Shelterbelts for Livestock Farms in Alberta

Overview

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Did you know that shelterbelts (trees and shrubs) planted around your livestock farm provide lots of benefits, including financial benefits? This publication series, Shelterbelts for Livestock Farms in Alberta, provides practical information about livestock farm shelterbelts in factsheets and a workbook.

This overview describes what livestock farm shelterbelts can do for you and answers some common questions about such shelterbelts.

Shelterbelts can serve multiple functions on a livestock farm.

1. What is a Shelterbelt?

A shelterbelt is a planned arrangement of trees and shrubs planted in rows. Shelterbelts vary based on the benefits they are intended to provide. For example, field shelterbelts are planted along the edges of crop fields to prevent soil erosion by wind, protect crops from wind damage, and trap snow to increase soil moisture. Farmstead shelterbelts are planted around farmsteads to protect buildings, people and animals from the cold effects of winter winds, conserve energy use on the farm, provide shade for animals in summer, improve feed conversion efficiency, control snowdrifts, etc. Farmstead shelterbelts can also be planted around livestock farms to help manage the impact of farm odour and other air emissions (e.g., dust) on people living or working in neighbouring areas.

A shelterbelt may have one or more rows of trees, shrubs, or trees and shrubs. If a shelterbelt is going to be used to manage odour and other air emissions off the farm, then a minimum of three, four, five or six rows of trees and shrubs is recommended, depending on the municipal zoning for neighbouring residences or other properties frequented by the public in the area around the farm. For example, if a neighbouring acreage is in an area zoned for agricultural purposes, then a shelterbelt with at least three rows is recommended. Alternatively, if the residences and other properties frequented by the public are in a town neighbouring the farm, then at least six rows are recommended. The reasons for using shelterbelts with more than two rows to manage odour and other air emissions from the farm are explained in Section 3.

2. Benefits of Shelterbelts to Livestock Farms

Once fully grown, livestock farm shelterbelts can provide several benefits, including (but not limited to):

- Protecting livestock from cold stress and airborne diseases. This can result in increased animal productivity and improved animal welfare.
- Reducing the impacts of odour, dust and other air emissions off the farm.
- Screening barns, feedlots and outdoor manure storage units from view.
- Reducing heating and cooling costs of livestock barns and other buildings on the farm.
- Improving the aesthetics and possibly increasing the real estate value of the farm.

Livestock farm shelterbelts can also be used to:

- Prevent snowdrifts on roadways.
- Trap snow to supply snowmelt runoff water to dugouts.
- Improve dugout water quality.
- Capture and store carbon to help manage climate change.

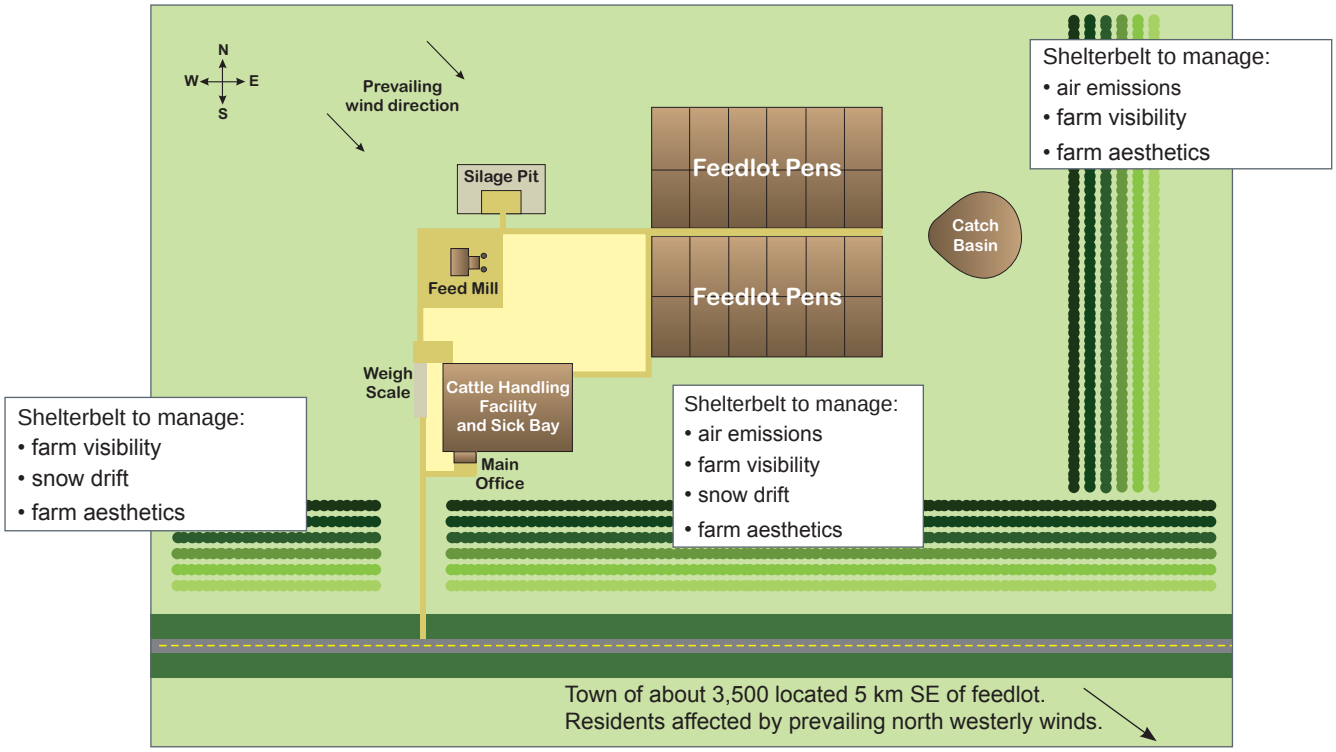

Figure 1. Three, multi-functional, 6-row shelterbelts sited east and south of a beef cattle feedlot.

3. Shelterbelts for Managing Odour and Air Emissions

Shelterbelts can be used to minimize complaints about odour, dust and other air emissions from your livestock farm, especially if these complaints are major concerns for you. Shelterbelts help manage odour and other air emissions by:

- Filtering the air: Tree and shrub leaves are able to filter dust particles from the air. When it rains, the precipitation washes the dust off the leaves. The leaves are also able to absorb odour and other gases emitted by livestock farms.
- Reducing wind speed: A shelterbelt can reduce wind speed or exhaust air speed from wall-mounted ventilation fans so that dust particles quickly settle out of the air close to the barn, rather than travel far off the farm.
- Screening livestock farms: Shelterbelts can screen livestock barns, manure storage units, silage pits and other facilities on the farm from view by the public. In keeping with the adage, "out of sight, out of mind", shelterbelts can help limit perceptions about odour and other air emissions associated with your farm.
- Mixing the air: A shelterbelt can force odour and other air emissions from a livestock farm high into the air where additional mixing and dilution with fresh air occurs. This is especially effective for making odour and dust less noticeable.

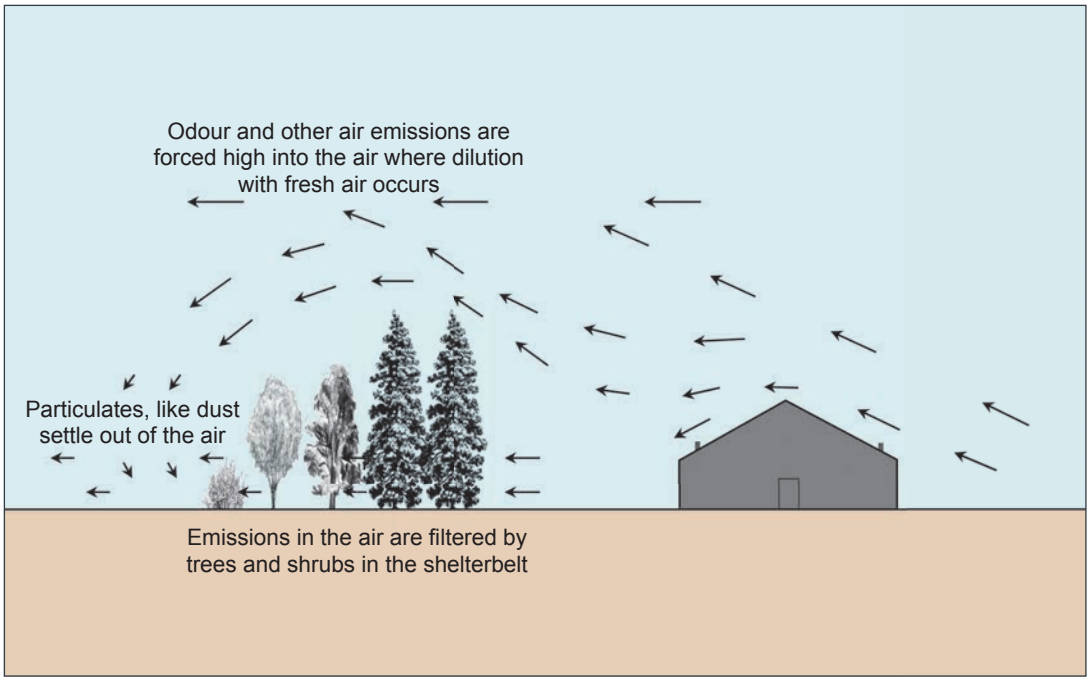

Figure 2. Effect of shelterbelts on wind flow patterns.

Figure 3. Dust filtered by a tree planted in front of a poultry barn's tunnel ventilation fans. Photo courtesy of Prof. John Tyndall, Iowa State University, Ames, IA, USA.

As mentioned earlier, a shelterbelt with a minimum of three, four, five or six rows of trees and shrubs is recommended for managing odour and other air emissions off the farm depending on the municipal zoning for neighbouring residences or other properties frequented by the public (see the table in Question 7 for the row recommendations). If fewer rows than the recommended minimum are used, then the shelterbelt may be too porous and not effective for managing the emissions.

3.1 Mechanically Ventilated Livestock Barns

Livestock farm shelterbelts can be planted alongside barns with wall or ceiling mounted ventilation fans. To be effective, these shelterbelts need to be planted at least 30 m (100 ft) downwind from the barns. In addition, they may have to be quite long (over 100 m or 330 ft), spanning not only the length or width of the barn, but the length or width of the manure storage unit and other facilities on the farm as well.

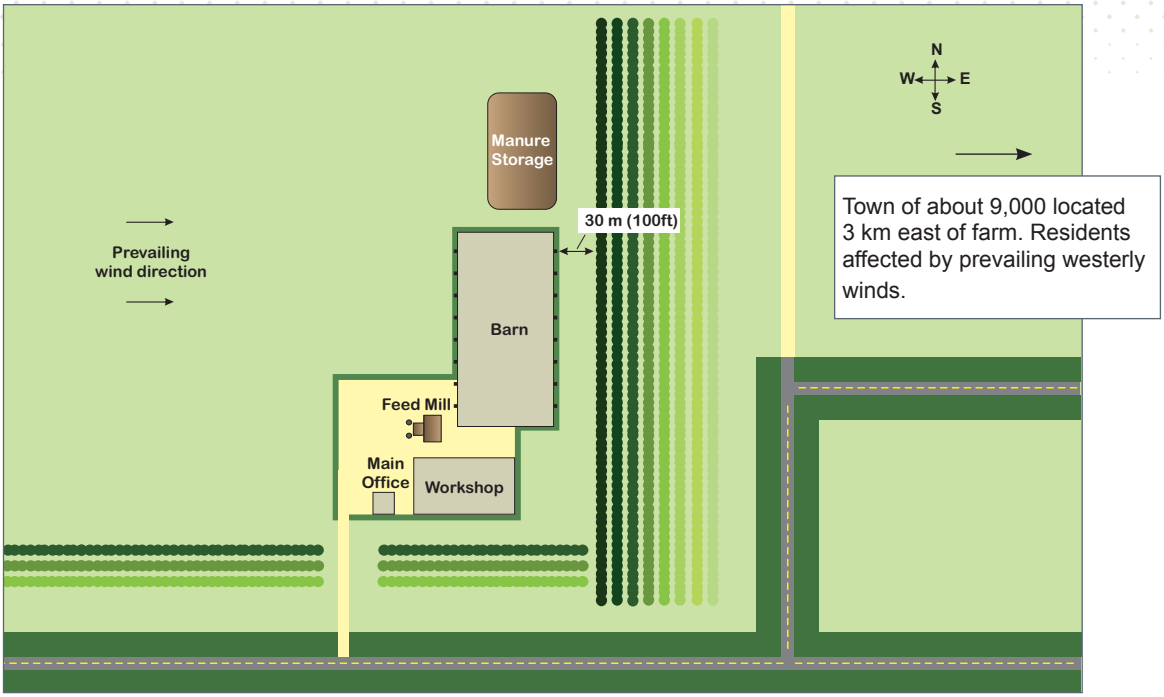

Figure 4. An 8-row and two 3-row shelterbelts located east and south of a livestock barn with wall-mounted ventilation fans.

3.2 Naturally Ventilated Livestock Barns

Where possible, a shelterbelt for a naturally ventilated livestock barn should not obstruct air flowing directly towards the air inlet walls of the barn. Rather, the shelterbelt should be arranged perpendicular to the air inlet walls and at least 30 m (100 ft) from the barn.

If a shelterbelt will obstruct air flowing directly towards the air inlet walls of the barn, then it may be best to limit the shelterbelt to the minimum number of rows recommended for the municipal zoning in the area around your farm. This is especially important if the farm depends on winds blowing from the direction of the shelterbelt for natural ventilation through the barn. In this case, the shelterbelt should be at least 150 m (500 ft) from the barn.

For example, a shelterbelt with a minimum of six rows is planted on the west side of a naturally ventilated barn because of a town of 7,500 residents on the west side of the farm. The shelterbelt is spaced 150 m (500 ft) from the barns to limit its obstruction to prevailing winds blowing towards the barn from the west, i.e., winds needed to cool the barns in summer. More spacing between the shelterbelt and the barn may be considered if space is available.

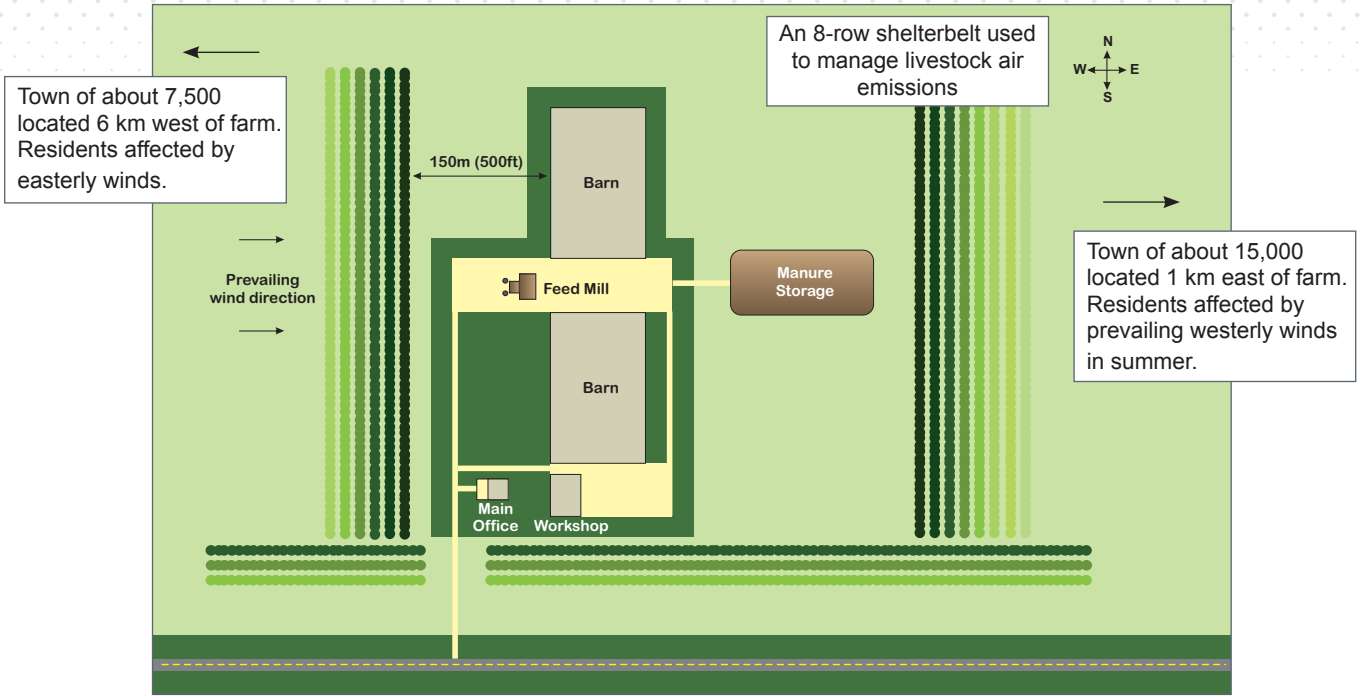

Figure 5. A 6-row shelterbelt sited west of two naturally ventilated livestock barns and an 8-row shelterbelt sited east of the barns. The smaller shelterbelt is sited west of the barns to limit obstruction to the prevailing westerly wind needed for cooling the barns in summer.

3.3 Feedlots

To control odour and other air emissions from beef cattle feedlots, plant shelterbelts between the feedlot and neighbouring residences or other properties frequented by the public. The shelterbelts should have a minimum of three, four, five or six rows of trees and shrubs depending on the municipal zoning of the neighbouring area. Each shelterbelt should be planted at least 30 m (100 ft) from the pens to limit obstruction to cooling summer breezes.

Shelterbelts can also be planted entirely around feedlots to help protect cattle from stress caused by cold winter winds. However, shelterbelts should not be used to control runoff from feedlot pens. Feedlot runoff can supply excessive amounts of nutrients to shelterbelts which will harm, or eventually lead to the death of trees and shrubs.

4. Limitations of Livestock Farm Shelterbelts

If odour and other air emissions are a significant concern, then each livestock farm should be evaluated to ensure that shelterbelts are the most suitable management option. Keep in mind that certain situations may warrant using shelterbelts in combination with other management practices to resolve concerns regarding odour and other air emissions.

Some limitations to bear in mind when deciding whether or not to plant a shelterbelt to manage odour and other air emissions include:

- Shelterbelts take a long time to fully develop and become functional and effective.
- They require careful planning, proper planting and dedicated maintenance, especially in the first few years after planting.
- A shelterbelt for managing livestock odour and other air emissions requires a minimum of three to six rows. Shelterbelts can take up land that could be used for other purposes.
- A shelterbelt intended to manage odour and other air emissions may create other issues for the farm such as, impeding movement of farm equipment, obstructing airflow, etc.
- Shelterbelts are not suited to controlling runoff from feedlot pens, barns or manure storage units because high nutrient levels in the runoff could harm or eventually kill the trees and shrubs.

5. Frequently Asked Questions

Q1: Can shelterbelts provide financial benefit to my farming business?

A: Yes. Shelterbelts can provide a direct financial benefit to your farm by reducing livestock barn heating costs in winter. They can also help reduce cold stress in winter or heat stress in summer in the animals, which can lead to improved livestock health and productivity, and ultimately provide an indirect financial benefit to the farm.

Q2: What steps should I follow if I decide to plant a shelterbelt on my farm?

A: Before you plant a shelterbelt, it is important to first create a plan that will help you manage costs and increase your chances of success.

Once your plan is complete, then prepare the soil where you will plant your shelterbelt, order tree and shrub seedlings, control weeds by using herbicides or mulch (plastic or organic), and then plant your seedlings at the correct depth.

For detailed planning, planting and maintenance information, click the following links: *Shelterbelts for Livestock Farms in Alberta: Planning, Planting and Maintenance (Agdex 400/92-2)* and the accompanying workbook *Shelterbelts for Livestock Farms in Alberta - Shelterbelt Planning Workbook (Agdex 400/92-3)*, or contact ARD publications (see contact information on back page) for printed copies.

Q3: What is the best location to plant a shelterbelt on my farm?

A: The best location for your shelterbelt will depend on what benefits you want your shelterbelt to provide. If your shelterbelt will be used to manage odour and other air emissions from your farm, then locate the shelterbelt between your livestock facilities and the properties you want to shield from these emissions. The shelterbelt should be at least 30 m (100 ft) from all livestock barns and feedlot pens, and 50 m (165 ft) from

manure storage units. Other minimum setback distances need to be considered if your shelterbelt is also intended to provide other benefits.

Q4: Do I need to obtain any permits before I plant my shelterbelt?

A: Yes. Contact your municipal office about any federal, provincial or municipal permits you may require and regulations you need to follow, for example, setback distances from municipal roads. Also contact Alberta One-Call online (*Click Before You Dig*) or toll free at 1-800-242-3447 about your intentions to plant a shelterbelt at the proposed location. Be aware of underground utilities or high-pressure gas lines in the area where you intend to plant your shelterbelt.

Q5: What are the minimum setback distances between my shelterbelt and on-farm roads or public roads?

A: The recommended minimum setback distance between your shelterbelt and on-farm roads is 30 m (100 ft). For provincial highways, the minimum setback is 60 m (200 ft) from the centerline of the road or 30 m (100 ft) from the right-of-way, whichever is greater. Contact your municipal office for setback distances for county roads.

Q6: Can I use my shelterbelt as a vegetative filter strip to control runoff from my barns, feedlot pens or manure storage units?

A: No. Runoff from barns, feedlot pens and manure storage units can contain high concentrations of nutrients that can damage your shelterbelt. Use other means to control runoff from your farm.

For runoff management options for livestock farms view the following publications (click the links) *Beneficial Management Practices: Environmental Manual for Livestock Producers in Alberta (Agdex 400/28-2)* or *Alberta Feedlot Management Guide*, or contact ARD publications.

Q7: How many rows of trees and shrubs should I plant to manage odour and other air emissions from my farm?

A: The recommended minimum number of rows in your shelterbelt will vary depending on municipal zoning for neighbouring residences or other properties frequented by the public in the area around the farm. The recommendations are listed in the table below.

Table: Minimum number of shelterbelt rows for different municipal land use zones

Category	Municipal Land Use Zone	Minimum Number of Rows
1	Agricultural purposes (e.g., farmstead, acreage residences, etc.)	3
2	Non-agricultural purposes (e.g., country residential, rural commercial businesses, etc.)	4
3	High-use recreational or commercial purposes	5
4	Large-scale country residential, rural hamlet, village, town or city	6

Q8: What types of trees and shrubs should I plant in my shelterbelt?

A: For help with selecting trees and shrubs most suitable for your shelterbelt: Contact an agroforestry specialist toll free through the Ag-Info Centre (see contact information on back page); click on the following link, *Shelterbelt Varieties for Alberta*; contact ARD Publications for a printed copy; or contact your local agricultural fieldman or your local tree nursery expert.

Q9: How long will it take before we start receiving full benefits from our shelterbelt?

A: This will depend on the types of tree and shrub species selected, and their unique characteristics such as growth rate, height and useful life. For example, under ideal conditions Acute Leaf Willow deciduous trees can reach their maximum height in four to eight years, but under less than ideal conditions they could take up to 30 years. Some species may grow faster but live longer or shorter than others, and so on. Therefore, plant a variety of trees and shrubs in your shelterbelt, taking advantage of the different characteristics of the various species. It is advisable to consult an agroforestry specialist to discuss your options before you proceed.

Q10: Can I plant mature trees and shrubs instead of seedlings to receive benefits from my shelterbelt sooner?

A: This is an expensive proposition. Shelterbelts for livestock farms can require thousands of trees and shrubs. Mature trees and shrubs typically cost several times more than seedlings and consume more resources for handling and planting. Therefore, the concern would be with the cost of purchasing and planting that many mature trees and shrubs.

Q11: What spacing is required between rows in the shelterbelt?

A: Spacing between rows depends on the types of trees and shrubs in each row. As a general rule, the minimum spacing between adjacent rows of shrubs and deciduous trees, adjacent rows of deciduous trees, or adjacent rows of coniferous trees, is 5 m (16 ft) in order to accommodate the width of maintenance equipment. The minimum spacing between adjacent rows of deciduous trees and coniferous trees is 6 m (20 ft).

Q12: What spacing is recommended between trees and shrubs within each row?

A: The spacing between trees and shrubs within rows varies depending on the types of trees and shrubs. For more information, contact an agroforestry specialist at the Ag-Info Centre.

Q13: Where can I get tree and shrub seedlings for my shelterbelt?

A: You can consult your local county agricultural office about where to obtain tree and shrub seedlings for your shelterbelt, contact commercial tree nurseries, or grow your own trees or shrubs from cuttings.

Q14: What is the best time of year to plant tree and shrub seedlings?

A: The best time to plant tree and shrub seedlings is in spring.

Q15: How do I plant my tree and shrub seedlings, and to what depth in the soil?

A: Tree or shrub seedlings may be planted by hand or mechanically depending on your selection of trees and shrubs, size of your shelterbelt, soil type and available labour. Plant your seedlings carefully to the same depth as at the tree nursery. Remember that the seedlings are highly perishable and their roots are fragile. Keep the roots cool and moist, and plant the seedlings as soon as possible after delivery. Avoid unnatural j-shaped bends in the roots when planting.

Q16: How often do I need to water the trees and shrubs?

A: Trees and shrubs need to be watered immediately after planting, frequently within the first two years after planting, and during periods of hot, dry weather.

Q17: Should I mulch my shelterbelt?

A: Mulching your tree and shrub seedlings soon after planting is recommended to help conserve soil moisture and control weeds.

Q18: Should I fertilize my shelterbelt?

A: Shelterbelt trees and shrubs do not need fertilizer. Their extensive, deep rooting systems enable them reach the nutrients they require to grow and develop.

Q19: How can I control weeds in my shelterbelt?

A: You can control weeds in your shelterbelt by mowing, cultivation or herbicide application.

Q20: Should I regularly prune my shelterbelt trees and shrubs?

A: Not necessarily. For safety reasons, only prune trees and shrubs that have broken and low hanging branches. Prune the affected trees and shrubs in late winter or early spring.

Q21: Some trees and shrubs in my shelterbelt are getting old and dying. What should I do?

A: Dead trees and shrubs should be replaced in spring of the following year. Consult an agroforestry specialist at the Ag-Info Centre for more information about replacing dead trees and shrubs.

Publications in this Series

Shelterbelts for Livestock Farms in Alberta: Overview (Agdex 400/092-1)

Shelterbelts for Livestock Farms in Alberta: Planning, Planting and Maintenance (Agdex 400/092-2)

Shelterbelts for Livestock Farms in Alberta: Shelterbelt Planning Workbook (Agdex 400/092-3)

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Contact Information

ARD Publications
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