Benefits of Agroforestry

In agroforestry, combinations of trees, crop and livestock are intentionally designed and managed as a whole unit. The biological and physical interaction between the crop and the livestock components are manipulated to enhance the agricultural production of the land base. Potential benefits from properly designed and managed agroforestry practices include:

Increased production and economic gain

Increasing Crop Yield

Crop yield increases in fields adjacent to shelterbelts have been reported in many studies. These increases occur because of improved microclimates and better snow (moisture) retention, reduced wind speeds and thus reduced wind erosion and damage to crops.

Studies from Saskatchewan, Manitoba, and North and South Dakota indicate that fields protected by mature shelterbelts develop an average yield increase of three and a half per cent for wheat and up to six and a half per cent for alfalfa. These figures include land taken out of production for shelterbelt planting and the competition of the shelterbelt with the crop, two factors which can partially offset gains in yield.

Generally, tall, long-lived trees planted in rows perpendicular to prevailing winds combined with narrow fields can be expected to provide the greatest yield increases.

Crops differ in their responsiveness to shelter. Winter wheat, barley, rye, alfalfa and hay are highly responsive to protection, while spring wheat, oats and corn respond to a lesser degree. By combining proper tree species selection, good shelterbelt maintenance and responsive crops, shelterbelts can be expected to improve yields and increase profits.

Livestock Benefits

Well planned shelterbelts can provide many benefits to livestock in both, winter and summer as well as screening noises, dust and odours that can be associated with livestock operations.

Shelterbelts planted within pastures, adjacent to winter feeding and calving areas and near feedlots protect livestock from wind chill in winter and provide shade in the summer. This protection lowers animal stress and increases feeding efficiencies.

Changes in temperature will produce irregular feeding patterns in livestock and cause them to be more susceptible to diseases and other heath problems. Producers believe that cattle

provided with protection spend more time eating and less time huddled up for warmth. Therefore, cattle can gain more weight per unit of feed.

Canadian researchers have determined that beef cattle on winter range, in unprotected sites, require 50 per cent more feed for regular activities. Beef, dairy, swine and poultry can all benefit from the protection of tree windbreaks. In the case of dairy cows protecting barns, feeding pens and milking parlour with trees can lead to increased milk production

Shelterbelts can screen unsightly areas from neighbours, roads, and living areas and filter dust from roads, livestock areas, and muffle noise from traffic and other machinery. Odours can be diffused by properly placed shelterbelts and some odours can be absorbed onto the trees within the shelterbelt.

It is important to protect shelterbelts from livestock grazing, rubbing and trampling of the soil in the root zone. Fencing shelterbelts and limiting access to treed areas will benefit the trees and your livestock over the long term.

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Energy Savings

A common problem the farmers face every winter is heat loss through conduction and infiltration. Conduction is the loss of heat through the walls and windows to the outside of a home, while infiltration is when cold air seeps into a building though cracks, doors and other openings. Also, shelterbelts reduce the amount of energy required to heat confinement buildings.

Shelterbelts are useful in that they reduce your home's winter heat loss by diminishing wind velocity and reduce the amount of energy required to heat confinement buildings.

Home Heating

Tests have illustrated the benefits of yard shelterbelts for reducing home heating costs. By comparing the heating costs from homes on protected and unprotected sites, researchers found that shelterbelts reduce fuel use by 18 to 25 per cent. These savings are a result of reduced wind speed, which lowers the rate of both conduction and infiltration.

How effective a shelterbelt is in lowering heat costs depends on the height of the trees and shelterbelt porosity, with the denser and taller shelterbelts being more effective. Dense shelterbelts are ones that have five rows: one row containing a shrub species, two containing deciduous tree species, and two rows of evergreens.

As time goes by, more uses and benefits of trees are being discovered. Heating costs and related greenhouse gas emissions are reduced in farmyards protected by shelterbelts.

Snow Control

Windblown snow creates problems for rural communities and landowners, livestock and wildlife. Snowdrifts block transportation routes and can cause safety concerns for travelers, and increase livestock and wildlife mortality.

Shelterbelts can reduce the cost of snow removal by managing snow distribution. Controlling blowing snow with trees and shrubs can prevent large drifts in the living and working areas of farmsteads, reducing the labour and cost of snow removal.

- Field shelterbelts can be designed to provide uniform snow distribution across a field and reduce the formation of deep snow drifts. Uniform snow cover can increase crop yields.
- Roadside shelterbelts trap blowing snow and reduce the occurrence of blizzard-like conditions, making for safer winter driving and significantly reducing the burden of road maintenance.
- Shelterbelts for dugouts can trap large amounts of snow. The resulting snowmelt helps fill dugouts.

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Soil conservation and improved soil quality

Field shelterbelts can be highly effective for preventing and controlling soil erosion by wind. Shelterbelt plantings on agricultural land to protect crops and soil, catch and distribute snow, and improve the micro-climate for crops growing in their shelter. A shelterbelt must be designed to perform its main function with optimum effectiveness.

Ideally, field shelterbelts consist of tall, long-lived trees which are not competitive with nearby crops and do not occupy too much land. The trees should be drought hardy, winter hardy, disease, insect herbicide tolerant and have a porosity of 30-50% during the erosion periods of the year (spring and fall). The growth habit and leafing characteristics of a tree, along with the tree spacing in the row, influence shelterbelt porosity. Trees are much less effective in reducing erosion in their leafless state than they are in the summer. They should be fully foliated during the times of the year when the potential for erosion is greatest. Excessive distance between trees in the row can also greatly reduce shelterbelt effectiveness.

Sequestration of atmospheric carbon

Trees are a valuable tool in the fight against climate change. Research has shown that trees are extremely useful in sequestering greenhouse gases.

A mature poplar tree sequesters 266 kilograms (kg) of carbon, green ash traps 63 kg; a white spruce tree will capture 143 kg; and, a caragana tree will sequester 39 kg. At the recommended spacing for shelterbelts, these values translate into 106 tonnes per kilometre (t/km) for poplar, 25 t/km for green ash, 41 t/km for white spruce, and 26 t/km for caragana.

These figures don't include the amount of carbon that will become sequestered in the trees roots, which may equal roughly 50 to 75 per cent of these amounts. These figures do not include the carbon stored in the roots, which may be equal to 50 to 75 per cent of the carbon stored above ground.

Other work has focused on the rates at which carbon is accumulated in tree and shrub species. Poplar trees grow quickly and accumulate carbon at a faster rate. Slower growing species,

such as spruce, accumulate carbon at a slower rate. However, slower growing trees live longer and therefore work as carbon sinks for longer periods of time.

This information allows experts to predict the carbon contents of future shelterbelt plantings.

Increased biodiversity

Historically landowners have planted trees around their farmyards to conserve energy, and across their fields to help conserve soil and water. Today, a growing number of landowners are making efforts to conserve another natural resource: wildlife.

Land settlement converted vast natural areas to cultivation, a practice that dramatically reduces wildlife habitat: a practice that continues today. The pace of this change has had tremendous impacts on wildlife. The ranges, migration patterns and breeding cycles of species worldwide are shifting. Species are threatened when habitat changes occur faster than the species' ability to adapt.

One option for reducing these losses is to plant trees. More trees are not only good for the landowner and the wildlife; they are good for the environment as well.

When designing a planting for wildlife, there are many elements which should be considered. The main elements of wildlife habitat are food, water, shelter and space. All wildlife species need these to live. When designing the planting it is very important that these needs are considered for the species that the habitat is designed for.

Availability of food and cover are critical in the winter months when the energy needs of wildlife are greatest. Trees and shrubs which retain their fruit above the snowline throughout the winter provide an important source of high quality winter food. Dense shrubs and trees such as conifers provide important thermal cover for wildlife by protecting them from cold temperatures.