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HAL R&D project number: VG13045

Project VG13045 is searching for potential future chemical and cultural alternatives for the soil fumigant Metham Sodium.

- **Biogas generation feasibility study.**

HAL R&D project number: VG13049

Project VG13049 is investigating the feasibility of biogas projects on vegetable farms for Horticulture Australia.

Identification of Potential Alternatives to Metham Sodium.

Facilitators:

Project VG13045 is being conducted by Project Leader Dr Doris Blaesing, from RM Consulting Group, and team.

Introduction

Metham Sodium (MS) is a soil fumigant that is used broadly to control pests such as nematodes, symphylids, soil-inhabiting insects and other soil borne pests. Under ideal operating conditions, MS's broad spectrum and long-lasting effects have made it a product of choice for growers, where alternative methods have not proven to offer a cost effective replacement for adequate control of target organisms.

As the primary breakdown product of MS is methyl isothiocyanate (MITC) - an active agent with a high toxicity - the product can have considerable environmental impacts and cannot be part of an Integrated Crop Protection (ICP) approach. Human health impacts are also a concern. In the United States, MS is listed as a carcinogen and development toxicant.

At the farm level, overuse of MS has been found to cause enhanced biodegradation in a number of cases and studies. Along with a number of older pesticide products, the longevity of MS is not certain, meaning commercially viable alternatives need to be introduced.

About the project

With a focus on carrot production for export, Project VG13045 aims to identify and prioritise current and potential future chemical and non-chemical alternatives for MS, including a cost/benefit analysis of the likely alternatives for growers. Considered will be the economic imperatives, human safety and environmental sustainability of different solutions, so that the true costs and impacts can be assessed.

"There are several objectives driving the research, the main of which is determining whether there are similar crop protection options (in terms of cost and effectiveness) that farmers can use as an alternative to MS," Project Leader Doris Blaesing, from RM Consulting Group, said.

"A component of this includes investigating how other industries deal with MS (which has been undertaken as part of the project's desktop review), along with a review of the international situation, MS alternatives and risk management options, such as DNA soil testing."

"The emphasis has to be on providing alternative management strategies to overcome the increasingly limited chemical options available for growers."

Dr Blaesing said while MS could provide a remedy for severely diseased sites as a pre-plant soil treatment, it was unable to discriminate between the 'good' and 'bad' soil organisms. While some soil critters can bounce back after fumigation with MS, earthworms will be eliminated and the soil microbial population will be altered.

Major Findings

With the project's consultation phase being finalised, Dr Blaesing and her research team are close to providing a set of recommendations for Australian vegetable growers to implement.

"The alternatives we are currently looking at are 'gentler' chemical products which are not only safer to people, plants and the environment, but more targeted in their approach," she said.

"For this to be a viable option, growers need know which pests and diseases they are dealing with and how great the risk of marketable yield loss is. Unfortunately, there are limited predictive tools available at the moment to assess risks. However, new technologies such as DNA testing are a possibility for the future."

Dr Blaesing said that in order for vegetable growers to reap the most benefits from alternative products, they should combine them with practices such as crop rotation and the use of biofumigation crops.

"In an ideal world, vegetable growers would take a break from planting the same crop in the same the soil for about four years to control pests and diseases with less pesticides. Ironically, consumer demand for high quality, uniform products at low prices may have driven the use of MS, because this demand led to specialised intensified production systems with little

opportunities for crop rotation or breaks to manage pests and diseases."

"If growers are still using MS, they should be supported to do this as safely as possible," she said.

Conclusion

Dr Blaesing said alternatives were not just simple replacements of MS but "the integration of several management methods in an integrated crop protection (ICP) approach".

"Even though ICP principles are the same for all vegetables, using a combination of cultural and protective methods, individual management programs need to be tailored to each crop, variety and growing condition."

"The cost versus profit margins and growers' experiences and preferences will also influence the approach. Unfortunately, there isn't a 'one fits all' solution - growers must select what best suits them, based on recommendations and their own experiences."

THE BOTTOM LINE: VG13045

- Australian vegetable growers, contractors and their advisers should be better supported in the safe use of fumigants. Access to information on alternative cultural methods should also be provided.
- Soil test based risk assessments for major vegetable crops and the major soil borne diseases affecting these should be developed.
- Opportunities of registration of alternative pesticides should be explored.

Acknowledgements

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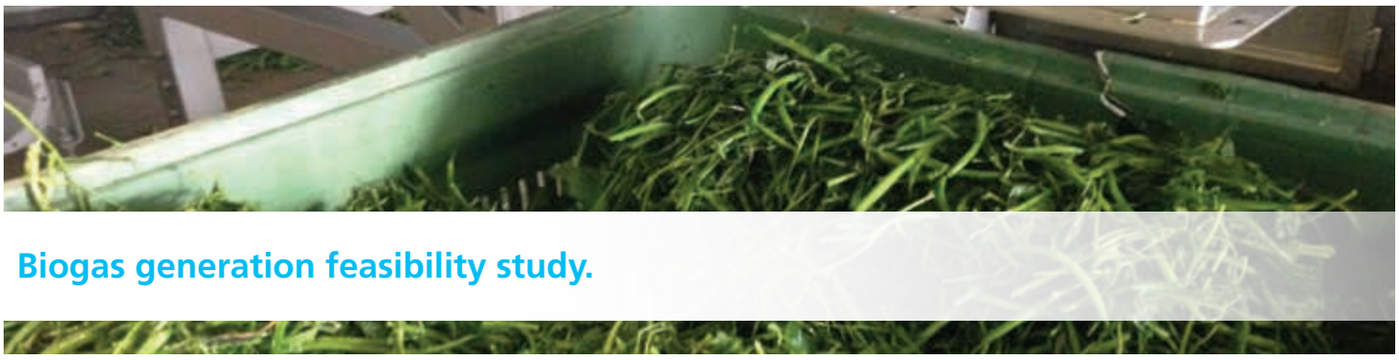

Biogas generation feasibility study.

Facilitators:

Project VG13049 is being conducted by Project Leader Dr Anne-Maree Boland, from RM Consulting Group, and team, in partnership with Marsden Jacob Associates and Alison Kelly Consulting.

Introduction

Once considered uneconomic for vegetable farms, preliminary research suggests that on-farm electricity generation through Anaerobic Digestion (AD) and the production of biogas could prove viable for larger properties. AD is a process by which organic matter, such as vegetable and animal wastes, is broken down by microorganisms in an enclosed vessel. The microorganisms feed on the organic materials to produce methane, which is converted into electricity using a generator, heat and carbon dioxide (biogas) – a source of renewable energy.

AD systems typically operate at the farm (or processing plant) scale using on-site waste streams, or at a centralised scale incorporating large volumes of waste from multiple sources. Their use has been demonstrated on properties where current waste disposal is costly, or in situations where there is no revenue being generated by vegetable waste management.

About the project

RM Consulting Group (RMCG) has been commissioned by Horticulture Australia Limited (HAL) to investigate the feasibility of on-farm electricity generation from vegetable waste.

Project Economist Kym Whiteoak said the rationale driving the project was "to look at how large volumes of waste could be disposed of, or managed, in the least costly way for farmers across a range of vegetable commodities".

"Whether you are allocating waste to neighbouring farms or setting up waste disposals in feedlots, every waste management system comes with its own costs and management issues, which can create added strain for farmers."

"Although some research points to the viability of AD for larger farms, this project aims to further understand under what conditions biogas may be feasible for the generation of electricity."

"Biogas is often most cost-effective when it contributes to solving a costly or time-consuming waste management problem, which is why we are interested in understanding the scale of the problem and any barriers to implementing biogas generation on-farm," he said.

The project team has undertaken an initial desktop review of available literature and technical information, and preliminary consultation with industry.

Mr Whiteoak said a feasibility assessment framework was being developed that would allow vegetable growers to make an educated decision on the economic, technical and operation benefits, as well as equipment availability and implementation barriers, of introducing an AD facility into their production system.

"The framework considers a number of factors that could influence the viability of the technology, including volume and type of waste, energy consumption on-farm, likely power saving

benefits and other logistics."

"Answers to these questions will contribute to determining whether the technology stacks up from a business perspective," he stated.

Mr Whiteoak said a key part of the project was the assessment of biogas feasibility case studies.

"This will allow us to test our feasibility framework on-farm, and enable those growers to get a better sense of the conditions necessary to make biogas generation a possibility for their operations."

"Potentially, these case studies will be used as a communication tool for the broader industry," he said.

Preliminary findings

The initial desktop review, consultation with industry and modelling has uncovered four factors that govern the favourable conditions for on-farm electricity generation through AD.

"The main factors to consider are scale of operation (the unit cost of energy tends to decrease with size), crop type (high energy crops such as sweet corn produce more electricity per tonne than crops like lettuce which are mostly composed of water), high and consistent energy (AD is typically set to match baseline energy use) and logistics (including high existing waste management costs and the ability to source additional consistent waste volumes, among others)," Mr Whiteoak said.

Further consultation with the AD industry and individual farm businesses is now required to better understand the parameters and assumptions involved in determining the feasibility of biogas. The feasibility study will be completed by May 2014.

Conclusion

"We think biogas generation could be feasible for larger farms with an input volume above 20 tonnes a day but probably not for farms below this input volume," Mr Whiteoak said.

He said while it would be technically possible for farmers to operate their own biogas plant, they could also consider "clustered" models whereby waste volumes are combined and costs are shared among two or more neighbouring farms.

"Larger, regional clusters could also potentially incorporate a variety of different waste streams."

"Operations at this scale might require full-time management and would need detailed management arrangements for digestate use," he said.

THE BOTTOM LINE: VG13049

- Biogas will not be a viable option for every farm, particularly smaller operations.
- It appears more likely to be viable for larger farms with high-energy crops, high-cost waste management and high electricity use.

Acknowledgements

This project is funded through HAL by the National Vegetable Levy with matched funds from the Australian Government.

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