SUSTAINABLE LAND USE

SLU10

FIRE-SMART AGRICULTURE

NATURE-DEMO

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ADDRESSED HAZARDS

PROTECTED CRITICAL INFRASTRUCTURE

Primary functions and key services

Fire-smart agriculture contributes to infrastructure resilience by:

- **Establishing fire breaks:** with crops and trees that are less flammable.
- **Reducing fuel loads:** strategic planting of fire-resistant vegetation minimises combustible material.
- **Soil and water conservation:** Enhances soil health and water retention through agroforestry techniques.

Infrastructure protection – Fire-smart agriculture protects these infrastructure types from wildfire damage:

- **Roads**
- **Electricity power lines**
- **Settlements**

Hazards mitigated by this NbS

Climatological hazards:

- Limited mitigation of wildfire risk by incorporating fire-resistant vegetation.
- Moderate mitigation of drought by improving water retention in agricultural landscapes.

Meteorological hazards:

- Moderate mitigation of wind erosion through tree and shrub barriers.

Hydrological hazards:

- Limited mitigation of surface runoff by enhancing soil retention capacity.
- Moderate mitigation of soil erosion by stabilising land with diversified vegetation cover.

Site suitability, scale and coverage

Fire-smart agriculture is applicable in:

- Agricultural landscapes prone to wildfires
- Forest landscapes prone to wildfires
- Peri-urban and rural areas with high fire risk
- Regions affected by drought and soil degradation

What is it?

Fire-smart agriculture is an integrated land management approach that combines agroforestry practices, sustainable farming techniques, and fire-resistant vegetation to reduce wildfire risks. By strategically managing fuel loads, utilising controlled burns, and incorporating fire-resistant plant species, fire-smart agriculture enhances ecosystem resilience while maintaining agricultural productivity. This approach includes techniques such as silvopasture (grazing livestock in tree-covered areas), rotational grazing to prevent excessive dry biomass accumulation, intercropping with fire-resistant species, mulching for soil moisture retention, contour ploughing to reduce fire spread, and establishing firebreaks with non-flammable crops or trees. Additionally, it supports soil and water conservation through terracing, cover cropping, and agroecological zoning to manage fire-prone landscapes effectively.

Wildfire.
Image Credit: [Pvproductions, Freepik], [n.d.. Free to use.

Challenges this NbS addresses

- **Wildfire -** reduction and containment (fire-resistant plants and vegetation buffers limit fire spread).
- **Drought –** Prevention and reduction (improves soil moisture retention and supports water conservation).
- **Erosion –** reduction (roots stabilise soil, reducing wind and water erosion)

Ecosystem services

- **Supports food security and local livelihoods:** enhances agricultural resilience and diversification.
- **Biodiversity conservation:** increases ecological diversity within agricultural systems by using diverse plant species that support pollinators, soil microbes, etc.
- **Improved soil health:** reduces land degradation and improves soil moisture retention.
- **Microclimate regulation:** provides cooling and moisture retention benefits.
- **Carbon Sequestration:** fire-resistant trees and shrubs increase CO_2 capture in biomass and soil while preventing additional emissions by reducing wildfire spread.

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Cost-benefit profile

Fire-smart agriculture integrates land-use strategies that reduce wildfire risks while maintaining agricultural productivity, offering both economic and environmental benefits (Sil et al., 2019). Compared to conventional land management, fire-smart landscapes require **lower wildfire suppression costs** by promoting fire-resistant and resilient environments (Lecina-diaz et al., 2023). They also **enhance ecosystem services**, including climate regulation, recreation, and soil protection, contributing to long-term economic sustainability.
When compared to high-nature-value farmlands (HNVf), which prioritise biodiversity and extensive agricultural practices, fire-smart agriculture provides a **balanced cost-benefit approach**, reducing wildfire-related losses while preserving agricultural and forestry outputs. While initial implementation may require investment in fire-adapted land-use practices, the long-term savings in fire damage mitigation and ecosystem restoration outweigh these costs. The effectiveness of fire-smart agriculture, however, depends on **regional land-use planning, stakeholder engagement, and ongoing adaptive management** to ensure resilience against future fire risks.
(Sil et al., 2019)

Environmental impacts
(EU taxonomy)

- ☑ **Climate change mitigation**
- ☑ **Climate change adaptation**
- ☐ **Sustainable use and protection of water and marine resources**
- ☑ **Transition to a circular economy**
- ☐ **Pollution prevention and control**
- ☑ **Protection and restoration of biodiversity and ecosystems.**

How a mixed-cropping system could be used to mitigate fire at a hypothetical farm on the Canterbury Plains.
Image Credit: [Curren et al.] [2023]. Creative Commons CC BY-SA.

Main components
(Lecina-Diaz et al., 2023; Leone et al., 2020; Sil et al., 2019)

- **Integration of Fire-Resistant Species:** use of tree and shrub species with low flammability and high moisture content, strategically placed among crops and grazing areas to reduce fire spread.
- **Vegetative Buffer Zones:** use of fire-resistant plants as natural barriers or "green firebreaks" around fields, roads, and urban edges, preventing wildfires from spreading into farmlands and settlements.
- **Mixed Land Use:** combination of tree crops, grasses, and shrubs with agricultural production, providing a multifunctional landscape that is productive yet less susceptible to wildfire.
- **Rotational grazing:** use in agroforestry systems to enhance soil stability and reduce fire-prone dry biomass
  Contour ploughing and terracing: application to reduce fire spread and improve water retention in fire-prone areas.
- **Agroecological zoning:** designating areas based on fire risk to optimise land use planning.
- **Prescribed burning:** controlled burns to manage excess dry vegetation safely and prevent large-scale wildfires.

Example of installation

- **FireSmart®-ForestWise: Managing Wildlife and Wildfire Risk in the Wildland/Urban Interface—a Canadian Case Study** (Westhaver et al., 2007).
- **Location:** Jasper National Park, Alberta, Canada
- **Implemented by:** Foothills Model Forest in conjunction with park managers
- **Description and results:** The project demonstrated that fuel reduction treatments can effectively lower wildfire risk while maintaining wildlife habitat and supporting ecosystem restoration. Using an adaptive management approach, the initiative developed practical, species-specific mitigation strategies that align with community wildfire protection standards and broader ecosystem management goals. The integration of selective thinning, prescribed burns, and habitat preservation techniques allowed for a balanced strategy that reduces fire hazards without compromising biodiversity. The study highlights the potential for fire-smart land management to simultaneously enhance ecological resilience and mitigate wildfire threats in wildland-urban interface areas.
  Reference: Vilicus Institute Case Study

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