can produce many valuable resources, like fruit, timber, or fodder. Ideally, tree rows should be aligned north to south to make the best use of sunlight.

The main differences between agroforestry and other farming practices are “the four I’s”:

- **Intentional:** The combination of agriculture with forestry is intentionally designed and not a product of nature or coincidence.
- **Integrated:** Crops, trees, and animals are all integrated into a single system. This helps improve the productivity of the land and diversifies production among different resources.
- **Interactive:** Agroforestry takes advantage of physical and biological interactions between crops, animals, and trees. For example, trees provide wildlife habitat, and the wildlife in turn keeps pests under control.
- **Intensive:** Agroforestry is an ongoing process to maximise productivity. Intensive management activities like weed control, pest control, pruning, thinning, and fertilisation should be done to ensure the agroforestry system functions effectively.

THE DIFFERENT AGROFORESTRY SYSTEMS

Agri-silvicultural system

This is when crops are grown beneath and in between trees. Most crops can be grown with the agri-silvicultural system, although the system focuses on integrating mutually beneficial trees and crops to create supportive relationships and a system that is more similar to natural ecosystems.

Silvi-pastoral system

This system incorporates trees and livestock. Trees or shrubs are primarily grown to produce fodder for livestock, or fruit, timber, or fuelwood, or to improve the soil. Livestock is kept mainly for meat, eggs, honey, or milk production. This type of system can contribute towards fodder availability in Namibia.

This system, if the primary goal is to grow fodder, can produce more dry matter, digestible energy, and crude protein per hectare than purely grass-based systems. This in turn reduces the need for external inputs such as chemical fertilisers and concentrate feeds.

Agri-silvo-pastoral system

This system incorporates all three components, being crops, trees, and livestock. The agri-silvo-pastoral (just like the agri-silvicultural) system can play an essential role in reducing plant vulnerability and increasing crop resilience, thus helping communities better to tackle climate risks. This specific agroforestry system provides around 320 million people in Africa with basic needs such as medical supplies and fuelwood.

Home garden system

Home gardens form a special category of agroforestry that deals with the cultivation of multipurpose trees and crops combined with animal husbandry around a homestead. This type of system is normally used to produce subsistence crops for the gardener and his family. The family manages the multipurpose trees and shrubs together with annual and perennial crops and livestock, within or around the homestead. The size and location of the home garden system is what differentiates it from an agri-silvo-pastoral system. Many farmers and communities have traditional knowledge and practices, and this decides the choice of trees and plants.

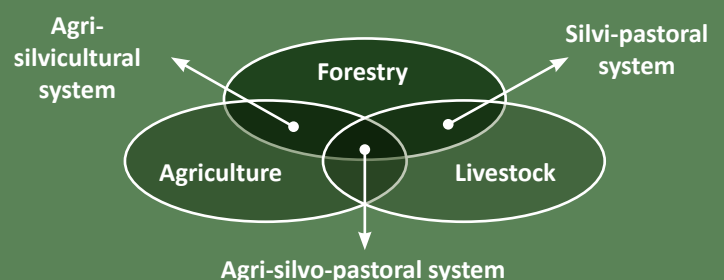


Figure 1: Potential synergies for agroforestry and REDD+ (Bhattarai, 2017)

THE BENEFITS OF AGROFORESTRY

Research has highlighted that agroforestry can reap substantial benefits, producing greater output and proving to be more sustainable than forestry or agricultural monocultures.

Economic benefits

- **Family income:** Farmers can get more income by selling surplus produce.
- **Livestock possession:** Agroforestry ensures good and cheap fodder, and thus increases livestock health and numbers.
- **Supplementary income:** Communities can start earning extra income from other products than crops, such as wood crafts, plant oils and fruits, and honey.

Social benefits

- **Improved food security:** A variety of food, especially vegetables and fruits, will be available.
- **Improved nutrition:** Many trees produce fruit with high vitamin or oil content, like Guava, Marula and Monkey orange.
- **Improved living standards:** Having surplus crops to sell can increase living standards in rural areas.
- **Improved resilience to climate change:** It increases the health of soils and biological diversity in Namibia's harsh climate.

Environmental benefits

- **Combats soil degradation:** It increases the soil's water holding capacity and stabilises soil structures.
- **Controls soil erosion:** Tree roots and other plants will help catch water and soil, preventing it from getting washed or blown away.
- **Increases carbon sequestration:** It has a high potential to sequester carbon, thereby mitigating climate change, while leaving the bulk of the land in agricultural production.

The following table shows the benefits of each agroforestry system:

BENEFITS	Type of Agroforestry System			
	A-S	S-P	A-S-P	HG
Producing multiple products such as food, vegetables, fruits, fodder and forage needed for livestock, fuelwood, timber, and leaf litter needed for organic manure production.	X	X	X	X
Improving and sustaining crop and livestock productivity, which increases the level of income of the farmers.	X	X	X	
Improving the nutritive value of animal feed by the supply of green fodder.	X	X	X	X
Best practice for soil nutrient recycling, which also helps to reduce chemical fertilizer purchase.	X		X	X
Improving farm site ecology by reducing surface runoff, soil erosion, and nutrient loss.	X	X	X	X
Improving the local micro-climate and enhancing the productive capacity of the land.	X	X	X	X
Reducing pressure on community forests and other natural forests for fodder, fuelwood, and timber.	X	X	X	
Increasing diversity by allowing for growing crops while still maintaining forage for livestock on the same land.		X		
Offering wind protection and shade for livestock and so reducing livestock mortality.		X		X

* A-S: Agri-silvicultural; S-P: Silvi-pastoral; A-S-P: Agri-silvo-pastoral; HG: Home garden

Table 1: Benefits of different agroforestry systems

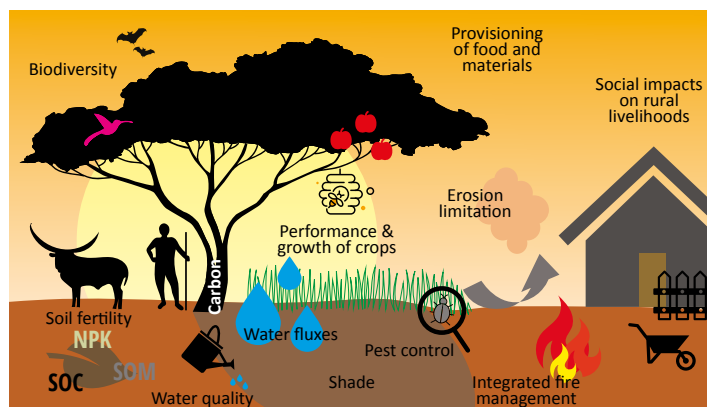


Figure 2: Agroforestry: An appropriate and sustainable response to a changing climate in Southern Africa (Sheppard, 2020)

HOW TO ESTABLISH AN AGROFORESTRY SYSTEM?

Identifying appropriate options

In the Omusati Region, for instance, crop production is reduced due to low rainfall and increasing demand for wood and timber products. It is therefore vital that Namibia adopts sustainable agriculture for food security. This is especially important for subsistence farmers.

Implementing an agroforestry system can reduce your vulnerability and increase your outputs in farming. The three key elements to be considered in this decision-making process are:

- **Land characteristics**, such as other crops and trees which grow well in your area that can be incorporated with what you currently have on your land.
- **Your needs and priorities**; for example, if there is a need for fodder, investigate the possibility of growing cowpea.
- **The availability of resources**, such as land, labour, time, and capital.

Adapting or designing an agroforestry system

Surveying local knowledge and practices, including the agroforestry species used in an area, is highly recommended, and will help you decide on an agroforestry system to adopt. Acacia trees, for example, add nitrogen to the soil and improve soil health.

In some cases, farmers may already have been applying a form of agroforestry without realising it, for example cattle farming in a marula field. In such a case look to improve that system rather than to introduce an entirely new system. Traditional systems will be well-adapted to local circumstances, although it may be possible to make them more efficient. Local farmers are also likely to be more willing to modify an existing system than to introduce an unfamiliar one.

The adaptation or design of an agroforestry system is the process of choosing and arranging the three main components. These components are:

- **Trees or other woody perennials:** Choose trees or shrubs that can provide fruit, fodder, woodfuel, timber, shade, or other products. As an example, the Grey-leaved saucer berry tree (*Cordia sinensis*) provides fruits which can be dried or made into juice, the leaves can be used for livestock fodder, and the wood for fuel and tools.
- **Crops or forage:** Choose grains, tubers, roots, or vegetables with minimal water and fertiliser requirements, that can tolerate shade provided by the trees, and that, if possible, can supply fodder to your livestock as well as having market potential. Cowpea, as an example, is drought resilient, heat-tolerant, and can be harvested within two to three months, making it a perfect fit for Namibia's dry climatic conditions.

- **Animals:** If animals are to be a component of the agroforestry system, factors to be considered include potential markets, desired products (e.g. meat or eggs), and interactions with other components of the system.

Establishing an agroforestry system

The site preparation varies according to the land type and agroforestry system. It may be minimal (e.g. preparing holes for planting seedlings, or weeding around and protecting naturally regenerated seedlings), or it may involve extensive works such as land clearing, fencing, irrigation and fertilisation.



Photo 1: Tree seedlings in a nursery

Tree seedlings can be purchased from local nurseries or produced by the communities or farmers themselves, depending on needs and situations. Seeds can also be collected from trees and wild plants. Seeds from the Kalahari podberry (*Dialium englerianum*) and Monkey orange (*Strychnos cocculoides*) can be propagated with relative ease.

High-quality and drought-resistant crop seeds should be chosen, and experienced local farmers are likely to be good sources of information on which seeds to use.

Animals can be bought at markets or auctions or from neighbours, but only healthy animals should be purchased, and they should be provided with adequate shelter and food to ensure their continued growth and good health.



Photo 2: Monkey orange (*Strychnos cocculoides*) (Credit: Fruitipedia)

Managing an agroforestry system

Maintenance is needed to ensure that an agroforestry system functions effectively.

Common maintenance practices include:

- **Seedling protection:** Bark is a natural mulch that can be used around a young tree.
- **Weed control;** by pulling out, mowing, or the use of mulch.
- **Pest control:** Thick hedges around the perimeter act as a barrier. The Kei apple is a good example.
- **Animal browsing:** It is necessary to protect young trees and shrubs from livestock.
- **Fertilisation:** Leaf litter and woody compounds from pruning can

be worked back into the soil.

- **Irrigation;** especially when crops and trees are just planted and there is no rain.
- **Thinning:** Trees must be thinned, otherwise they will grow too slender and eventually not reach the desired size.
- **Pruning:** Allows easy access to crops and to provide quality wood.
- **Coppicing:** Certain trees or shrubs can be cut back to ground level periodically to stimulate growth.
- **Harvesting.**
- **Post-harvesting activities,** like keeping products cool and avoiding bruising or other damage.



Photo 3: Kiaat (*Pterocarpus angolensis*) (Credit: C. Mannheimer)

SUGGESTIONS FOR NAMIBIA

The following trees will do well under Namibian agroforestry conditions: Marula (*Sclerocarya birrea*), Kiaat (*Pterocarpus angolensis*), Wild olive (*Olea europea africana*), Ringwood tree (*Syzygium anisatum*), Mopane (*Colophospermum mopane*), African wattle (*Peltophorum africanum*), and Gray-leaved saucer berry (*Cordia sinensis*).

The Apple-ring acacia (*Faidherbia albida*) and the Camel thorn tree (*Acacia erioloba*) are important fodder trees. The Ana tree (*Faidherbia albida*) is one of the fastest growing indigenous trees and the leaves are highly digestible with more than twice the calcium content livestock require. The Manketti tree (*Schinziophyton rautanenii*) and White bauhinia (*Bauhinia acuminata*) yield good quality oils, while the Sugar plum (*Lagunaria patersoni*) and Mobola plum (*Parinari curatellifolia*) produce edible fruits.

Low density tree plantings are best suited for semi-arid conditions, which foster higher plant survival and reduce disease incidence.

Ooptera burchellii (or in Afrikaans the Beesboontjie) as well as the *Lablab purpureus* (commonly known as Lablab) are both legumes with high potential as fodder crops.

CONCLUSION

A large proportion of Namibia's population relies directly on subsistence farming, which is extremely dependent on rainfall and water resource storage.

Adoption of agroforestry practices in the country's subsistence farming systems can reap substantial benefits, both economically and environmentally, producing greater output. It therefore proves to be more sustainable than forestry or agricultural monocultures. Farmers can expect a wide range of benefits with major increase in production output per area. Though agroforestry schemes are seen as long-term investments, they can greatly improve the living condition of Namibia's local farmers and communities in the short to medium term.

GLOSSARY

Crop resilience:

The crop continues to provide a vital service, such as food production, even if challenged by severe drought or by a large reduction in rainfall.

Ecosystem:

A biological community of interacting organisms and their physical environment.

Forage:

Food such as grass or hay for horses and cattle; fodder.

Intervention:

The action or process of intervening.

Micro-climate:

The climate of a very small or restricted area, especially when this differs from the climate of the surrounding area.

Monoculture:

The cultivation of a single crop in a given area.

Precipitation:

Rain, snow, sleet, or hail that falls to or condenses on the ground.

Soil erosion:

The wearing away of a field's topsoil by the natural physical forces of water and wind.

Topography:

The arrangement of the natural and artificial physical features of an area.

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'Promoting Sustainable Forest Management in the Kavango-Zambezi-Region in Namibia'



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