Land Application of Greenhouse Nutrient Feedwater

Why land apply greenhouse nutrient feedwater to alternative crops?

Greenhouse nutrient feedwater (GNF) is water that is generally rich in nutrients and has value for crop production, but has inherent risks for re-use within the greenhouse. While water and nutrients are valuable commodities to greenhouse farmers, GNF may require treatment to manage nutrient imbalances or pathogen risk to make it suitable for use on certain crops. In the absence of effective treatment, transport offsite using an approved waste hauler or pre-approved discharge to a municipal sewer are acceptable options.

An alternative to treatment or approved removal is to collect GNF in holding tanks and use it to irrigate less sensitive alternative crops such as orchards, fruit, vegetable, field, or biomass crops. Land application under the *Nutrient Management Act* (NMA) encourages best management practices, and provides valuable water to local farmers. If nearby crops are available to the operation, land application may be a simple, cost-effective option for GNF management, and has the advantage of using what would otherwise be considered waste (water and nutrients).

The following legislative details should be considered:

- The Greenhouse Nutrient Feedwater regulation (Ontario Regulation 300/14) under the NMA is designed to regulate and permit the land application of GNF to agricultural crops.
- To be considered GNF under the NMA, the nutrient solution must come from a closed circulation system in your greenhouse, and must not be mixed with any other material (GNF may be mixed with liquid Agricultural Source Materials (manure) in certain circumstances.)
- In order to land apply GNF under the NMA, you must register you operation with OMAFRA.
- Land application requires a GNF Strategy (covers the generation and storage) and a GNF Plan (covers land application) if the farm generates more than 5 nutrient units (NU) in any one calendar year (1 NU has a fertilizer replacement value of the lower of either 43kg N or 55kg P_2O_5). If the farm generates 5 NU or less, a simplified version of a GNF Strategy, called a GNF Document, is required, and the GNF Plan is not required.
- GNF Strategies and Plans need to be prepared by a certified nutrient management planner or by someone from the operation who has completed the appropriate training.
- Both the GNF Strategy and Plan must include a contingency plan.
- GNF Plans account for nutrient levels in the receiving soil and the applied GNF using updated NMAN software
- Maximum application rates need to be followed. There are requirements for maximum application of a range of nutrients, regulated metals, and other ions, as well as maximum application rates based on volumes applied (based on runoff potential rather than nutrient loadings)
- Application timing is generally restricted to April 1 to November 30 (crop growing season), and is prohibited on snow-covered or frozen ground. Having enough GNF storage for the winter months is necessary.

Other considerations:

- There is a limited practical distance for transport of GNF between storage and the receiving crop
- The daily maximum amount of water that can be irrigated onto a crop is regulated and depends on soil type, slope and the crop being irrigated

- Irrigation should be applied based on proper irrigation scheduling to avoid secondary runoff
- Standard irrigation equipment is sufficient if available, or portable irrigation systems may be used

Application of nursery irrigation runoff water to a biofuel crop

Land application is a low cost, closed management option for dealing with GNF so it closes the *environmental* loop. Nutrients are beneficially used for crop production, so it closes the *nutrient* loop. If the alternative crop can be harvested as biomass and facilities exist for producing energy from it, it may also help close the *energy* loop.

Figure 1: Irrigation of feedwater onto a young *Miscanthus* biofuel crop

To demonstrate how the environmental, nutrient and energy loops on an operation could be closed, irrigation of container nursery feedwater onto a biofuel crop was demonstrated (Figure 1, 2). The yields from the experimental crop described above approached 14 tonnes per hectare for the second year crop. Literature suggests yields of up to 20 dry tonnes are feasible for fully mature crops. One dry tonne yields an estimated energy value of 17-18.5 GJ.

Figure 2: Mature biofuel crop

Who can use this management option?

- Greenhouse operations that have access to suitable land and crops
- Operations that need to get rid of a proportion of GNF due to issues of build up of limiters such as salts
- Operations with concerns over pathogen issues
- Operational waters that meet the GNF criteria as set out in the regulations but cannot be recirculated
- Operations that need to empty and clean fertilizer tanks at the end of a crop cycle
- Operations that normally recirculate but require a contingency plan

Further Reading

OMAFRA: Applying greenhouse nutrient feedwater on agricultural land
http://www.omafra.gov.on.ca/english/nm/regs/gnfpro/gnfland.htm

https://www.nutrientmanagement.ca/directories/nutrient-management-consultants/

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Funding for this project has been provided by Agriculture and Agri-Food Canada through the Canadian Agricultural Adaptation Program (2014-2019).

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

The research team acknowledges the support of OMAFRA. The views expressed in this factsheet are the views of the research team and do not necessarily reflect those of OMAFRA.