THE CODE OF PRACTICE FOR AGRICULTURAL ENVIRONMENTAL MANAGEMENT (AEM CODE)

This e-Book outlines the specific requirements of the AEM Code and how the Agrilyze platform can help BC consultants and farmers.

agrilyze™

Chapters:

ABOUT AGRILYZE

Agrilyze is BC's first data analytics portal for precision agriculture. Developed by the i-Open Group of Companies, Agrilyze helps consultants and farmers with land use management, compliance, traceability, sustainability, and more. With a strong focus on agritech and the supply chain, Agrilyze uses subscription-based imagery to visualize information received from different sources, allowing consultants and farmers to work more effectively, increase profits, optimize productivity and improve efficiency in day-to-day operations.

Our suite of smart applications can help you:

- Better understand and analyze the soil test results from your fields
- Combine your farm's data with expert geospatial technology
- Meet farm safety standards and agricultural best practices
- Understand your farms, fields & crops better with precise mapping
- Track weather, tasks, and contacts all from your device
- Analyze and build actionable data from financial information and spreadsheets
- Track fields and farm activities to understand ongoing changes
- View printable maps and graphs documenting your farm's overview

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We are data-driven – Data enables you to reveal new opportunities in the field. By doing so, you can generate more revenue, predict future trends, optimize your current operational efforts, and, most importantly – produce actionable insights that matter to your business.

We empower you – Agrilyze allows your hardware and software to communicate seamlessly on one platform, so you won't have to spend late nights planning your next moves. Our tools will help you to be more precise in your decision-making, and you will be able to operate at higher efficiency and with optimum accuracy.

For a better planet – Agrilyze can help to reduce your environmental footprint and impact on natural ecosystems. We know no one is closer to the earth than farmers, so it is vital to manage the way we care for the land, water, and natural resources.

For everyone – We work with farmers, government authorities & educational institutes to drive change in the farming industry. Farm automation technology addresses significant issues like a rising global population, farm labour shortages, and changing consumer preferences. Plant one seed that will change the world, embrace technology, and the knowledge that comes with it!

THE CODE OF PRACTICE FOR AGRICULTURAL ENVIRONMENTAL MANAGEMENT (AEM CODE)

CHAPTER 1 - INTRODUCTION

Environmental challenges may be keeping agricultural operations from achieving full potential in their respective industries. However, through good stewardship and the use of best management practices, farmers can improve the health of animals and crops and increase farm profits. To get started, farmers should evaluate their farm and adopt practices suited to it so that they can protect their investments and the environment.

In February 2019, a new regulation called the Code of Practice for Agricultural Environmental Management came into effect, impacting all agricultural operations across BC from smallholdings to large commercial enterprises. Based on the code, regardless of your agricultural operation's size or type, a basic level of protection must be adhered to. There are additional measures for operations that are in high-risk areas or who are operating during high-risk conditions.

EXAMPLES OF HIGH-RISK AREAS

- Where precipitation levels are 600mm or more between October 1 – April 30
- Over vulnerable aquifers where groundwater is susceptible to pollution or contamination from the land
- Phosphorus-affected areas of land that drain into surface water bodies that may be affected by high levels of phosphorus

> ***"Based on the code, regardless of your agricultural operation's size or type, a basic level of protection must be adhered to."***

Taking care of the land is an all-encompassing idea, an unwritten agreement between farmers and the vast resources that facilitate their role as nurturers of the earth. This relationship determines a farm's success; by improving farming productivity and increasing efficiency, a farmer's job can become more profitable.

However, to promote sustainability in the long run, farmers must adapt and build new skills, knowledge and technical competence to make better decisions that will help them manage their operations more effectively.

The Code of Practice for Agricultural Environmental Management is a set of rules created to clarify how the industry can better protect the environment, specifically our drinking water, watercourses, and air.

As farming is continually changing, the AEM Code can help to identify problem areas and ways to manage environmental challenges with detailed guidelines that farmers can easily apply. A systems-oriented approach can help address the problematic issues associated with the complexity of food and other production systems in different ecologies and locations.

We can take time to consider some basic farming practices that contribute toward the betterment of our planet. We will get into the specific requirements of the Code of Practice for Agricultural Environmental Management further into the series, but for now, let's quickly visit the ideas of conservation, preservation and moderation.

Conservation refers to using fewer resources to have less impact on the land. One example of this is collecting water runoff, which helps to stop pollutants from reaching water sources.

With **preservation**, the goal is to keep things as natural as possible while also improving land quality. One example is to protect natural areas so that wildlife can populate the area and increase their diversity.

Then, we can practice **moderation** when it comes to the application of pesticides or fertilizer. These products can harm the environment, so it is crucial to develop new methods to decrease their impact on our land.

There's more to it; this is just a start. For now, it is essential to consider –

A farmer's land is full of opportunity – The intimate relationship farmers have with nature can be viewed as an opportunity to balance interacting elements (water, plants, soil, and animals), protect resources and produce healthy, sellable and good-tasting food.

We are clear on the fact that agriculture sustains us – As farmers, it defines who we are, what we do and why we do it. Rather than disrupting our vital ecosystems' natural balance, we must find ways to increase our knowledge around critical factors like soil systems and water resources.

By understanding, evaluating and managing the benefits of conservation, preservation and moderation, as well as implementing the Code of Practice for Agricultural Environmental Management, we can boost yields, improve sustainability and increase growth and competitiveness in the agriculture market.

Provincial inspectors are being deployed to check in on farmers and may visit on-site to validate if the agricultural site is adhering to the rules. To be best prepared for a visit, ensure that your agricultural operation meets the AEM Code and that you are keeping records for at least five years.

Here are some of the general rules of the Code of Practice for Agricultural Environmental Management:

- Make sure there is no direct discharge entering into watercourses or groundwater
- Prevent contaminated runoff, leachate, solids or air contaminants from crossing property boundaries or entering watercourses and groundwater
- Follow minimum setbacks from drinking water sources, watercourses and property boundaries
- Avoid over-application of nitrogen so that agronomic nitrogen application rates are meeting your crop needs

By acting now, we are helping farming communities around BC by providing resourceful solutions to farming operations impacting production, livelihood and our ecological footprint.

CHAPTER 2 - AGRICULTURAL BOILERS & HEATERS

If you are using these systems in a greenhouse or tree seedling nursery, bear in mind that units with a higher than 0.15 MW capacity must be registered under the Code of Practice for Agricultural Environmental Management. If the capacity is less than that, it does not need to be registered; however, it must still meet a design standard, as stated in the AEM Code.

Opacity Tests

Based on the AEM Code, all boilers and heaters must be tested visually for opacity 60 minutes after the boiler or heater is started and before shutdown procedures begin.

Particulate Matter Tests

If your boiler or heater has an output greater than 1.0 MW or increased capacity by 25%, it must be tested. To determine boiler output capacity, check the nameplate or request this information from the boiler manufacturer.

PAIN POINTS

Farmers are looking for ways to ensure that their boilers and heaters are operating with lower environmental impacts and better temperature control. Some other benefits they are looking for are safety and durability.

Taking greenhouses as an example, growers would like to produce healthy, high-quality plants in a consistent environment. Greenhouse heating allows growers to control their growing environment.

Boilers and heaters deliver heat directly to plants and can provide the following advantages:

- Controlled growing environment
- Extended growing season
- Increased yields
- Accelerated rooting and plant growth
- Reduced disease and improved plant quality
- Up to 40% fuel efficiency savings over conventional forced-air heating
- Flexibility to heat by zone, plus soil and plant temperature control

Based on the type of greenhouse or crop, the equipment being used, and even the geographical location, farmers should perform a precise and complete analysis of the heating equipment requirements to better protect the environment.

The adverse effects of combustion on the environment – particularly greenhouse gas (GHG) emissions released to the atmosphere contributing to global warming – have received much attention in recent years.

Managing combustion processes and improving energy generation efficiency and use are two of the critical strategies for reducing atmospheric emissions. By ensuring you are following the Code of Practice for Agricultural Environmental Management, you can design your heating system to achieve optimal performance for your crop's growth while also optimizing your energy consumption and protecting the environment.

HOW AGRILYZE CAN HELP

1 - Monitoring sensors and tracking data over time

Track temperature in greenhouses to optimize heating or monitor output from the equipment itself to ensure it is running efficiently. By monitoring temperature and humidity fluctuations online, you can detect problems early, and in real-time mode.

2 - Notifications when sensors go out of range

Receive a notification if the temperature drops too low. A wireless temperature alarm is indispensable if you want to keep a healthy greenhouse—track problems such as power outages, temperature fluctuations, water damage, and intrusion.

3 - Aggregate and correlate data

Pull in data from different sources (weather, indoor temperature, historical usage). Agrilyze provides farmers with an understanding of what to expect and how to build budgets for equipment and use.

4 - Data management and tracking

Put all the data in a system, track, analyze and audit it. For example, obtain gas usage for September, October and November in previous years and the overall costs of acquiring that gas.

It is important to note that technology is not the only contributing factor impacting energy efficiency and performance optimization. Human beings contribute as well, if not more so. From a humanistic perspective, our habits, behaviours, attitudes and most crucially actions can be critical to making strides in protecting investments and the environment.

Like a feedback loop (for more on feedback loops, check out this article), technology can be interpreted as the interaction between humans and systems. The application of technologies (or systems like the Code of Practice for Agricultural Environmental Management) can amplify your farming output, resulting in growth on many levels, not just for your agricultural operation, but your personal development as a farmer, grower, or rancher.

When we input positivity (better habits, behaviours, attitudes, actions), we can increase our knowledge and understanding. This allows us to better leverage and analyze all of the information around us, which can produce local benefits to our business and the environment.

Through the tools and technologies that Agrilyze offers, you can build new skill sets and the technical competence to make smarter decisions that will help you manage your operation more effectively.

Going back to our feedback loop, it works like this:

A produces more of **B** which in turn produces more of **A**

Input Positivity produces more **Results** which in turn produces more **Input Positivity**

By applying this mentality combined with the need to conserve energy, we should continuously aim to:

- Understand patterns in energy usage, then use the appropriate tools to measure and analyze the patterns
- Make better choices about the equipment we choose to use so that we can meet standards to meet regulations such as the AEM Code
- Decide on the most appropriate energy source or provider to better manage and decrease costs
- Consider if your operation has specific requirements around heating that need to be addressed now or in the future

CHAPTER 3 - AGRICULTURAL COMPOSTING

Only specific types of materials can be composted. Also, where composting takes place and how it is distributed and used is managed by the Code of Practice for Agricultural Environmental Management.

In composting, agricultural by-products like manure, vegetative material, solid animal bedding, wood residue, processing waste, and mortalities are combined and managed using a system that decomposes the by-products in an environment rich with oxygen. If you are storing any of these by-products, you are not composting—proper composting consists of actively managing the process.

Composting is the biological decomposition of organic materials by microorganisms under controlled, aerobic conditions to a relatively stable humus-like material called compost. Traditionally, some farmers allow manure to pile up and it decomposes until they are ready to use it.

As a general rule, collect and contain leachate, ensure rain or stormwater runoff does not enter any piles, and prevent contaminants from entering watercourses, leaving your property boundary, or going below the water table. Also, ensure that all wildlife cannot access your composting area or piles that are outside.

PAIN POINTS

Farmers must choose their composting site carefully to reduce the potential for environmental impact and respect neighbouring land uses. Airborne emissions and water management are the primary risk factors for composting, so farmers need to address off-site and on-site water runoffs.

Another primary pain point and a cause of friction with neighbours are composting odours—these need to be carefully managed when using odourous materials. Even well-maintained piles can result in foul odour or ammonia emissions.

Some materials can attract birds, rodents and insects, so strategies need to be devised to reduce vector attraction and, as always, to alleviate impacts to neighbouring land uses. Noise and traffic may also be a concern, so it is essential to work with your neighbours to reduce problems.

Here are some advantages vs disadvantages that could impact the way farmers approach agricultural composting:

Advantages

- Reduce/eliminate pathogens
- Reduce volume and moisture content
- Reduces viable weed seeds
- Reduces insect larvae (fly problems)
- Reduce odour
- Stabilize organic components and nutrients
- Produce a soil amendment/fertilizer

Disadvantages

- Pathogen control requires high temperatures and proper aeration
- Often requires additional bulking material (carbon)
- Long processing time
- Poorly run processes achieve very little
- Land required for composting and storage areas
- May require a significant investment
- Requires more labour

The Importance of Monitoring and Record-Keeping

To make good compost, farmers must monitor and respond to changes as they occur. By keeping good records, farmers can improve compost quality and keep track of when compost was turned and the compost's conditions at specific times.

The temperature must also be closely monitored as some standard operating procedures require a daily temperature recording during the active phase.

When inserting a thermometer into the centre of a pile, it should have a one metre or three-foot stem with a 0-80 °C temperature range. The thermometer should be inserted in several locations while taking note of moisture conditions and the presence of odours. Any bad smells may be an indication of anaerobic activity or minimal presence of oxygen. The smell of ammonia may indicate high nitrogen content, indicating a need for more carbon material.

HOW AGRILYZE CAN HELP

Through the tools and technologies that Agrilyze offers, farmers can build new skill sets and the technical competence to make smarter decisions that will help them manage agricultural composting more effectively.

1 - Understand where property boundaries, watercourses and aquifers are in relation to where composting is taking place (Map My Farm)

2 - Have quick and easy access to relevant documentation related to composting, soil, water (linked legislative documents, best practices guides)

3 - Upload your own best practices documents; add photos, forms etc.

4 - Create specific tasks to track actions to provide audit-ready data (task management)

5 - Measure outputs with sensors (temp/moisture – IoT devices)

6 - Track nutrients in compost and understand where to apply it to (soil testing)

7 - Analyze detailed information over time (analytics)

8 - Access nutrient management calculator (how to do it)

CHAPTER 4 - LIVESTOCK & POULTRY AREAS

There are specific requirements for confined areas around livestock & poultry, feedlots, seasonal feeding, grazing, and temporary holding areas.

A confined area is simply a space contained by structures (i.e., fences) or the land. The following rules must be met under the Code of Practice for Agricultural Environmental Management:

- Ensure livestock or poultry can access clean drinking water or a watercourse
- Properly manage accumulating manure, bedding or feed in the space to prevent contamination
- Collect and contain any contaminated by-products so that they cannot leave the area
- Ensure contaminated by-products cannot enter a watercourse, groundwater or someone else's property
- Make sure your livestock and poultry are set up in an area that meets the minimum setbacks

For seasonal feeding, grazing, and temporary holding areas, the following rules must be met:

- Reduce trampling and erosion of soil close to the watercourse

- Ensure contaminated runoff, manure, and solids do not enter the watercourse
- Don't place livestock in areas that are prone to flooding or already flooded
- On-ground feeding locations and mobile bins should not be in areas that are prone to flooding or already flooded
- Distribute feeding locations and bins evenly in the area to prevent manure from accumulating
- Make sure on-ground feeding locations and mobile bins meet the minimum setbacks
- Ensure that your livestock and poultry are not held in a temporary space for more than 72 hours

"Numerous physical, biological, and socioeconomic factors interact to influence animal agriculture in any region."

PAIN POINTS

Numerous physical, biological, and socioeconomic factors interact to influence animal agriculture in any region. To carefully raise livestock and poultry, various factors must be considered. From investing in a suitable shelter to installing appropriate fencing, farmers must pay special attention to daily chores as these actions contribute toward meeting the rules outlined above. Some examples of daily tasks that must be attended to:

- Cleaning out manure
- Collecting eggs
- Veterinary bills
- Measures to deter predators
- Logistical issues of slaughtering

Let's review a few other areas of concern when it comes to keeping livestock and poultry.

Animal Health

The best things you can do to reduce disease risk is to keep your animals clean, comfortable and adequately fed and watered. By no surprise, most animals need regular health care ranging from deworming to vaccinations to hoof trimming. By following the Code of Practice for Agricultural Environmental Management, you can ensure your livestock and poultry are happy and healthy.

Biosecurity

Some animal diseases can be passed to humans and other animals, so it is crucial to minimize the risks by following well thought out biosecurity and health management practices. Biosecurity can be described as any implementation of actions that can reduce chances for introducing and spreading infectious agents that can cause animal disease.

Take, for example, poultry growers. Because poultry flocks' size and location are typically concentrated in today's commercial production operation, the risk of disease as associated with this type of production can be high. By developing and practicing daily biosecurity procedures in combination with best management practices like the AEM Code on poultry farms, we can reduce the possibility of introducing infectious diseases like Avian Influenza, Exotic Newcastle and others.

Some simple ways to avoid cross-contamination include wearing clean clothes and boots, washing hands with warm water and soap or using hand sanitizer before and after handling any animals. It is advisable to follow the specific requirements within the AEM Code as disease and pests can:

- Reduce productivity
- Reduce the value of animals and products
- Reduce domestic consumption
- Increase animal health and welfare issues
- Increase veterinary and labour costs
- Reduce the producers' and transporters' incomes
- Close export markets
- Negatively impact the environment and human health

Animal Welfare

Animal welfare is another significant challenge. Abiding by the Code of Practice for Agricultural Environmental Management is one way to get on the right track toward protecting animals and their welfare and health. The system is a rational way to meet the animals' needs while helping to protect the environment.

The BC government supports animal welfare by:

- Providing educational sessions to help increase consumer knowledge of the animal welfare challenges facing the agriculture industry today
- Growing awareness for production practices so that together we can support animal welfare
- Promoting scientific investigations to identify and address potential gaps
- Monitoring issues and developing practical solutions to ensure a proper governance framework for animal welfare is in place
- Making sure farms have suitable animal housing, and are following cleanliness regulations

HOW AGRILYZE CAN HELP

1 - “Map Your Farm” to understand setbacks and other relevant map-based constraints

2 - Track daily tasks and provide auditable data

3 - Analyze data over time to understand how changes impact the farm

4 - Create and assign tasks to ensure issues are resolved in a timely fashion

5 - Integrate data from various systems into one dashboard

6 - Leverage image recognition AI to recognize hazards and security risks

7 - Track digital systems and alert when they stop working

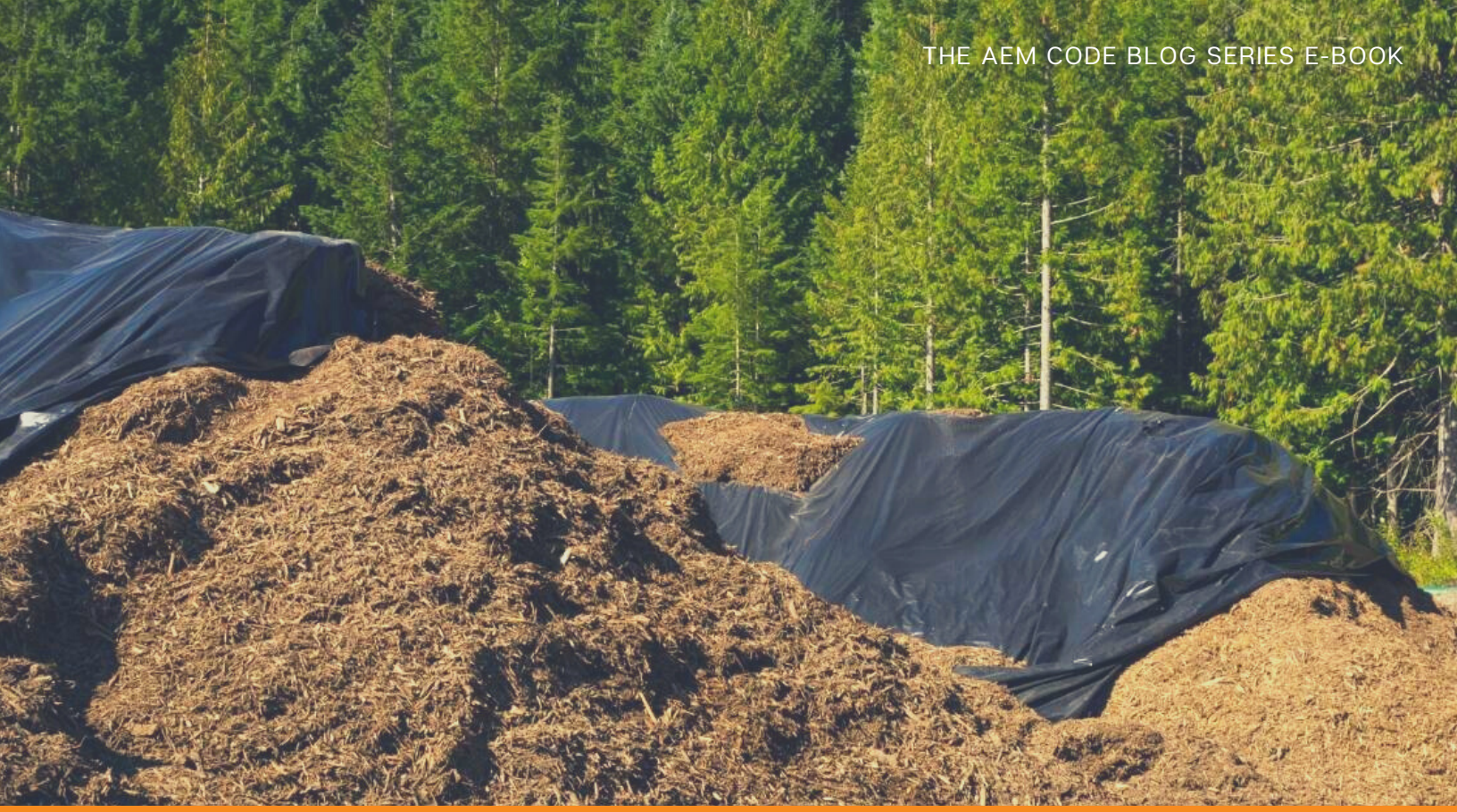
8 - Store and access best practices and other guides within the software

RECOGNIZING DISEASE SYMPTOMS

Poultry growers should be aware of the signs of disease in their flocks. Early detection can greatly reduce the impact and spread to other flocks. Some clinical signs associated with the chance of a disease in a poultry flock are:

- Swelling of the head, eyes, comb, wattles and hocks
- Lack of coordination in mobility
- Lack of energy or appetite
- Nasal discharge
- Diarrhea

- Sudden or excessive mortality without clinical signs
- Purple discoloration of the wattles, combs and legs
- Soft-shelled or misshapen eggs
- Decreased egg production
- Coughing, wheezing and sneezing



CHAPTER 5 - MINIMUM SETBACKS

It is important to set back agricultural activities from watercourses, drinking water sources, and property boundaries as it creates a buffer that protects water quality and neighbouring properties. Setback distances are dependent upon the specific agricultural activity. Here is the rundown provided by the Government of BC.

Agricultural Composting Processes

Composting structure:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 15 m
- Property boundary: 4.5 m

Outdoor agricultural composting pile:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 30 m
- Property boundary: 4.5 m

When Applying Nutrient Sources to Land

Other than wood residue or irrigation water:

- Drinking water source: 30 m from a well or diversion point & 3 m in any other case
- Watercourse, other than a drinking water source: 1.5 m if commercial fertilizer or subsurface injection is used, & 3 m in any other case
- Not on the property boundary

Disposing of Processing Wastes or Mortalities

In a composting structure:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 15 m
- Property boundary: 4.5 m

Using an outdoor agricultural composting pile or burial pit:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 30 m
- Property boundary: 4.5 m

Using an incinerator:

- Drinking water source: 15 m
- Watercourse, other than a drinking water source: 15 m
- Property boundary: 7.5 m

Feeding Locations

On-ground feeding locations or mobile feeding bins used in a seasonal feeding area:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 30 m
- Property boundary: 4.5 m

Keeping or Rearing Livestock or Poultry Using a Confined Area

<10 animal units in which animals are fed:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 5 m
- Property boundary: 1.5 m

≥10 animal units in which animals are fed:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 30 m
- Property boundary: 1.5 m

Any number of animals, none of which are fed:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 5 m
- Property boundary: N/A

Note: 10 animal units are equivalent to 4,550 kg of livestock or poultry or any livestock and poultry combination that equals 4,550 kg.

Storing Manure and Other Agricultural By-Products

In a permanent storage structure, as on-ground under-pen storage or as temporary field storage of < 2 weeks:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 15 m
- Property boundary: 4.5 m

As temporary field storage of ≥ 2 weeks:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 30 m
- Property boundary: 4.5 m

Agricultural by-products include manure, soiled animal bedding, dropped or spoiled feed or silage, agricultural vegetative debris, a product of an agricultural composting process used mushroom-growing substrate, and used soilless media.

Storing or Applying Wood Residue

In a permanent structure, or as temporary field storage, or applying wood residue to land in a layer measuring 30 cm deep or more:

- Drinking water source: 30 m
- Watercourse, other than a drinking water source: 15 m
- Not on the property boundary

Applying wood residue to land in a layer measuring less than 30 cm deep:

- Drinking water source: 30 m from a well or diversion point & 3 m in any other case
- Watercourse, other than a drinking water source: 3 m
- Not on the property boundary

PAIN POINTS

Setbacks are a way of managing nutrients properly to avoid any harmful damage to the environment. It also minimizes nutrient loss to ground and surface water. Let us quickly review how setbacks can positively impact farming operations.

If crop nutrients are heavily applied, either from manure or fertilizer, nutrient requirements will be exceeded and will result in the buildup of nutrients in the soil.

If nutrients are not properly worked into the soil and are applied to the surface, they can be washed away by heavy rain or snow and even more so on sloping land. Then these nutrients can end up in ditches, streams or other surface watercourses. And if a significant amount of nutrients is built up in the soil and water over some time, resource quality will be affected. Hence, the necessity of minimum setbacks.

By understanding how various crop nutrients behave regarding their specific landscape, farmers can better understand how crops use nutrients and how they may impact the environment. Placement method is essential as it may significantly reduce the risk of nutrient losses.

Proper management of setbacks can keep nutrients in targeted areas as much as possible. It also serves as a defense line, keeping nutrients and other potential contaminants out of water resources. Maintaining setbacks can contribute toward protecting the quality of surface water, as well as preserving your land. It is crucial to keep track of several “health” factors like – type of vegetation in the area, what the health of this vegetation is, degree of erosion etc. Also, by managing or restricting access to grazing for confined livestock, you can help vegetation grow and thrive.

> ***"Setbacks are a way of managing nutrients properly to avoid any harmful damage to the environment."***

HOW AGRILYZE CAN HELP

1 - With the Map My Farm setup at the implementation of Agrilyze, key features are identified (farm boundaries, field edges, watercourses, wells, storage facilities), and the appropriate setbacks are applied to give farms a clear understanding of the requirements

2 - Farmers can identify where nutrients are applied to allow for documentation for the Nutrient Management planning process as well as for historical analysis using spatial task management

3 - Links to guidelines and legislation are available in the software so farmers can access relevant details

4 - Tracking nutrient usage over time gives farmers a better idea of usage requirements, and perhaps other choices can be made

CHAPTER 6 - NUTRIENT APPLICATION & MANAGEMENT

The Code of Practice for Agricultural Environmental Management ensures that nutrient application matches crop needs and aims to prevent nutrients and pathogens from entering water bodies. Farmers must test their soil, follow a nutrient management plan, or conduct a risk assessment during the wet season before application.

As a general rule, do not apply nutrient sources to standing water or saturated soil, on frozen ground, or on a field where there is at least 5 cm of ice or snow over 50% or more. Avoid allowing nutrient sources to enter a watercourse, someone else's property or leach into the water table.

Always keep records of the type of nutrients you apply to your field and how much and where.

If your land base is 2 hectares or more, and you use nutrients, you must take soil tests for each field for post-harvest nitrate and phosphorus. Tests must be completed every three years at a minimum, and a nitrate test should be conducted on an annual basis with high nitrate results.

Having a nutrient management plan can help you to be prepared and follow a guided manner of applying nutrients to your land.

PAIN POINTS

Nutrient management is a necessary component of environmental stewardship. It offers economic and ecological benefits that can help reduce input costs for production and minimize nutrient loss risks to surface and groundwater.

As fuel and fertilizer prices rise, it becomes more critical to have an effective nutrient management plan as the impacts on the overall sustainability of crop and livestock operations are too great to ignore.

To understand how various crop nutrients interact in the landscape, we must pay proper attention to nutrient management. Knowing which soils have the potential to be at higher risk of nutrient loss can help producers manage nutrients more efficiently while protecting the environment.

There are some essential elements to nutrient management to be aware of:

Soil testing – To produce an accurate reading of the soil nutrients required for crop growth, a soil sampling strategy should be followed. There will be a recommended amount of supplemental nutrients to add as fertilizer.

Manure testing – You can determine an application rate for crop nutrient requirements by estimating the amount and availability of manure nutrients.

Maintaining a realistic idea of crop yield targets – You can use your field and farm records to determine target yields for reasonable and attainable results. If your farm records aren't available, then you can use crop insurance data. Most farmers are aware that higher crop yields can result from increased nutrient uptake from added fertilizer. However, it is still important to consider that other factors like limitations from the weather, pests, practices etc. can impact yield potential.

Keeping proper records – By documenting your nutrient management journey, you can maximize the economic benefits while also reducing environmental risks. All aspects of information should be recorded, including details on the fields receiving nutrients, fertilizers, soils, crops being grown and equipment being used, not to mention any weather conditions that may affect application.

Here are some challenges to nutrient management that many farmers are faced with:

When is the right time to apply?

Application in the fall is preferred as fertilizer costs are lower, and there seems to be more time, drier field conditions etc. However, if your soil is more susceptible to leaching and runoff, fall application may not be the best option.

When is too much too much?

Over-application of manure happens when you apply too much product on too little acres. Two factors that influence farmers' reliance on using manure fertilizer to meet crops' nutritional needs are a shortage of land and prohibitive transportation.

How do you establish thresholds?

It is challenging to establish impacts and limitations within an environmental and economical standard, so it is best to do some research prior to developing a nutrient management plan.

HOW AGRILYZE CAN HELP

1 - Task Management allows for the capture of records that are stored, reportable and auditable

2 - Track the historical data to run comparative analysis on what happened with crops in previous years based on nutrient applications, weather, crop types, irrigation

3 - Better track soil nutrients to apply the correct amounts to provide maximum economic benefit

4 - Input standard soil tests into Agrilyze and then compare year over year

5 - Visually see soil test results on a map on your farm

6 - Easily access legislation, standards, guidelines, best practices through links to the source data in Agrilyze

7 - Understand where streams, drainage, aquifers are and how they relate to the fields

8 - Track and improve usage patterns on the farm by mapping them

CHAPTER 7 - RECORD-KEEPING

Farmers must keep records of farm activities for at least five years and provide them to a record inspector within five business days if requested. Although it is not required to submit records, farmers can ensure that they are meeting the Code of Practice for Agricultural Environmental Management by keeping a proper record of activities.

A record is information that demonstrates the way farmers are managing operations and events on the farm. Farmers aren't required to use a specific form or template but should consider utilizing a proper system that organizes particular activities to ensure that records are easy to access and manage.

PAIN POINTS

More than ever, farmers are looking for ways to project sales and expected expenses based on historical figures while also understanding everything they own and owe. This need makes record-keeping a crucial aspect of farm operation management.

Record-keeping may seem like a complicated process, but at the end of the day, it will contribute toward the efficient management of agricultural businesses. By keeping good records, farmers can make more informed decisions and plan for the future.

To become successful, farmers must not only be good producers, but excellent financial managers equipped with the ability to hold accurate farm records while establishing and maintaining a proven record-keeping system.

Here are 4 reasons why keeping proper farm records is essential:

Improve farm management – By keeping a detailed farm journal that tracks every specific aspect of the farm, farmers can see exactly how their farm is functioning. Tracking activities can help determine the root cause of a problem, assisting farmers in knowing their animals, crops and finances better.

Monitor progress – Keeping good records helps farmers to ensure that they are progressing toward their goals and moving forward on their business plan. Ultimately, this contributes toward becoming more efficient, which will help farmers to make positive changes that will benefit their operations.

Assist with loans and grants – To qualify for certain loans and grants, farmers may be required to provide financial records showing what they've earned, their expenses etc. Banks want to see that the farm is financially viable, so it is essential to keep good records to prove that.

Assist with taxes – Farmers should ensure that they're paying the proper taxes for their farm. Tracking income and expense is a necessity for any farm.

Some types of records farmers should keep:

Food safety and traceability are two growing concerns for both farmers and consumers. Specific standards have been set to demonstrate that the farm is following regulations, which helps protect the environment, worker safety and welfare, animal welfare and more.

Harvest yield records compare crop yield year to year, thus helping farmers make more informed crop management decisions in the future. These records are crucial as they assist farmers in tracking their income against the cost of production.

Tracking labour is crucial to properly manage payroll for farmworkers as efficient record keeping will save farmers time and money, making assessments of productivity easier.

Pesticide and spray records help ensure that customers and employees are protected from exposure to harmful pesticide residues. For most countries, tracking chemical use is mandatory for complying with food and environmental safety regulations.

Overall, there are many benefits to good record-keeping, such as:

- Become more efficient and be able to measure progress

- Be more prepared for the year-end review
- Better plan your GST and HST payments
- Help to avoid over or underpaying taxes
- Gain the ability to identify your operation's strengths vs weaknesses
- Make changes and improvements that will impact agribusiness
- Make predictions and forecasts for productivity
- Minimize your tax burden by maximizing claimed expenses
- Become more efficient when paying employees and see what is owed to creditors
- Promote a more simplified process for applying for loans or selling the business
- Facilitate the distribution of profits to shareholders (dividends)
- Make it quicker for partnerships to view gains and losses
- Make records more accessible should the business get audited by the Canadian Revenue Agency

HOW AGRILYZE CAN HELP

1 - Use tasks to document processes, assign responsibilities and attach documents and photos

2 - Track what is applied to fields and when as part of Traceability

3 - Map your farm and track where fields, crops, assets are

4 - Track staff and their time assigned to tasks

5 - Leverage baseline industry data to compare farm averages

6 - Store data in an auditable database

7 - Track progress over time and analyze using the Analysis module

8 - Create simple forms that work on desktop/mobile

"By keeping good records, farmers can make more informed decisions and plan for the future."

CHAPTER 8 - STORAGE & USE

According to the Code of Practice for Agricultural Environmental Management, you must store and use agricultural by-products in a certain way.

Some examples of agricultural by-products are:

- Manure and soiled animal bedding
- Products used in composting
- Vegetative debris such as leaves from trimming/pruning
- Used mushroom substrate
- Used soilless growing media

A few general rules to follow are:

- Ensure runoff water does not enter the storage area
- Prevent contaminants from entering watercourses, someone else's property or going under the water table
- Ensure to follow minimum setbacks
- Prevent wildlife, pests, and domestic pets from having access to the storage area

PAIN POINTS

As part of their regular operations, farmers and producers must build temporary or permanent storage facilities to protect and store waste, materials, produce, equipment, and end products from the environment's detrimental effects. These areas are also used to prevent natural resources pollution and promote the safe-handling of farming inputs. By having storage facilities, farmers can ensure quality production of products and encourage the safety of their workers and themselves. Storing these items can also prevent issues down the road like theft or vandalism.

Aside from storing farm machinery (tractors, field implements, combines, etc.), farmers must store their animal feed, grains, fruits, vegetables, milk and eggs. As these products will be intended for human consumption, farmers must do their due diligence to ensure that temperature and humidity are controlled. This will assist products vulnerable to bacterial activity that could become rotten, germinate prematurely or create and absorb odours.

Waste

Agricultural waste products like plant residues, nutrient-rich runoff, manure, and mortalities are often stored, mostly when reused or recycled later. These are some key factors to consider when building storage facilities intended for waste products –

- Safety
- Protecting the environment
- Material handling efficiency

It is also important to note that the type of storage facilities designed for waste products will vary depending on climate, site-specific requirements (minimum setbacks) and local legislation.

Handling and Storing Manure

All animals generate waste, and it is considered a valuable by-product that can be used as a soil conditioner and as a nutrient source for essential elements like NPK. However, the nutrient value can vary depending on the animal (type and age), the nutrients found in their feed and how the manure is collected and spread for use on the farm.

Storage facilities for manure are necessary on many farms, as the waste materials will be stored until it is time to be spread in time to be taken up by crops. The storage requirements may even be minimal if the manure was purchased by other parties and moved to an adjacent site.

Manure can be stored in fields before it is used to fertilize crops. If stored for an extended period or in high rainfall areas, the manure piles must be covered from October to April. And if the field is

prone to challenges like high water tables, flooding or close to wellheads, manure should not be stored there.

Manure storage facilities are permanent structures located in designated areas and operated to contain waste in an environmentally safe way until it is needed for field application. Facilities should be at least 30 metres away from a well or watercourse to minimize the potential of leaks or spills occurring near the storage unit. Manure also needs to be stored during the year when crops are less likely to take up the nutrients, or there is a significant risk of the manure entering surface waters or groundwater.

HOW AGRILYZE CAN HELP

1 - Agrilyze works with farmers to map their farm (Map My Farm), so they can track where the manure is stored and used as well as critical setbacks outlined by the legislation and locations of key features such as high-water tables, flood-prone areas, and water bodies including aquifers

2 - By incorporating the soil test results in the tool, farmers can easily see their historical records of what happened in the field year over year

3 - Tracking images for an audit can be attached to tasks for the fields

4 - A nutrient management task can be added to collect the structure for the Ministries' Nutrient Management Plan

CHAPTER 9 - TREATMENT OF WASTEWATER

According to the Code of Practice for Agricultural Environmental Management, you should not be discharging treated wastewater into water or on land. If you are doing this, you must notify a Director before February 28, 2021.

If your plan is to modify an existing treatment system or build a brand new one, you will need to notify a Director a minimum of 60 days before starting the project.

PAIN POINTS

Agricultural wastewater treatment is necessary to control pollution from surface runoff that could be contaminated with pesticides, fertilizer, irrigation water, crop residues and more. Two primary forms of pollution could cause farmers concern, the first being nonpoint source pollution or pollution caused during rainstorms by surface runoff from fields. Runoff is a significant contributor to pollution, and we are going to review some main forms here –

Sediment Runoff

This is when soil is washed off from fields caused by high levels of turbidity in water bodies, and down the line, it can be detrimental to plants' growth. There are some standard techniques that farmers can utilize to reduce runoff flows and better retain soil on the fields, such as crop rotation, contour ploughing, installing riparian buffers and crop mulching.

Nutrient Runoff

Nitrogen and phosphorus are applied to land in several ways, as industrial wastewater, animal manure or commercial fertilizer. These key pollutants may enter runoff from crop residues, wildlife, irrigation water and atmospheric deposit. By implementing a nutrient management plan, farmers can better control how runoff impacts water quality. Here are some ways:

- Being realistic with crop yield projections
- Testing soil and analyzing nutrients in manure
- Identifying other potential sources of nutrients
- Documenting and mapping fields, soil types, crop types and water bodies
- Evaluating field features like shallow aquifers, subsurface drains and highly erodible soils
- Applying precision agriculture techniques based on realistic yield goals

Pesticides

Pesticides are used to control pests on plants and enhance production, but they sometimes can cause significant water quality issues. They can appear in surface water from applying them directly to crops (i.e., aerial spraying), from runoff during rainstorms and from aerial drift coming from adjacent fields. Pesticides can also be detected in groundwater. Farmers need to use proper management techniques to control pests, reduce reliance on chemical pesticides, and ultimately protect their water quality.

The second form of pollution that may impact agricultural operations is point source pollution or pollution from livestock and poultry operations. Facilities that manage concentrated animal feeding operations are subject to increased government regulations as these larger farms can be a considerable contributor to point source wastewater.

Here are some examples –

Animal Waste

Polluting wastewaters from runoff are common from solid manure heaps left outdoors, which can be easily treated by containing or covering the heap. Of course, special handling is a must as wastewater disposal that contains animal waste can move upstream into drinking water intake. It can pose some serious threats if anyone drinks the water.

Livestock Water Pollution

Farm animal waste needs to go somewhere, and unfortunately, it isn't treated like how we treat human waste by sending it to a plant for treatment using a sewer system. Instead, we must dispose of it by spreading the untreated manure onto land. Typically, there is too much manure, and it ends up in water sources. Before being applied to the ground, the waste can be kept in a lagoon, which creates a very toxic mix of antibiotic residues, decomposing bacteria and other chemicals that can often leach into the soil and groundwater.

HOW AGRILYZE CAN HELP

1 - Track where manure is stored and other details about it using the Farm Map and tasks
2 - Track what is applied to the fields, when and how much
3 - Report on details of applications, therefore, managing the compliance
4 - Store soil and water test results over time and analyze the outcomes
5 - Correlate inputs and outputs to ensure that the Nutrient Management Plan is being adhered to
6 - Track environmental, and physical components such as soil types or aquifers or weather and relate it to manure applications

A NEW PERSPECTIVE

A significant change is the only way we can make a difference, but every small change is still meaningful! Farmers must consider changing their very practices, which will help decrease pollution and of course, following regulations like the AEM Code can help. Our educational blog series on the Code of Practice for Agricultural Environmental Management aims to spread awareness of the impacts of farming processes on the environment to protect our land, water, and air in BC.

CHAPTER 10 - CONCLUSION (HOW THE AEM CODE RELATES TO PERMACULTURE & AGRILYZE)

It is always important to ask questions. What is the point of all of this? What are the benefits, and how does it fit into my life? Let's explore some answers to these questions by introducing a concept called permaculture as it relates to the Code of Practice for Agricultural Environmental Management and Agrilyze, an innovative platform solution for farmers.

You may already be aware that the Code of Practice for Agricultural Environmental Management (AEM Code) is intended to help farmers protect the environment. The rules aren't in place to subject farmers to more regulations (although this may be believed to be true) or designed to create new, unforeseen compliance models. When they say 'code of practice', we should be hearing, 'here are some detailed suggestions to help you do the job you know best'. This is an important detail to understand as we take time to educate each other and ourselves. By providing clear outlines that are both risk and science-based, we can take more preventative measures, especially in high-risk conditions. And since the AEM Code applies to all agricultural operations, we can ensure that farms of all sizes and ventures demonstrate a basic level of environmental protection.

Ultimately, the code is helping farmers to become more self-sufficient. Ideally, this can be combined with ideas taken from a concept like permaculture. It is relevant to investigate such connections because most of us understand that our way of life on our planet must change if we will survive long-term. Farmers are faced with challenges that evolve beyond front-facing duties. There are challenges like climate change, feeding a growing population and transitioning toward an eco-friendly, ethical and sustainable future that may be pushed out of the limelight. Why? Because we are all working so hard! Also, we may become enraptured in our acts of service, so much so that we forget we are not involved in a grand scheme but participate together in the BIG picture. Our industry is our peer. What matters most (what is the big picture)? The health and wealth of our land and jobs. What makes a difference? Our experience, combined with a willingness and openness to learn and grow.

Along with helping us to understand the purpose of the Code of Practice for Agricultural Environmental Management, permaculture is an excellent concept to wrap our heads around. It's a broad outline of potential solutions to the problems we face in the industry. It is also flexible enough that it can endure and thrive for generations to come. The 12 principles of permaculture are most commonly used concerning food growing systems but can also be used to guide us in farming. Let's see how each principle relates to the AEM Code and the Agrilyze platform. Don't worry, the benefits are nestled in there!

1 - OBSERVE & INTERACT

Manage your operation using knowledge plus data.

Think of the Code of Practice for Agricultural Environmental Management as a set of observations. As farmers, growers, or ranchers, we can interact with observations by being aware of the specific requirements that apply to our agricultural operation.

Agrilyze takes this into account. We provide high-level data that can be used to better observe and interact with our work. For example, use the platform to observe where nutrients are applied, then interact with your findings and document an effective nutrient management plan.

2 - CATCH & STORE ENERGY

Gather and aggregate data into a unified, easy-to-use, browser/app-based platform.

Energy is abundant on our planet and learning how to 'catch and store' that energy is vital to our role as farmers. The Code of Practice for Agricultural Environmental Management provides several guidelines for efficient use of abundant energy sources, such as ensuring that boilers and heaters

operate with lower environmental impacts and better temperature control. We must meet a design standard, which is how they put it.

Agrilyze can notify you when sensors go out of range by sending a notification if the temperature drops too low. A wireless temperature alarm is indispensable if you want to keep a healthy greenhouse so that you can track problems such as power outages, temperature fluctuations, water damage, and intrusion.

3 - OBTAIN A YIELD

Stay on top of trends and industry advances, so you can better measure, analyze and interpret farm data.

It is important to design systems that will best leverage your activity and avoid wasting energy and resources on things that do not provide value. Having a goal in mind will help you reach your targets. For example, according to the AEM Code, by choosing your composting site carefully, you can reduce the potential for environmental impact and respect neighbouring land uses. By obtaining a yield, farmers can improve compost quality and keep track of when compost was turned and the compost's conditions at specific times.

Agrilyze takes it a step further by allowing you to measure outputs with sensors (temp/moisture – IoT devices), therefore tracking nutrients in compost and understanding where to apply it to (soil testing), as well as analyzing detailed information over time (analytics).

4 - APPLY SELF-REGULATION & FEEDBACK

Identify where you are succeeding and lacking results.

As farming is continually changing, the AEM Code can help identify problem areas and manage environmental challenges with detailed guidelines that farmers can easily apply. A systems-oriented approach can help address the problematic issues associated with the complexity of food and other production systems in different ecologies and locations.

This is the same benefit of a platform like Agrilyze. It gives farmers valuable feedback, impacting our business processes and relationship to our land and our job. Fundamentally, we can always make better decisions. For example, have real-time analytics on hand to analyze detailed information over time or have quick and easy access to relevant documentation related to composting, soil, water etc. Agrilyze helps farmers apply new techniques to boost yields and increase growth and competitiveness in the agriculture market.

5 - USE & VALUE RENEWABLES

Move toward a more sustainable practice.

According to the AEM Code, we should build storage facilities for waste products that promote safety, protect the environment, and can be reused or recycled later. When we think about manure's value alone, we should find specific uses for it, such as introducing nitrogen and organic matter into your soil to improve your soil's fertility and structure.

Agrilyze works with farmers to map their farm (Map My Farm). As an example, this application allows farmers to track where the manure is stored and used, critical setbacks outlined by the legislation and locations of principal features such as high-water tables, flood-prone areas, and water bodies, including aquifers.

6 - PRODUCE NO WASTE

Reuse or recycle wherever possible.

According to the AEM Code, farmers have the opportunity to reduce waste by following steps like properly managing the storage and disposal of wastewater to ensure that pollution does not enter into waterways. Farmers need to use proper management techniques to reduce waste and our reliance on chemical pesticides, control pests, and ultimately protect the environment.

Agrilyze helps by tracking environmental and physical components like soil types, aquifers, or weather and relates it to manure applications, then correlates inputs and outputs to ensure that the farm produces less waste overall.

7 - DESIGN FROM PATTERNS TO DETAILS

Analyze and build actionable data from financial information and spreadsheets.

This is the idea that by thinking holistically, the farm can grow and thrive. One key concept that contributes to this idea is organization. The AEM Code emphasizes that farmers must keep records of their farm activities, contributing to more efficient management, informed decisions, and a future plan.

By creating simple forms that work on desktop/mobile, tracking and analyzing progress over time and storing data in an auditable database, Agrilyze helps keep farmers organized. It responds to our needs and then, combined with better organization, gives farmers the power to concentrate on more crucial business areas.

8 - INTEGRATE DON'T SEGREGATE

Understand your farms, fields and crops better with precise mapping.

As we've discussed, to make a change, we must be open to change itself, honest and willing to work with new approaches like the AEM Code. One prime example is keeping a nutrient management plan. It offers many benefits, including having a better understanding of how various crops interact in the landscape. Instead of creating silos and segregating data, we have the opportunity to integrate it and make it more worthwhile.

Agrilyze can help farmers collect relevant data, then combine the data to track and improve usage patterns on the farm or better track soil nutrients to apply the correct amounts yielding the maximum economic benefit. Use the Agrilyze platform to harness the power of location – identify property lines, fields, crops, buildings, soil test locations, manure storage and animal housing and their setbacks in relation to any watercourses, wells, or other areas of concern.

9 - USE SMALL, SLOW SOLUTIONS

Take what you can handle, one step at a time.

We understand that there's value in your data and that you are required to do things in a certain way. We also know that you are looking for a competitive advantage. We presented the Code of Practice for Agricultural Environmental Management as an invitation to explore new ways to farm smarter and stronger. It may seem daunting at first, but every small step counts. These guidelines are small in comparison to the bigger picture. You can become a part of the solution, not by reacting but by responding!

Agrilyze is equipped to help farmers find solutions to operational challenges. Transitioning toward a technology-based system takes time, and the Agrilyze team is here to provide context and correlations that make sense. We provide training and mentorship. As succession planning becomes a reality, we must nurture the next generation of farmers by using technology ourselves.

10 - USE AND VALUE DIVERSITY

Promote more diversity and stability in the industry.

Your operation is different than your neighbours and we value that. However, stability comes with a price. It's time to look into new ways to automate typical farming processes, giving you more insight and data to improve productivity and efficiency. Smallholding or commercial enterprise, the

AEM Code is in place to help you produce better results.

For example, to carefully raise livestock and poultry, various factors must be considered. Agrilyze can help make sure farms have suitable housing and follow regulations regarding cleanliness and clean water. Agrilyze makes it easy to manage this aspect by providing AI to recognize hazards and security risks before they become a problem.

11 - USE EDGES AND VALUE THE MARGINAL

Get your agricultural site's compliance requirements, allowing for a more straightforward understanding of what is required.

The whole idea behind minimum setbacks is to create edges around marginal space to set back agricultural activities away from watercourses, drinking water sources, and property boundaries. We can avoid harmful damage to the environment by adhering to the AEM Code.

With the Map my Farm setup at the implementation of Agrilyze, key features are identified (farm boundaries, field edges, watercourses, wells, storage facilities), then the appropriate setbacks are applied to give farms a clear understanding of the requirements.

12 - CREATIVELY USE AND RESPOND TO CHANGE

Farm smarter. Start today.

This might sound cliché, but change is always happening. It is a regular part of life. Ultimately, permaculture matters because it impacts our future and not just the present. We all operate within an established framework; however, the design could change. The AEM Code is one way to implement design changes on our farm.

Whether it be the changing seasons or climate, our attitude toward change will shape how well we can integrate technologies like Agrilyze into our approach. Technology is like creativity. It generates and recognizes ideas, alternatives, or possibilities that can change the way we live. Period.

We are all different, but as farmers, much the same. Amid a challenging landscape, we must repeatedly remind ourselves of this commonality - we love and dedicate our work to better understand the industry, support our communities, and provide good, clean and healthy food to all. By taking a holistic approach, we can begin to understand the Code of Practice for Agricultural Environmental Management.

Agrilyze supports the AEM Code and the use of technology in our field because together, these applications inspire farmers to broaden their capacity, and protect the only environment we have. Agrilyze is for this change, to help farmers, who work so hard at their job to make the world a better place.

We hope that by connecting the twelve principles of permaculture to a method, we can inspire a more altruistic farming system based on resilience and results.

Did you learn a lot? We hope so! Keep learning and never stop growing. If you have any questions at all, please feel free to send us an email at info@agrilyze.ca.

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