

**DETAILED INSTRUCTIONS FOR COMPLETING PHOSPHORUS RELATED PORTIONS OF THE  
 MANURE MANAGEMENT PLAN FORM**

*If you require technical assistance, please contact your local Manitoba Agriculture, Food and Rural Development (MAFRD) office or Manitoba Conservation and Water Stewardship (CWS).*

**Soil Phosphorus Thresholds**

Compliance with regulatory phosphorus (P) thresholds must be demonstrated on a field by field basis, prior to manure application in order for the MMP to be registered. Registration may be refused if the MMP would put the operator in violation of the regulation, or if it does not contain all required information. In this case, the MMP would need to be revised to show compliance and registered prior to manure application.

The soil test P concentration, using the Olsen Method, will determine the maximum manure phosphate (P<sub>2</sub>O<sub>5</sub>) application rate permitted based on regulatory phosphorus threshold levels shown below:

- If soil P is less than 60ppm there are no restrictions to P<sub>2</sub>O<sub>5</sub> application.
- If soil P is 60ppm or more but less than 120ppm, no more than two times (2x) crop removal P<sub>2</sub>O<sub>5</sub> can be applied.
- If soil P is 120ppm or more but less than 180ppm, no more than the crop removal of (1x) P<sub>2</sub>O<sub>5</sub> can be applied.
- If soil P is 180ppm or higher, no manure can be applied. However, the director may approve application in an emergency situation or other extenuating circumstances.

For fields with soil test P concentrations of 60 ppm or more but less than 180 ppm, there is a multi-year option. This option is available for producers to apply manure at higher rates of application, up to 5 times (5x) the crop removal of P<sub>2</sub>O<sub>5</sub>. However, manure cannot be reapplied to that field until the number of years equal to the multi-year application rate has passed (up to 5 years), or the soil test P is equal to or less than the value at the time of original manure application. Manitoba Conservation and Water Stewardship may conduct soil sampling audits to verify that soil test P, at any place in the application area, does not exceed the value at the time of the original manure application.

When soil test P is over 60 ppm the nutrient budget contained in the MMP must demonstrate that applied manure P<sub>2</sub>O<sub>5</sub> does not exceed P<sub>2</sub>O<sub>5</sub> removal for the applicable restriction.

<b>Applied Manure</b>	<b>≤</b>	<b>Crop Removal</b>
<i>Rate x P<sub>2</sub>O<sub>5</sub> Concentration</i>		<i>Yield x P<sub>2</sub>O<sub>5</sub> Removal Rate x Restriction (1x to 5x)</i>

Manure application of P<sub>2</sub>O<sub>5</sub> must ensure the P budget meets the regulatory requirements (i.e. 1x to 5x crop removal). Each crop has a specific P<sub>2</sub>O<sub>5</sub> removal rate dependent on crop yield. This removal rate dictates the maximum manure application rate, which is dependent on the P<sub>2</sub>O<sub>5</sub> content of the manure.

## **Required Information**

The MMP must state the proposed manure application rate, as well as related information to support this calculation and demonstrate the P budget complies with P thresholds. This includes:

- ✓ Manure application rate
- ✓ Manure P content (estimated or actual analysis)
- ✓ Crop type
- ✓ Target crop yield
- ✓ Crop P<sub>2</sub>O<sub>5</sub> removal
- ✓ Soil test P (0-6" depth) using the Olsen Method

## **Estimating Inputs and Removals**

**Inputs** are calculated by multiplying the rate of manure application by the estimated concentration of manure P. The conversion factor for P to P<sub>2</sub>O<sub>5</sub> is 2.3. To determine the amount of applied P<sub>2</sub>O<sub>5</sub> for a given manure application all of the total manure P must be included in the calculation. If MMP reported values for manure nutrient content are not within industry accepted published values, the operator will be asked to provide information supporting the values used. This may include other sources of published values, farm specific historical values, laboratory manure analysis, or a combination of sources. Management of manure storage, treatment and transportation may have a large influence on manure nutrient content. Although an actual manure analysis is not required for the MMP, it is useful for producers to test manure for agronomic purposes, but it is important to ensure that manure sampling protocol is adequate. The MMP should also indicate if any other P amendments/fertilizers will be applied, including chemical fertilizers, biosolids, or compost.

**Removals** are considered to be the crop removal rate. This should not be confused with crop uptake which refers to the total nutrients absorbed by the growing crop. As defined by regulation, crop removal rate will be determined as the net nutrients removed from the soil in the harvested portion of the crop and exported from the field. This includes the crop material that is harvested and removed from the field. Nutrients remaining in stubble, roots and other crop residue which is left on the field would not be considered in the net crop removal. One way to estimate crop removal is by multiplying the target crop yield by the crop P<sub>2</sub>O<sub>5</sub> removal rate. It is important to use a realistic target yield. If MMP reported values for crop P<sub>2</sub>O<sub>5</sub> removal are not close to industry accepted published values, the operator will be asked to provide information supporting the values used. This could include the information indicating a higher than usual target crop yield, such as crop insurance data, farm history, recent studies, or novel crop trait. This could also include information indicating increased crop P<sub>2</sub>O<sub>5</sub> content (removal) such as crop tissue analysis.

## **Multi-Year Option**

When a multi-year application is required, the operator must complete [Schedule D](#) to accompany the MMP. The Schedule will indicate all proposed crops and corresponding estimates of crop P<sub>2</sub>O<sub>5</sub> removal for each year of the multi-year application. These values will be combined and divided by the multiple of years to determine the average annual crop removal rate of P<sub>2</sub>O<sub>5</sub>. This value will be used to assess whether the manure application rate complies with the P thresholds.

## Grazing

The MMP may indicate spread fields are grazed. Crop P<sub>2</sub>O<sub>5</sub> removal is very low in this situation as it only occurs in P contained in the grazing animals weight gain. There are two acceptable options for estimating P removal on grazed fields: 1) P Removed by the Grazing Animal as a Percentage of Mechanically Harvested Forage; or 2) P Retained in Weight Gain of the Grazing Animal.

### 1. P Removed by the Grazing Animal as a Percentage of Mechanically Harvested Forage

One option is to multiply the crop removal values for hayed crop (mechanical harvest) by an estimate of the percentage of feed intake retained by the animal. Local studies suggest crop removal by mechanically harvested forage is five times greater than grazing on manured forage fields. This results in grazing removals of P being approximately 20% of the P removal when forage is mechanically harvested. For example, mechanically harvested forage may remove 30 lbs P<sub>2</sub>O<sub>5</sub> per acre. Grazing that same forage using a factor of 20% would account for a removal of 6 lbs P<sub>2</sub>O<sub>5</sub> per acre.

### 2. P Retained by Grazing Animal's Weight Gain

Another option is to calculate an estimate of the P retained by a grazing animal during the time spent on the proposed spread field. Total P<sub>2</sub>O<sub>5</sub> retained in the cumulative animal weight gain is divided by the number of acres to arrive at the crop removal of P<sub>2</sub>O<sub>5</sub>. The operator would need the following information to complete this calculation:

- a. Number of animals on pasture
- b. Estimated Average Daily Gain (ADG) per animal (lbs/day)
- c. Number of days on pasture
- d. P<sub>2</sub>O<sub>5</sub> retention coefficient (i.e. P coef of 0.007 \* 2.3 = P<sub>2</sub>O<sub>5</sub> coef of 0.016)
- e. Field size of grazed area (acres)

A sample calculation is as follows:

$$\text{P}_{2}\text{O}_{5} \text{ Removal} = \frac{(\text{number of animals}) \times (\text{ADG}) \times (\text{number of days on pasture}) \times (\text{P}_{2}\text{O}_{5} \text{ coef})}{(\text{field size})}$$

There are many sources which reference P retention values of 0.7 to 0.9% of animal weight gain. Values within this range would therefore be acceptable for MMP calculations. An estimate of animal daily weight gain is also needed for this calculation. It is noted that manured pasture fields yield a much higher live weight gain per acre when compared to non manure fields. If an operator uses option 2, they must complete [Schedule E](#) to accompany the MMP. Schedule E allows the operator to demonstrate they have used appropriate values in calculating crop removal on pasture.

## Supporting Material

The values reported in the MMP used to estimate P<sub>2</sub>O<sub>5</sub> inputs and removals should be reasonably similar to industry accepted values found in various publications. There are numerous sources that report industry accepted values such as MAFRD publications (i.e. Farm Practices Guides, Studies, Factsheets), Canadian Fertilizer Institute, International Plant Nutrition Institute, and local research projects to name a few. If the values in the MMP are not similar to these values, the operator will be asked to provide information to support the numbers being used.

Other relevant information can be accessed online at <http://www.gov.mb.ca/conservation/envyprograms/livestock>