Weather or Not

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## Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Why Grow Winter Wheat</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Planning</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Variety Selection</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Seeding</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Fertility</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>Pest Management</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td>Spring Assessment</td>
<td>21</td>
</tr>
<tr>
<td>8</td>
<td>Marketing</td>
<td>23</td>
</tr>
</tbody>
</table>

### 1 Why Grow Winter Wheat
- Top Reasons to Grow Winter Wheat 4

### 2 Planning
- Crop Rotation and Planning for Stubble 5
- Harvesting the Stubble Crop 5
- Logistical Planning 6
- Seeding Opportunities 6
- Spring Stand Assessment 6
- Key Points for Planning for Profit 7
- Winter Wheat and Canola 7
  - Seeding Canola with Winter Wheat in Mind 7

### 3 Variety Selection
- Winter Hardiness 8
- Disease Resistance 8
- Yield Potential 9
- Lodging Resistance 9

### 4 Seeding
- Winter Wheat Stage Timing 10
- General Seeding 11
  - Seed Early 11
  - Seed Shallow 12
  - Seed Slowly 12
  - Seed Heavy 13
  - Use a Seed Treatment 13
- Seeding Into Standing Stubble 13
- Seeding Into Chemfallow 14

### 5 Fertility
- The Importance of Soil Sampling and Testing 15
- Nitrogen Fertility 16
  - The 4Rs of Nutrient Stewardship 16
  - Fall-Applied N Options 16
  - Spring-Applied N Options 17
  - Split Applications 17
- Other Fertility 17

### 6 Pest Management
- Diseases 18
  - Wheat Streak Mosaic Virus 18
  - Fusarium Head Blight 19
  - Ruts 19
  - Leaf Spotting Disease 19
- Weeds 20
  - Pre-Seeding Weed Control 20
  - Fall In-Crop Weed Control 20
  - Spring In-Crop Weed Control 20
  - Chemical Control of Bromes 20

### 7 Spring Assessment
- Winter Hardiness Factors 21
- Assessing Winter Wheat Survival 22
- Plant Populations 22
- If You Choose to Reseed... 22

### 8 Marketing
- Milling 23
- Feed 24
- Ethanol 24
Winter wheat is often overlooked by many farmers because of the extra time it can take, the risk due to winter weather, and various other factors, many of which are misconceptions. But there are many reasons why including a winter wheat crop in a rotation can be beneficial.

**winter wheat yielded**

21%

higher than CWRS wheat over the past 3 years in the Canadian Prairie Provinces.

Top Reasons to Grow Winter Wheat

1. High yield potential means increased returns per acre as compared to other cereal crops
2. Avoids seeding problems on late, wet springs; earlier harvest than spring wheat
3. Increased timeliness and profitability of the entire rotation
4. Increases the effectiveness and efficiency of crop protection products
5. Helps manage herbicide resistance
6. Uses early spring moisture in dry areas more efficiently than spring cereals
7. Provides soil cover during the fall and winter, reducing the potential for soil loss due to water and wind
8. Spring moisture is not lost from seeding operation
9. Yields range between 15 to 40 per cent higher than Canadian Western Red Spring wheat
10. Matures earlier than spring cereals, spreading out harvest operations and reducing the potential for grade losses due to early frost
11. Provides an ecological tool to help manage common annual pests in wheat such as most grassy weeds, orange blossom wheat midge, and wheat stem sawfly
12. Less disturbance to wildlife, especially waterfowl and upland game birds

On average in Western Canada in 2013, winter wheat produced a return on investment of $144.53 per acre compared to spring wheat’s $70.47 per acre.

Source: http://www.agcanada.com/grainews/2013/08/02/growing-winter-wheat-for-profit/
Planning for profit is important with all crops. Winter wheat, due to the unique timing of field operations, requires special attention to maximize opportunity to produce profitable results. Experienced winter wheat growers plan ahead to consistently achieve successful results from their crop.

Crop Rotation and Planning for Stubble

Planning begins when spring crop decisions are being made, as the spring crop’s seeding date will have a strong influence on availability of stubble for fall planting. Have stubble available for the September 1 to 15 ideal seeding window is step one towards a successful winter wheat crop.

Canola is the most popular stubble crop for winter wheat. It offers good weed sanitation, an early harvest, and adequate stubble, all of which are critical to successful winter wheat production. Winter wheat must be direct seeded so that the stubble can trap snow, insulating the crop from harsh winter conditions.

Long-time growers typically have a contingency plan to ensure available stubble. Barley, or forage stubble are good alternatives as they can be seeded later and still provide stubble as they are early maturing crops.

Harvesting the Stubble Crop

Best results are obtained when winter wheat is direct seeded into standing stubble. Harvest operations should be conducted to leave the tallest stubble possible. Straw and chaff should be spread in a wide swath to avoid seeder plugging, emergence problems, and nutrient immobilization. Harrowing prior to seeding is not recommended as it breaks down stubble. Experienced growers also avoid excessive traffic on the field when harvesting to limit compaction and damaging stubble in high traffic areas, such as field edges and approaches.

The snow trapping potential index (STP) can be used to identify if sufficient stubble exists to trap snow. An ideal STP prior to seeding is 40 or greater, to result in a post-seeding STP of 20 or greater.

\[
STP = \frac{\text{stubble height (cm)} \times \text{standing stems per m}^2}{100}
\]
Finding the time to seed winter wheat during the fall harvest can be a challenge for new growers. Experienced growers find there are enough breaks in harvest to seed without abandoning the combine. Damp mornings or down-time due to rain make for perfect seeding opportunities. After the initial year of growing winter wheat, growers find that the subsequent harvests are more spread out, easing the pressure of seeding the following winter wheat crop.

**Seeding Opportunities**

Finding the time to seed winter wheat during the fall harvest can be a challenge for new growers. Experienced growers find there are enough breaks in harvest to seed without abandoning the combine. Damp mornings or down-time due to rain make for perfect seeding opportunities. After the initial year of growing winter wheat, growers find that the subsequent harvests are more spread out, easing the pressure of seeding the following winter wheat crop.

**Spring Stand Assessment**

Stand assessment should not be conducted until spring seeding is almost complete i.e. around May 20 to 25. This gives winter wheat time to regrow while still allowing time to reseed, if necessary. Brown plants are not necessarily indicative of a dead plant as leaves and roots can die off over winter. Winter wheat regrows from the crown, so dig up plants on a warm day and inspect the crown tissue. White colour and new white root growth is a positive sign of plant survival. The optimum plant density for winter wheat is over 20 plants per square foot. Research shows that stands with 8 plants per square foot can still yield almost 50 bushels per acre if managed appropriately. This is likely due to winter wheat’s tremendous ability to tiller.
Key Points When Planning for Profit

- Have the first fields seeded in spring be the crops to precede winter wheat
- Choose early maturing varieties for the spring crop
- Direct seed into standing stubble
- Be aware of post-seeding STP
- Book seed and fertilizer early and have it on-farm
- Have equipment serviced and ready to seed
- Seed during the optimal window for your area
- Capitalize on opportunities to seed during harvest delays
- Don’t wait for rain
- Wait to assess winter wheat until all spring seeding is complete
- Look for new root growth and healthy crown tissue
- Experienced winter wheat growers manage the crop intensively to maximize profit

Winter Wheat and Canola

Winter wheat and canola are a winning combination when it comes to crop rotations and profitability, with the added benefit of protection and enhancement of wildlife habitats and broader benefits such as clean water and air.

Stats Canada data indicates winter wheat and canola are two crops increasing in acreage and, more importantly, in yield. Average yields for canola are up 16 per cent this decade compared to the 1990s while winter wheat yields are up 33 per cent over the same period. These crops are important components for sustainable rotations.

Alberta Agriculture, Food and Rural Development research and crop insurance data indicate that wheat yields increase 10 to 20 per cent after canola in direct seeding systems.

Canola is the ideal crop for seeding winter wheat after because the stubble provides the “optimum crown protection during the winter months.”

“Canola stubble tends to be tall, strong and plentiful, all three qualities which contribute to ideal snow trapping conditions throughout the winter” says Autumn Barnes agronomist with the Canola Council of Canada.

Jake Davidson, the executive director of Winter Cereals Canada, agrees that canola is an ideal stubble for seeding winter wheat. “It is very strong stubble; it can take a beating and still stand up well, and it is dense compared to other stubble so it catches snow best.”

Winter wheat and canola together in a cropping system also offer producers an excellent opportunity to avoid the development of, or manage herbicide resistant weeds. Winter wheat generally does not require grassy weed control and several canola production systems use “non-traditional” herbicides.

Including an oilseed crop previous to winter wheat especially helps with suppressing downy brome, the most troubling weed for winter wheat. It also helps protect winter wheat from disease due to canola being a low-residue crop being planted before a high-residue crop, breaking the disease cycle.

Winter wheat also provides improved soil retention for following canola crops, preventing erosion and protecting valuable soil resources.

Seeding Canola with Winter Wheat in Mind

Canola should be seeded early in the spring and/or seeded with an early maturing variety. Stubble should be available for winter wheat to be planted September 1.
Growing Winter Wheat
Variety Selection

Winter wheat varieties are available with good adaptation to all production areas in Western Canada. When selecting a variety that is best suited for your farming operation, important traits to consider include: winter hardiness, disease resistance, yield potential, market opportunities, and lodging resistance.

Winter Hardiness

The winter hardiness ratings of most winter wheat varieties registered in Western Canada are good to excellent. Producers who farm in areas of the Prairies outside the Chinook belt should be particularly vigilant in selecting a variety with good winter hardiness. Also if recommended seeding practices are compromised, such as late seeding or seeding into inadequate stubble, the winter hardiness of a variety can become a critical trait in that crop’s success. Properly managed winter wheat on the Canadian Prairies has similar winter survival to winter wheat in Kansas, the largest winter wheat growing state in the United States.

Disease Resistance

Resistance to diseases common to your area and/or farming practices is another important consideration when deciding on a winter wheat variety. If you are in an area that commonly struggles with rusts, there are varieties that provide resistance to stem, stripe, and leaf rust. If wheat streak mosaic virus is a concern due to past occurrence or tight wheat rotations, there are other varieties available with resistance to the wheat curl mite, the vector of this disease. Producers in areas where Fusarium Head Blight (FHB) is an issue should also be aware that, although winter wheat can avoid this disease in many years, there are varieties that offer genetic resistance.
In high-moisture areas, including irrigation, lodging resistance can be a major issue. There are varieties available for areas concerned with straw length, lodging, and plant height.

Yield Potential

Yield potential of each variety is influenced by management practices and growing regions of Western Canada. Each of the Prairie Provinces publishes variety guides comparing yields and other traits according to soil climatic zones. These guides are useful resources and should be referred to before purchasing your winter wheat variety. The University of Saskatchewan has also created a variety selection tool based primarily on yield potential.

Discussions with experienced local winter wheat producers and/or our Western Winter Wheat Initiative agronomists can provide good insight into which varieties may be best suited to your location.

Lodging Resistance

In high-moisture areas, including irrigation, lodging resistance can be a major issue. There are varieties available for areas concerned with straw length, lodging, and plant height.
Growing Winter Wheat

Seeding

There are many critical factors that set the stage for a successful winter wheat crop, making seeding a critical time. Follow the guidelines in General Seeding to get your winter wheat off to a good start.

It is also possible to consider seeding into chemfallow if you have a year with excessive moisture and think seeding in the spring might be a challenge. See Seeding Into Chemfallow on pages 17 and 18 for more details.

Winter Wheat Stage Timing

<table>
<thead>
<tr>
<th>Stage</th>
<th>Date of Germination</th>
<th>Yield Factor</th>
<th>Competition Factor</th>
<th>Winter Survival FSI</th>
<th>Rust Risk</th>
<th>Maturity (Days Later)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Leaf + Tiller</td>
<td>September 5</td>
<td>100%</td>
<td>1</td>
<td>514</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1 - 2 Leaf</td>
<td>September 15</td>
<td>90 to 100%</td>
<td>2</td>
<td>510</td>
<td>2</td>
<td>+4</td>
</tr>
<tr>
<td>Sprouted (Not yet through ground)</td>
<td>October 1</td>
<td>80 to 100%</td>
<td>4</td>
<td>476</td>
<td>4</td>
<td>+8</td>
</tr>
<tr>
<td>Not Germinated</td>
<td>October 15</td>
<td>60 to 100%</td>
<td>5</td>
<td>499</td>
<td>5</td>
<td>+10</td>
</tr>
</tbody>
</table>

Source:

Stage Timing

Winter wheat is seeded in late August or early September into a shallow seedbed to allow the plant to access enough water to germinate quickly and grow for four to five weeks. The next four to eight weeks (October to November) allow the plant to vernalize (giving the plant the signal to flower next spring) and acclimate to the cold (harden off for the winter). Ideally, this plant would be three to four leaf, have a tiller or two with developed crown tissue and would be ready to achieve winter wheat’s maximum yield potential next spring.

In extremely dry conditions, establishment can look quite different. Seeds could be anywhere from lying in dry dirt not germinated, to sprouted and not quite through the ground, to emerged crop in the one to three leaf stage in wet areas around sloughs or in low spots. In these delayed germination situations, vernalization may occur under cool spring conditions. The stage of crop development in the fall influences not only winter survival and yield potential but also crop competitiveness, maturity, and the risk of infection with diseases such as rust and fusarium head blight. The table below gives the best idea of what to expect from variable crop stages.

Please be aware that later-germinating winter wheat still has the potential to achieve high yield and profitability but management becomes more critical as the crop is often not as competitive.
General Seeding

The most critical factors that set the stage for a successful winter wheat crop are to:

- Seed early
- Seed heavy
- Seed shallow
- Seed slowly
- Use a seed treatment

Seed Early

Seeding early is the most important thing a grower can do to produce a vigorous plant with improved chances of winter survival. Plants that enter winter with greater than three leaves usually have well-developed crowns. The crown is the area at the base of the shoot from which the plant regrows in the spring.

Seeding too early, however, could promote excessive growth by winter, which can increase the risk for winter injury. Larger plants may also be at risk of snow mould. Despite these risks, seeding early is preferable to seeding too late.

The optimal seeding window across most of the Prairies is between September 1 and 15. If the crop is to be used for fall grazing it should be seeded by mid August. Seeding past the optimal date is ok and many growers still produce profitable yields.

The exceptions to this rule include:

- The Peace Region of Alberta where ideal seeding dates are earlier than the rest of the Prairies due to cooler fall temperatures. Producers in this area should aim to seed around August 25-31.
- The Chinook belt where seeding can be postponed because of long falls and milder winters. Producers in this area can seed into late September.

Producers should not wait for moisture prior to seeding. Winter wheat needs very little moisture to germinate. Under dry conditions, seeding into dry soil and waiting for rain to germinate the crop has been a far more successful strategy than delaying seeding until after rainfall. Research has demonstrated that postponement of seeding until after the middle of September can result in a five to ten per cent yield penalty for each week delayed.

There are many factors involved in deciding when to plant your winter wheat. Contact the agronomist for your area to discuss what is right for you.
Seed Shallow

Soil moisture in most stubble fields in the fall has been depleted, leaving a very dry seedbed for winter wheat. Under these conditions, seeding shallow (1/2 to 1 inch) allows the seed to take advantage of moisture provided by fall rains. Research has shown that as little as 1/3 inch of rain is often enough to successfully establish winter wheat that was seeded shallow. Conversely, deep seeding delays emergence and often results in a spindly plant that is more susceptible to winterkill. Research has consistently shown that shallow seeding is much more successful than deep seeding.

It is also important to ensure that the seed is well packed in soil when planted for adequate seed to soil contact. This helps to keep the much needed fall moisture for germination.

Seed Slowly

Just like canola, winter wheat performs better if seeded at speeds closer to 4 mph than 6 mph.
Seed Heavy

Seed size can vary can between different and similar varieties of the same crop from field to field and year to year depending on many factors such as growing conditions, soil conditions and integrated pest management practices. Because of this variation in seed size, the number of plants in a pound or a bushel of seed is also highly variable.

The proper way to calculate seeding rate is determined using target plants per square foot in conjunction with 1000 kernel weight (TKW) and seedling survival rate. Higher seeding rates create a denser, more uniform stand and are especially important in high moisture areas and are critical to winter survival, crop competitiveness, and yield potential. Ideal target plant stand for winter wheat is 30-35 plants per square foot.

To calculate seeding rate:
- Seeding rate (lb/ac) = target plant population/ft² X TKW (g)/seedling survival rate (0.75) / 10
  - TKW in grams is used as the average number of seeds per pound varies
  - Seedling survival rate of 0.75 is used to take into account germination and emergence rate (similar to spring crops) plus the impact of winter survival, as some plants invariable do not survive harsh winter conditions.

Use a Seed Treatment

Based on seed quality, crop rotation, and weather conditions determine whether you are at a high risk for seedling disease development. If so, use a fungicide/insecticide seed treatment to minimize the effects of the disease. Recent research conducted by the AAFC indicated that use of a fungicide/insecticide seed treatment increases the chance of seed survival and spring plant vigour in winter wheat.

Seeding Into Standing Stubble

Direct seeding into standing stubble is important for winter wheat production. Standing stubble helps to trap snow that insulates crown tissue from cold winter temperatures. Snow cover ensures the soil temperature at the crown (1/2 to 1 inch deep) stays well above killing temperatures, even with air temperatures at -40 degrees Celsius. Optimally for winter survival, stubble needs to hold four inches or more of snow. This amount of snow will prevent soil temperatures from dropping to lethal temperature.

Snow trapped in the stubble not only reduces the risk of winterkill but also improves soil moisture reserves in the spring.

Tall, dense stubble provides optimal snow trapping capability. Canola, barley, oat, flax, or the stubble of a forage crop all consistently provide this type of stubble. Wheat stubble also provides tall dense stubble but is not recommended due to the potential risk for wheat streak mosaic virus. This disease may develop from a “green bridge” created when a previous cereal crop and the emerging winter crop are too close together, allowing the movement and survival of the disease vectoring mites. At least seven to 10 days between the dry-down of spring cereal crops and the emergence of winter wheat is necessary to prevent problems with the disease, as the wheat curl mite needs a live cereal plant for a host at all times. Radiant is currently the only winter wheat variety resistant to the wheat curl mite. Crops that do not provide tall dense stubble such as field pea and lentil are not recommended. However, many winter wheat growers seed into these stubbles with an increased risk of winterkill.

Harvest management of the previous crop including cutting height and straw/chaff spreading also plays a role. Producers should strive to minimize stubble disturbance during harvest and subsequent seeding operations.
Many growers across the Prairies are facing challenging circumstances. Due to wet spring and summer conditions in some areas millions of acres have gone unseeded on the Prairies. These acres not only pose a problem by reducing income and increasing field management expenses, but could also be a further challenge to seeding the following year.

However, there is a solution: seed winter wheat into chemfallow. Having a crop growing in the fall helps reduce excess moisture, and also eliminates the potential challenges of seeding in those wet fields the following year.

As seeding winter wheat into chemfallow requires different planning than seeding into other stubble, use this checklist to help you plan, prepare and seed successfully.

√ Minimize Stubble Disturbance

Stubble is necessary to trap snow and insulate your winter wheat crop from winterkill. Year old stubble will break apart much easier than freshly harvested stubble.

- If conducting multiple spraying operations, try to stay in the same tracks to minimize tire stubble knock-down
- Let weeds bolt before spraying. Tall weed carcasses trap snow effectively
- Use wide equipment (spraying and seeding) to minimize tire stubble knock-down
- Use narrow openers when seeding
- Avoid harrowing and cultivating if possible

√ Line Up Your Seed Early

Make sure you contact your local seed supplier early, so you are not scrambling for seed at the last minute.

√ Decide on a Seed Treatment

Based on seed quality, crop rotation, and weather conditions determine whether you are at a high risk for seedling disease development. If so, use a fungicide/insecticide seed treatment to minimize the effects of the disease. Recent research has shown that use of a fungicide/insecticide seed treatment increases the chance of seed survival and spring plant vigour in winter wheat.

√ Line Up Your Starter Fertilizer

P, K, S, and micronutrient fertilizers should be managed similarly to a spring wheat crop. Manage these appropriately to have a well-established winter wheat crop in the fall.

√ Decide on a Nitrogen Management Plan

Due to its high yield potential, winter wheat has a high N requirement. High soil moisture in the fall can lead to excessive spring losses if N is applied at seeding time. Conversely, it may be too wet in the spring to apply N in a timely fashion to meet the crop needs. Split applications and/or use of specialty nitrogen products may reduce risk of loss and best-fit situations where there is a lot of moisture.

√ Seed Into Weed-Free Conditions

Eliminate perennial, biennial, and winter annual weeds as best as you can before establishing your winter wheat crop. Chemical control options are preferred over tillage to minimize stubble loss. Destroying green cereal growth prior to seeding is especially important to reduce the “green bridge” that can transmit wheat streak mosaic virus.
Growing Winter Wheat

In Western Canada, winter wheat is a high-yielding, profitable crop, and it is good practice to match your fertility rates with your yield goals. Managing the health of winter wheat is important for its success, and fertility is a key player in crop health. Here are some guidelines for winter wheat fertility management.

The Importance of Soil Sampling and Testing

Every area is different when it comes to soil types and nutrient contents in soil. Soil sampling and testing can show you the plant available nutrients and other soil chemical factors important for winter wheat production.

Nutrient levels in soil also vary from year to year, so it is important to perform soil sampling and testing prior to planting any new crop. It is important for farmers to follow certain recommended steps for soil sampling and testing to develop a fertility management program.

To ensure accurate results, standards must be set for performing soil sampling and testing. Here are some guidelines set out by Alberta Agriculture, Food and Rural Development:

- Begin by evaluating each field to determine representative areas
- Major areas within fields that have distinctly different soil properties, such as texture, should be sampled and fertilized as separate fields because of the potential for different nutrient requirements
- Samples should be taken at 0.6, 6 to 12, and 12 to 24 inch depths from 15 to 20 locations within each field
- Each depth should be bulked into composite samples, air dried, and sent to a reputable soil testing lab
Nitrogen Fertility

Nitrogen (N) fertility is an important consideration in winter wheat production, and can be one of the most challenging factors for producers planning winter wheat. The 4R Nutrient Stewardship approach: Right Source @ Right Rate, Right Time, Right Place can be helpful in assessing the merits of various nutrient management options. By adopting the 4R Nutrient Stewardship approach producers maximize the productive capacity within their operation without adversely affecting the other pillars of sustainability; environment and social.

The 4Rs of Nutrient Stewardship

Selecting the right source will help ensure your soil has a balanced supply of essential plant nutrients. Performing annual soil tests and applying nutrients to meet crop requirements will assist in deciding on the right rate. Applying nutrients at the right time will ensure nutrient uptake when the demand is high. Lastly, the right place helps minimize the risk of loss while increasing the availability of nutrients to the crop.

The 4Rs of Nutrient Stewardship is a site-specific, integrated approach that considers source, rate, time, and place decisions for the cropping system. These decisions work towards the economic, social, and environmental sustainability goals for the farm.

To learn more about 4R practices and programs in Canada, visit Farming4RFuture.ca.

Fall-Applied N Options

There are several advantages of applying N at planting time. Typically, the price of N is more cost-effective in the fall than in the spring of the following year. If the nitrogen requirements of the crop can be applied at the time of seeding, the additional time and expense of a second pass over the field can be eliminated. Also, it ensures that there are nutrients available to the crop early in the spring, a critical time in establishing yield potential. Spring applications can get delayed due to poor weather or adverse field conditions, thus limiting the roots’ access to available N.

In a study done by Alberta Agriculture, Food and Rural Development, it was discovered that when planting winter wheat in stubble fields low in soil N, the additional N fertilizer that was applied improved stand establishment and overwintering ability and did not reduce winter hardiness, plant populations, or yield. In this same study it was determined that N applied at the time of seeding was generally as effective and often more effective than spring broadcasting.

Possible disadvantages of N applications at seeding time are risk of seedling damage and risk of significant N losses. If placing N in the seedrow, safe rates of up to 30 lbs/ac can be applied, but may vary with moisture conditions, soil type, type of opener, and row width. Seedling damage can largely be overcome with openers, which place fertilizer away from the seedrow. If warm and moist soil conditions persist for a long period following seeding, risk of N losses due to denitrification or leaching can be substantial. Slow release N products can create more options for producers wishing to place higher rates of N with the seed and can also decrease the risk of these N losses.

Another disadvantage is with potential soil moisture loss. If banding N prior to conventional seeding, you could lose soil moisture and cause a lumpy, rougher seedbed resulting in poor seed-soil contact, which can in turn result in reductions in germination, emergence, and plant populations.

Topdressing in late fall has also attracted the attention of some growers. With the cooler temperatures that the Prairies typically experience in late fall, N losses are usually minimal. Applying urea to cold (temperatures below 10°C approximately), but not frozen soils is the primary way to minimize losses. Precipitation, either as rain or wet snow, is always needed to move surface-applied urea into soil so it does not volatilize. On warm soils having temperatures above 15 degrees C, it is essential that precipitation occur within a day or two of application to minimize losses. On cold soils, the critical window for rain or snow is a little wider at five to seven days after application. To minimize N losses, spread urea fertilizer when rain or snow is in the forecast or when the chances are good for substantial showers soon after application.
Spring Applied N Options

The key to a successful spring broadcast N application is to apply early when soil conditions are still cool. A healthy winter wheat crop will resume growth early in the spring. Cereal crops use 70 per cent of their N by late tillering, and late applications of N will hinder the plant’s ability to convert this into yield. As a rule of thumb, spring N applications should be made as soon as it is dry enough to operate equipment without making too many ruts. Some growers will even apply very early when they can still travel on the frost; however, it is not a good idea to apply N on frozen soils.

Liquid UAN (28-0-0) and ammonium sulfate (including sulfur fines) are less susceptible to volatilization losses then urea (46-0-0), but under ideal conditions, spring topdressing can occur on cool soils and/or just before a significant precipitation event. Under these circumstances, any of these products will perform equally well. However, if warm and humid conditions persist for a period of time, some N losses will likely occur. To minimize volatilization losses associated with these products, the use of commercial urease inhibitors, such as Agrotain, can be considered. The amount of trash on the soil surface may affect liquid N efficiency by immobilizing applied N.

Split Applications

Some producers prefer to split their N fertilizer application between the fall and the spring. The value of this option depends on how practical it is for individual growers. For example, this may be a good fit for producers who do not have side or mid-row banding capabilities but want to make sure their crop has enough N to make it through the first few weeks of growth in the spring before they can get out and topdress the balance. In the spring, the producer can then apply the remaining N requirement based on soil moisture and crop conditions. This helps manage nutrient losses in wet soil conditions.

Winter Wheat nitrogen management is different than spring wheat; therefore, when considering how to adopt the 4Rs into your farm operation, it may involve different choices than a spring sown crop. For example, choosing the right source/lowest risk product (i.e. a urease inhibitor) based on best management practices may help reduce risks associated with broadcasting if this is the best choice to achieve the desired nutrients to the crop at the right time and right rate.

Regardless of the option chosen to apply N, there is one component that is critical. Be certain to use adequate rates. Winter wheat yields up to 40 per cent more than CWRS wheat and therefore requires more nitrogen. Using a soil test and the assistance of a local agronomist to determine proper rates is advised.

Other Fertility

Nutrients and micronutrients (not just nitrogen), specifically phosphorus (P), potassium (K), and sulfur (S), are required in similar fashions and levels as spring-seeded wheat varieties. Manage these appropriately and you will have a well-established winter wheat crop in the fall.

It is important to pay particular attention to phosphate applications. In addition to a potentially good yield response, adequate seed-placed phosphate will aid in the establishment of a healthy winter wheat crop in the fall and increase winter hardiness. The general recommendation is to apply 20-25 lbs/ac of actual phosphate with the seed. Not unlike other cereals, maintenance amounts of nutrients such as sulfur, potassium, and copper are required.
Winter wheat is ecologically different from other crops due to the overwintering dormancy stage that kills off many diseases and weeds, therefore, winter wheat isn’t prone to much disease or weed interference. But there are a few specific things to look out for to try and manage in the early stages.

### Diseases

#### Wheat Streak Mosaic Virus

Wheat is the only cereal that is seriously affected by Wheat Streak Mosaic Virus (WSMV). It causes wheat plants stunted growth and lower seed production.

WSMV is transmitted by the wheat curl mite and by leaf rubbing. Mites can be blown from field to field by the wind and can overwinter on winter wheat. Its development depends on the population of mites, virus-infected wheat plants, and sufficient moisture for good plant growth and rapid mite reproduction. A severe outbreak can occur when there is an abundance of mites in a spring wheat field and a field of winter wheat is planted early next to the existing infected spring wheat field.

Winter wheat will rarely show symptoms of WSMV until spring. Symptoms become more pronounced when temperatures rise above 10 degrees Celcius in the spring. Dashes, streaks, and yellow stripes will appear on leaves parallel to the veins and will become increasingly mottled until the leaves die. Infected plants have stunted growth from the time the infection took place. If the infection took place during the early tillering stage the plant will stop growing and produce few to no heads. If the plant gets infected in the late tillering to early jointing stages there can be head formation, but the flowers may be sterile. With a late-season infection flowers can be fertile, but kernels will be reduced in size. Fall-infected plants will not produce grain the following spring.

WSMV can be controlled by preventing transmission by eliminating the “green bridge.” The green bridge is when a maturing spring crop is close enough in proximity to allow the transfer and survival of viruliferous mites. The green bridge can be eradicated with a seven to 10 day break between the drydown of the spring wheat crop and the emergence of the winter wheat crop.
Fusarium Head Blight

A Fusarium Head Blight (FHB) infection can be a problem and cause downgrading in winter wheat. Early flowering is the best way to try and escape the prime FHB infection period, so plan on seeding early in September if you are concerned about this disease. It is also a good practice to avoid irrigation at flowering to reduce the risk of FHB.

Rusts

Leaf Rust

Leaf rust is a common disease in winter wheat mainly in Saskatchewan and Manitoba. With round lesions largely confined to the leaves, they should be easy to spot; however, they are much smaller than those of stem rust. Each pustule develops orange-red unrediniospores and as the plant matures the pustules will darken.

Spores can overwinter on straw and germinate in the spring. In Western Canada, leaf rust infections are usually observed in June and will peak in August. Resistant cultivars are available and folicur fungicides are effective in treating leaf rust. Spraying is recommended if the threshold is met in three of five spots sampled in the field.

Stem Rust

Stem rust, like leaf rust, is also more common in Saskatchewan and Manitoba, but instead of pustules forming on the leaves, you will see them on the stem, and they will have a darker, brick red colour. As the plant matures, pustules will darken to a black colour.

Spores can be seen in southern Manitoba and Saskatchewan in mid to late July. The severity of the disease will depend on weather conditions, time of arrival, and growth stage of crops, and it will rarely overwinter. Resistant cultivars are available and folicur fungicides are effective in treating stem rust at the very early stage of disease development.

Stripe Rust

Stripe rust is a disease more common to Alberta that can defoliate and shrivel kernels. With this disease you will see elongated yellow pustules that develop on leaves and extend lengthwise on the leaf. This disease will affect juvenile and adult leaves as well as the kernels.

Stripe rust can overwinter in a mild winter. It is best to scout for stripe rust from emergence in fall to 35 to 45 days before harvest. Resistant cultivars are available and folicur fungicides are effective in treating stripe rust.

Leaf Spotting Disease

Leaf spotting diseases can be caused by one or a combination of leaf spotting pathogens causing tan spot on leaves and potentially infecting wheat kernels causing red or pink smudge and black point. Severely infected kernels can result in significant down grading of seed quality.

Managing leaf spotting diseases starts with the seed: try and ensure you are planting disease-free kernels. Proper tillage, crop rotation practices, and fungicides are also management practices for leaf spotting diseases.
Weeds

Weed control in winter wheat is aided by the crop’s fall-growth habit, vigorous spring growth, and early maturity. This benefit not only is of value in the year winter wheat is grown, but is also an important tool for maximizing the effectiveness of other crop protection products in other crop years. For example, avoiding a graminicide during the winter wheat year can help avoid or manage the development of herbicide resistance.

By incorporating winter wheat and these weed management practices into your rotation, you can be certain that not only your winter wheat, but also all subsequent crops in your rotation will reap the rewards of having lower weed pressure.

In situations where winter wheat is less competitive, such as late seeding in fall or winter injury, more intensive wheat management may be needed to achieve maximum yields.

Pre-Seeding Weed Control

Winter wheat is no different than other crops in its need to have a competition-free establishment period. Controlling weeds prior to seeding is a particularly effective time for that second step in control of biennial, perennial, and winter annual weeds, especially downy brome. Glyphosate products provide the most effective control in this window for weed control.

Pre-seeding herbicide applications also control early emerging volunteer plants. Control of volunteer seedling is particularly important when seeding into wheat stubble. Pre-seed glyphosate one to two weeks prior to seeding will break the “green bridge,” preventing wheat streak mosaic virus from carrying over to the winter wheat crop. Some growers tank mix residual broadleaf chemistry with their glyphosate to extend the weed control into winter wheat emergence and establishment. Early emerging weeds are generally some of the most competitive weeds a crop has to face. Removing early weed competition helps develop a well-established winter wheat crop, which will have a better ability to survive the winter.

Fall In-Crop Weed Control

Controlling winter annual weeds is the next important step in successful winter wheat production. Common winter annual weeds include stinkweed, shepherd’s purse, and flixweed. Due to their habit of emerging in the fall and resuming growth early in the spring, winter annuals can be very competitive and difficult to control in the spring. This makes fall control a very practical and cost effective approach to controlling winter annuals if sufficient densities are present. Herbicide applications should target actively growing plants that are able to metabolize the product quickly. According to Brian Beres of Agriculture and Agri-Food Canada, “Fall 2,4-D when used in the form and rate specified above is very effective in the control of winter annuals and I prefer it to any spring phenoxy applications as it’s very hard to apply in spring before the plant stage is too advanced.”

Spring In-Crop Weed Control

Considerations for spring in-crop weed control in winter wheat are generally very similar to any other cereal crop. In-crop applications in spring generally occur at times that coincide with pre-seeding glyphosate applications and seeding operations. Waiting until spring seeding is complete to spray winter wheat often results in poor weed control due to weeds becoming too large. The early growth habit of winter wheat also leads to increased crop canopy cover and potential crop injury due to the herbicide being applied beyond the safe application stage.

Chemical Control of Bromes

Grassy winter annual weeds such as Japanese brome and downy brome can be particularly difficult problems for winter wheat. Japanese brome can be controlled with a fall or spring application of pyroxsulam herbicide. Initial studies indicate that flucarbazone and new chemistries flumioxazin and pyroxasulfone also have good promise for Japanese brome control, but these are not registered for use on winter wheat at this time.

Downy brome is a more difficult winter annual weed to control. Pyroxsulam is registered for control of downy brome in fall applications and suppression for spring applications. As with Japanese brome, new chemistries flumioxazin and pyroxasulfone also show good promise for downy brome control, but are not registered for use on winter wheat at this time.
After a long dormant winter it is important to assess your winter wheat crop in the spring when the snow has melted, the weather has become warmer, and your crop will begin to grow again. There are many things to look at when assessing your winter wheat in the spring. Here are the things you should look for:

**Winter Hardiness Factors**

**What was the plant stage before freezing?**

It is important that your plant has a developed crown (three leaf and a tiller) before going into winter. A plant at this stage has maximum reserves and will be able to resume growth in the spring. Optimal seeding date and depth are important in seeing this stage before winter.

**What was the snow cover over the winter?**

It is important that your winter wheat crop be covered in four inches of snow (light and fluffy snow is best) for the coldest part of the winter (December 22 to March 20) to buffer from extremely low air temperatures.

**Phosphate Fertility**

This is an important nutrient in creating winter hardiness for winter wheat. It also helps in spring recovery of damaged plants.
Assessing Winter Wheat Survival

By removing a few of your winter wheat plants on a warm day, you can easily assess your winter survival. Keep the crowns on a moist paper towel exposed to light in a warm room for a few hours, maybe a day. If the crown tissue is damaged it will turn brown. If the tissue is not damaged it will stay white and begin to produce roots in a few days. Assessment should be made of the “worst-case” areas, where fertility may have been poor, snow cover was lost in cold temperatures, and/or plants did not develop the crown before winter. If the plants have survived in the worst-case areas the rest of the plants in the crop that did obtain these things should be fine.

Winter survival cannot be determined by leaf colour in the field. A brown leaf may not mean the plant is dead and a green leaf may not mean the plant is alive. Winter wheat plants need time to recover, so it is important to scout the crop as late as possible. When the plant has grown new roots, then new leaves will form; this will be aided by cool damp weather. If there is hot dry weather in the spring it can cause cracking and drying of the soil, which will be detrimental to the plants. Winter wheat crops should be assessed between May 15 and 25.

Plant Populations

Don’t be alarmed by a thin stand in your winter wheat. Due to its excellent ability to tiller, winter wheat can be thin but still produce an excellent crop. Because winterkill often occurs in patches it can be difficult to assess plant population, so this shouldn’t be a reason to reseed. The optimum plant stand is 20-30 plants per square foot; however, 10-15 plants per square foot can still produce a profitable crop.

If You Choose to Reseed...

Some agronomic factors must be considered if reseeding after a winterkilled winter wheat crop. Reseeding to another wheat could cause an infestation of the Wheat Streak Mosaic Virus, so that should be avoided. Also, broadleaf crops (pulse, flax, canola) should not be seeded on land that was treated with 2,4-D in the fall or early spring. Remember to credit fall fertilizer.
Marketing flexibility is just one of the many benefits winter wheat provides to growers. Winter wheat offers the potential for early movement, timely cash flow during harvest, and more efficient use of storage. Producers can make better marketing decisions by knowing what markets are available plus the standards and marketing details associated with each market option.

Winter wheat has three market options: milling, feed, and ethanol.

In 2011 it was recorded that Canadian Western Red Winter Wheat exhibited excellent milling quality suitable for French-style breads, certain types of noodles, flat breads, and steamed breads.

**CWRW FLOUR QUALITY:**

- **Protein content**: 9.7%
- **Wet gluten content**: 24.7%
- **Loaf volume**: 780 cm³ / 100g


**Milling**

CWRW is utilized as a blending flour in North America, in pan breads and throughout the world in applications that not require gluten strength. It competes directly with CPS in Canada and HRW out of the U.S. Winter wheat is known for its white flour colour and high flour yield.

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Feed

Local feed marketing options may provide superior returns due to early availability. There are a number of buyers including local feed mills, hog operations, and feedlots.

Standards for feed wheat are generally less comprehensive than for milling wheat and vary by purchaser. Growers should check with specific buyers with regard to their requirements. CWRW and General Purpose varieties may all be accepted by the feed and ethanol markets.

Four main quality factors are considered by feed wheat purchasers:

**Vomitoxin**

Winter wheat is a low risk to Fusarium (producer of vomitoxin) as its early growth habit allows it to avoid the disease most years. Application of a fungicide registered for Fusarium Head Blight at early heading is an option in years when the risk of disease development is high. Tolerances for vomitoxin range from zero to one ppm depending on the buyer and the end use.

**Protein**

Requirements vary from no minimum to a minimum of 11.0 per cent. For CWRW varieties, protein under 11.0 per cent is an indicator that the crop may not have had enough nitrogen to achieve maximum yield.

**Test Weight**

Requirements are variable, but most buyers have minimum requirements of 58 to 60 lbs/bushel.

**Moisture**

Winter wheat is dry at 14.5 per cent moisture. Requirements vary, as some buyers stipulate grain must be dry while others accept grain to a maximum of 15.5 per cent moisture.

Ethanol

Winter wheat fits well into ethanol production due to its high starch content. Starch is the source of sugars used to create ethanol. For this reason, purchasers are mainly interested in low protein and high starch content.

Some of the grain specifics for ethanol are:

- Weight: 58 lbs/bu minimum
- Moisture: dry, maximum 15 per cent
- Sprouting: 10-15 per cent maximum

As with the feed market, producers should contact the buyer for more specifics.
References


why grow winter wheat?

winter wheat 2X ROI than spring wheat

On average in Western Canada in 2013, winter wheat produced a return on investment of $144.53 per acre compared to spring wheat’s $70.47 per acre.

see the proof at growwinterwheat.ca
and grow winter wheat...why wouldn’t you?

Western Winter Wheat Initiative

Source: Statistics Canada CANSIM Table 001-0017
http://www5.statcan.gc.ca/cansim/a26/lang-eng&retdLang=eng&id=0010017&tabMode=dataTable&srchLn=-1&p1=-1&p2=9
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