



AGRI-FACTS

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Applying Manure on Perennial Forage: A Summary

Alberta has about 25 million acres of forage land (native and tame hay and pasture). In some cases, applying manure to forage land may be the best option to make use of the nutrients in manure in an environmentally sustainable way. As well, applying manure can increase forage productivity and reduce commercial fertilizer costs.

Manure is a valuable nutrient source for forage crops as it contains all the major plant nutrients and a number of essential micronutrients. Manure may also enhance soil physical properties such as water infiltration rate and aggregate size and stability, leading to better tilth and improved yields.

The nutrients in manure do not occur in the proportions required by crops. Therefore, producers need to balance nutrients from manure, commercial fertilizers and the soil with the requirements of the crop to be grown. Establishing this balance is the process of nutrient management.

More accurate information, better management

Soil testing, manure testing and realistic projections of crop production are the key ingredients of a nutrient management plan. Soil testing is essential to determine the present concentration of plant-available nutrients. Manure testing is needed to determine manure nutrient concentrations, and projected yields are necessary to calculate the expected crop use of nutrients. These three components allow the calculation of the manure application rate needed to supply the difference between the soil nutrient supply and crop demand.

If manure test results are not available when the manure is being applied, producers can use “book values”— average nutrient concentrations in manures from different sources (different livestock types, solid versus liquid manure, etc.). However, if producers are able to test manure annually and build a database from those results, they will be able to see the yearly variability of the manure being applied and how it differs from the average values found in tables. This information allows producers to tailor application rates to their own manure supply.

Applying manure can increase forage productivity and reduce commercial fertilizer costs

The key to getting useful results from manure tests is to ensure that the tested sample is representative of the manure being applied. Producers need to collect a number of samples from the manure source, mix those samples thoroughly and take a representative sub-sample from the mixture for lab testing. Non-representative samples will give lab results that do not indicate the nutrient levels actually applied. This result may lead to larger errors in calculating application rates than simply using book values.

Ideally, producers should sample the manure far enough in advance of manure application to receive the lab results and use them to calculate application rates. However, obtaining a representative sample from storage facilities, whether lagoons or stockpiles of solid manure, is difficult. Many producers opt for first collecting samples during application and then compiling the test results for use in future years.

Effective, safe application rates

If manure is applied at a rate to supply the crop's nitrogen (N) requirement, then phosphorus (P) and potassium (K) are applied in excess of the

crop's needs for that year. If annual applications are based on the N requirement, then P and K levels in the soil will become too high. These levels may increase the risk of environmental damage due to the contamination of surface water via runoff or groundwater through leaching, or there may be a risk of livestock health problems due to nutrient imbalances in the forage.

Producers have two options to avoid excessive P and K levels. One is to apply manure at a rate to supply the crop's N requirement in one year and then not make further applications to that field until soil test results indicate a need for more P. The other option is to apply manure annually at a rate calculated to meet the crop's P requirements. The crop's additional N needs could be met by supplementing the manure applications with some commercial N fertilizer.

Almost all the P and K in manure is in an inorganic form and is plant-available in the year of application. A portion of the N in manure is in organic form (the portion varies with livestock type, whether the manure is liquid or solid, and the amount and type of bedding).

Organic N must be mineralized before it is available to plants. The mineralization process continues at a declining rate for several years after manure application, so there is a carryover effect for available N after application. This carryover must be accounted for in calculating N application rates for up to three years following manure application.

Large amounts of nitrogen are lost through volatilization (gassing off) when manure is broadcast on forages. For solid manure, there is no application alternative until research underway in Saskatchewan to develop solid manure injection equipment is completed. For liquid manure, injection can greatly reduce nitrogen loss.

Economic benefits

Manure application provides a substantial economic benefit due to manure's nutrient value and soil improvement benefits. The manure's value increases as the cost of commercial inorganic fertilizer increases. At moderate application rates, the net economic benefit (application costs deducted) of manure may exceed \$70 per acre, based on 2004 commercial fertilizer prices.

Protecting water and soil quality and neighbour relations

In Alberta, the *Agricultural Operation Practices Act and Regulations* (AOPA) sets out the rules that must be followed when applying manure. These rules require that manure must not be applied within specified setback distances from water bodies and residences. The rules also take into account the effects of field slope, soil texture and other factors and they specify requirements for soil and manure testing as well as record-keeping.

Key practices

Using beneficial management practices will maximize the crop use of manure nutrients and will minimize environmental effects. These practices include the following:

- complying with all AOPA regulations
- applying manure to meet crop nutrient requirements
- doing annual soil and manure testing and maintaining records
- injecting manure if possible
- applying manure early in the growing season
- applying manure to fields with a low risk of runoff (low slope and good plant cover)

More information

For more information, refer to the manual *Applying Manure on Perennial Forage*, Agdex 538/120-2, available from the Alberta Agriculture Publications Office, toll-free call 1-800-292-5697, or visit the website www.agric.gov.ab.ca

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