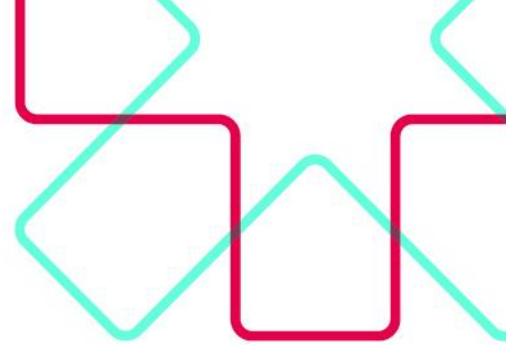# MARTIN JENKINS

STAKEHOLDERS IN METHYL BROMIDE REDUCTION (STIMBR) – PRIMARY GROWTH PARTNERSHIP PROGRAMME

Final Report

Public report on evaluation of progress toward outcomes

18 February 2015

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EXECUTIVE SUMMARY

Introduction

In October 2014 MartinJenkins was contracted as independent evaluators of the Stakeholders in Methyl Bromide Reduction (STIMBR) Primary Growth Partnership (PGP) programme for the Ministry for Primary Industries (MPI). The purpose of the evaluation was to examine progress towards the programme's intended outcomes and key barriers and enablers to achieving outcomes, and to identify lessons learned. Interviews were conducted with eight key stakeholders, and programme documentation was reviewed. This report documents the evaluation findings.

Background

In 2011 MPI approved co-investment of $1.2 million in the STIMBR PGP programme (total budget $2.4 million). The programme was designed to explore and implement sustainable treatments as alternatives to methyl bromide, for New Zealand's export forest and horticulture sector products and as a quarantine treatment for imported goods. Key drivers for this PGP programme were the need to meet a deadline imposed by the Environmental Protection Authority (EPA) over release of methyl bromide, and protecting New Zealand's trade with export partners.

The programme comprised five research-based work-streams, each involving a number of sub-projects, to be completed over a 5 year period. These timeframes were later accelerated to two-and-three-quarter years when the opportunity to deliver a more tightly focused work programme was identified. The PGP programme was completed in June 2014. An agreement was made that STIMBR would complete the programme's outputs in a timely manner with their own resources.

Key findings

Outcomes achieved

- Protecting New Zealand's forestry exports by finding alternative treatments to methyl bromide, or by discovering methods for the management of methyl bromide emissions, were priority outcomes for industry. The STIMBR PGP programme design was comprehensive, scientifically rigorous, and capable of addressing these outcomes.

- The programme made good progress in achieving its research objectives within the life of the PGP contract. Contracted milestones were all completed by June 2014. STIMBR is continuing its programme of work outside of PGP, and is receiving MBIE funding for work on sustainable alternatives to current fumigants.

- Full achievement of work-stream objectives is not expected until 2016, and in some cases has been hindered by a lack of time and funding. As a flow on from this, not all of the contractual outputs (also due in 2016) have yet been fully achieved, although good progress has been made.

- Most of the programme's stated short-term outcomes involve end products being industry ready. Progress toward outcomes is slower than anticipated, largely because trials have not yet been completed, meaning that outputs cannot yet be developed to a point where they are ready for

uptake by industry, and that it is not yet appropriate to promote findings and outputs to potential industry users, which is a fundamental step to achieving the intended outcomes.

- The programme has resulted in three key unintended outcomes:
    - STIMBR has been strengthened as an industry body, with the PGP programme enhancing STIMBR's programme management and governance, and facilitating sector collaboration. This is consistent with the intended short-term outcome for the PGP as a whole.
    - By eliminating a range of options, the STIMBR PGP programme focussed ongoing work to identify a solution that allows methyl bromide users to meet the 2020 EPA regulations.
    - It has contributed to the knowledge base on the range of phytosanitary treatments available for use within primary industry, and resulted in some noteworthy technological innovation.

Enablers and barriers

- A key enabler of the programme is stakeholder buy-in. Motivation to identify a solution that allows methyl bromide users to meet the 2020 EPA regulations is strong across industry.
- The main challenges to achieving the programme's intended outcomes within the anticipated timeframes were:
    - The programme's exploratory nature, and the indirect nature of intended economic benefits, resulting in path to market and economic outcomes being long-term goals.
    - A degree of misalignment between the programme's activities and its intended outcomes, with monitoring focused on activities more so than outcomes.
    - Challenges within programme management and governance, particularly during the initial business planning stage, resulted in an under-estimation of the activity, time and budget required to achieve intended outcomes. Both STIMBR's systems and MPI's requirements evolved over the course of the PGP programme.

Next steps

- The programme has revealed there are few viable alternatives to methyl bromide. Both STIMBR and the forestry industry share a strong commitment to achieving the programme's outcomes by 2016. As a result of the PGP investment, the pathway to doing so is now clearer, and STIMBR is a stronger, more cohesive industry body focused on pursuing a solution.

Value of investment

- Considering its contributions to enhanced sector collaboration, the knowledge base on phytosanitary treatments, and the potential risks to high value export trade and to the environment arising from the continued use of methyl bromide, our conclusion is that the PGP investment was necessary and in justifiable proportion to the gains achieved.

Lessons learned

As a formative investment, the STIMBR PGP programme has provided a useful learning tool for MPI and industry. Key lessons, many of which have already been addressed by MPI, include:

- That clear guidance for industry partners on PGP requirements (eg criteria, reporting, monitoring, business planning) at the outset may reduce administrative and programme management challenges.

- The need for co-investors to fully consider programme implementation risks and mitigation strategies as well as commercial and technical risks.

- That MPI may wish to seek expert advice on specialised and exploratory research programmes; particularly on the likelihood that programme activities and outputs can achieve intended short and medium-term outcomes within agreed timeframes, and that programme risks have been fully explored. Where programmes are exploratory in nature, and intended economic benefits are long term, there may be challenges in achieving path-to-market outcomes within PGP timeframes.

- The need for industry investors to demonstrate sound governance and management structures and processes, to ensure that management and governance are delivered by separate bodies.

- The importance of strong relationships between MPI and co-investors to support not only programme implementation, but business planning and, in some cases, proposal development.

- Requirements for sound links between programme activities, outputs and outcomes through the early development of a programme logic model.

- The potential for engaging interested government and industry bodies early in the life of the programme, both to inform programme development and ensure interested parties are aware of programmes from the beginning.

BACKGROUND

Primary Growth Partnership (PGP)

The Primary Growth Partnership (PGP) was established as a 2009 Budget initiative by the then Ministry of Agriculture and Forestry. PGP programmes are intended to boost the economic growth and sustainability of New Zealand's primary industries by matching private sector partners in market-led investments into innovative and knowledge creating activities.

STIMBR PGP programme

Context for STIMBR PGP investment

Forestry is New Zealand's third largest export sector behind dairy and meat, with forestry products earning an estimated $4.8 billion in the year ending 30 September 2014. Top markets for forestry products include China, Australia, South Korea, South East Asia and Japan[2]. India is also an active market. China, South Korea, Japan and India purchase 99 per cent[3] of New Zealand's unprocessed export logs due to lower processing costs in those countries. Phytosanitary treatment of export forestry and other primary sector products is required to eliminate biosecurity threats and to meet importing countries' quarantine standards.

Use of methyl bromide: the regulatory environment

Methyl bromide is a highly effective phytosanitary treatment used for raw logs, timber and other primary products. It is also an ozone depleting substance, as recognised by the Montreal Protocol on Ozone Depleting Substances[4].

Since 2002, countries have had to report annually on methyl bromide use for both quarantine and phytosanitary (QPS) and non-QPS purposes. In developed countries such as New Zealand, methyl bromide is used for QPS purposes; non-QPS uses have been phased out. Some EEC countries have banned QPS use in those countries.

In 2010, New Zealand's Environmental Protection Authority (EPA) completed a reassessment of methyl bromide[5] and introduced new requirements, with a 2020 deadline for all methyl bromide to be recaptured. This was driven by an increased use of methyl bromide as log exports increased, and by public concerns about the potentially adverse effects of the fumigant. While this is a domestic regulatory requirement, not having technologies available to manage methyl bromide emissions may have repercussions for industry by limiting exports. This could result in a significant economic loss to

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[2]   Statistics New Zealand and Ministry for Primary Industries, Situation and Outlook for Primary Industries (2014).

[3]   MPI exports data, email communication MPI, 3 February 2015.

[4]   Ozone Secretariat, United Nations Environment Programme (2000). The Montreal Protocol on Substances that Deplete the Ozone Layer.

[5]   Environmental Risk Management Authority Decision (2010). Application for the Reassessment of a Hazardous Substance under Section 63 of the Hazardous Substances and New Organisms Act 1996: Name of substances: Methyl bromide and formulated substances containing methyl bromide.

New Zealand, as well as negatively impacting international perceptions of New Zealand's primary export sector.

STIMBR

Established in 2008, the group known as Stakeholders in Methyl Bromide Reduction (STIMBR) represents a range of organisation and individuals (forestry companies, ports, fumigation treatment companies, and the horticulture industry) who have a common interest in seeking alternatives to managing methyl bromide emissions.

STIMBR manages a broad programme of research and other activities that assist in meeting the desired outcomes for methyl bromide. STIMBR has partnerships with MPI, the University of Canterbury, Plant and Food Research and Scion (the latter two are Crown Research Institutes). In 2011 the Ministry for Primary Industries (MPI) co-invested, through PGP, in a programme of work led by STIMBR.

Key drivers of the STIMBR PGP programme were the need to meet the EPA's 2020 deadline and to identify suitable alternative phytosanitary treatments for methyl bromide.

STIMBR PGP programme structure

The STIMBR PGP programme was designed to explore and implement sustainable treatments (as alternatives to methyl bromide) for New Zealand's exported forest and other primary sector products. The vision behind the STIMBR PGP programme was to:

> *"…protect the value of New Zealand's primary produce export sector by facilitating the development of alternative options for negotiating and meeting overseas countries phytosanitary requirements with respect to exports of logs, sawn timber and other wood products (the sector with the highest use of methyl bromide) without reliance on methyl bromide (in full or in part).We aim to do this by 2015".* [6]

The programme was expected to contribute to the outcomes described in the STIMBR PGP Outcome Logic' (see Appendix 1). The short-term desired outcomes are shown in Table 1, which also shows the originally contracted outputs.

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[6]   STIMBR PGP Agreement (2011).

Table 1:   STIMBR PGP programme short-term outcomes (2013-2018)

Short-term outcome (2013-2018)	Contracted outputs (by 2016)
Robust data proves efficacy of alternative treatment options.	By 2016 efficacy data for at least one alternative to methyl bromide will be available for [MPI] to use in market access negotiations.
Alternative non fumigants are identified that are efficient, cost effective, and minimise environmental impacts and health concerns.	By 2016 at least one alternative treatment to methyl bromide will be available for forestry and horticultural produce.
Greater local and global awareness of methyl bromide alternatives, and willingness to accept changes.	By 2016 at least one alternative treatment to protect New Zealand's border will be available to treat imported products.
Alternative treatments, best practice technologies and processes are increasingly used where appropriate.	By 2016 efficacy data supporting a rationalization of the treatment requirements for methyl bromide will have been made available to [MPI] to use in trade negotiations.
Improved fumigant safety monitoring and reporting.	By 2016 new tools to apply to components of the product pathway will be available to increase the pathway security for use in one forest and one horticultural product.
Effective technologies and infrastructure developed to reduce methyl bromide emissions.	By 2016 a dispersion model, revised monitoring protocols and national monitoring recording data base will be in use.

Source: STIMBR Outcome Logic, 2014 (Appendix 1), and STIMBR PGP Agreement (Contract), 2014.

It was expected these outputs would be achieved as a result of the STIMBR PGP programme activities (see Table 2). The programme was coordinated by a research director appointed by STIMBR.

Table 2:   STIMBR PGP work-streams/objectives, milestones and project leads

Work-stream/Objective	Milestone (activity or sub-project)	Project leads
1.1 Improving use, control and acceptability of phosphine as an alternative to methyl bromide	Develop technology for remote monitoring and control of phosphine concentration during in transit fumigation	Genera
	Determine efficacy of cylinderised phosphine treatment for selected plant and pest species	Plant & Food Research/Zespri
	Obtain efficacy data acceptable to trading partners	Plant & Food Research
1.2 Alternative fumigants other than phosphine (3 sub-projects)	Efficacy trials on new fumigants for forest exports, especially EDN and Mel and new volatiles for kiwifruit exports	Plant & Food Research
1.3 Fumigation monitoring and modelling	Fumigation monitoring	Sinclair Knight Merz
	Fumigation dispersion modelling	Scion
1.4 Reducing methyl bromide emissions	Rationalising methyl bromide application rates	Plant & Food Research
	Methyl bromide destruction using chemical catalytic treatments and/or oxidative catalysis	Aurecon
	Methyl bromide destruction using thermal oxidation	Aurecon
	Methyl bromide carbon recapture	Genera
1.5 Non-fumigant risk management	Pest risk reduction trial	Scion
	Proof of concept joule heating logs	University of Canterbury & Scion
	Pathway risk management and secure pathway strategies (2 projects)	Scion

The research programme also included an 'intellectual assault' workshop, bringing together subject-matter experts to consider the programme approach, identify key priorities and offer recommendations for future research.

The STIMBR PGP programme was originally designed to be conducted over five years, with output completion by 2016. On STIMBR's initiation, timeframes were accelerated part-way through the PGP programme, with the contract finishing in June 2014. The original outputs and work-stream/objectives were retained; however, achievement of these and some of their associated milestones now fall outside of the STIMBR PGP contract.

STIMBR has undertaken to complete these work-streams using its own resources although neither these resources not timeframes for completion have been secured. Achievement of short-term outcomes is reliant on outputs (Table 1) being achieved.

EVALUATION APPROACH

MPI contracted MartinJenkins in October 2014 to evaluate the STIMBR PGP programme, specifically to examine:

- Progress towards delivering the programme's intended outcomes, any unintended outcomes, and the programme's overall value (was the programme worth it?).
- Key barriers or enablers to achieving outcomes.
- Lessons learned, to inform the management and development of PGP.

Evaluation data

The data used for assessments of the effectiveness of programme implementation and the programme's progress towards (short- and medium-term) outcomes are described below.

The following documents were reviewed

- STIMBR PGP initial business case (November 2010)
- MPI comment on initial business case (November 2010)
- PGP agreement between MPI and STIMBR (the contract), inclusive of a revised business plan (September 2011)
- STIMBR PGP intervention logic model
- Annual reports (2012/13 and 2013/14)
- Variation of contract and accompanying MPI memorandum (May 2014)
- End of programme report by co-investors (June 2014)

Stakeholder interviews

Interviews were conducted with eight key stakeholders. This included a mix of representatives from the forestry sector, industry co-investors, MPI, and the Investment Advisory Panel (IAP). The questions covered the following key themes: programme design; implementation and outputs; outcomes achieved; lessons learned; and value of the investment and future investment.

Limitations

The participants interviewed for the evaluation represented bodies that were co-investors to the programme (STIMBR, MPI) or had been involved in decision-making around PGP investment (IAP); all had an interest in the success of the programme. In scoping the evaluation, MPI required participants to be drawn from a group who had an informed position on the STIMBR PGP programme, and who could provide sufficient information to contribute to an evaluation of the programme's outcomes. Interviews with independent experts and full cost-benefit analysis were outside the scope of the evaluation.

OUTCOMES ACHIEVED

The STIMBR PGP programme has made good progress in achieving its objectives and outputs; further steps are necessary to achieve intended outcomes by 2016. The programme has had positive, unintended outcomes for industry.

Evaluation participants agreed that the priority outcome for STIMBR PGP was to find a solution to enable methyl bromide users to meet the 2020 EPA regulations – either by identifying alternative treatment methods, or by discovering methods for capturing and destroying methyl bromide emissions at the end of a fumigation. While this outcome has not yet been achieved, good progress has been made in narrowing the range of science-based options. It appears likely that there is no single solution to replace the use of methyl bromide as a phytosanitary treatment.

The following sections take a systematic approach to evaluating progress towards the programme's intended outcomes by evaluating:

- Progress in achieving the programme's activities (referred to as work-streams, objectives, milestones and milestone achievement measures).

- Progress in achieving programme outputs and outcomes at June 2014.

STIMBR has now completed all of the milestones within the STIMBR PGP variation of agreement (2014). The remaining work largely comprises further efficacy studies, or other work (eg techno-economic assessments) to enable alternatives to methyl bromide and recapture/recycle technologies to become industry-ready. This work is now outside of the scope of the STIMBR PGP programme.

Progress towards achievement of programme activities by 2016

To date, good progress has been made in completing activities within the STIMBR PGP programme work-streams.

Evaluation participants identified the following as important achievements within work-streams:

- Notable progress was made in the phosphine work-stream to develop efficacy data-sets. This work-stream was prioritised over others part-way through the programme.

- The completion of technical studies to develop an innovative recapture/recycle technology. This could allow an economic capture of methyl bromide, and reduce methyl bromide use (by reusing the recycled fumigant).

- A finding that it may be possible to reduce the treatment rate of methyl bromide by 40%. The success of this will be determined by efficacy data sets supporting the reduction, and if MPI is able to agree acceptance of the findings in market access negotiations.

- A methyl bromide plume data model which is being further refined, and has been used in discussions with Councils.

- The development of technology to breed forest insects in captivity, meaning that insects of a known age and quality are consistently available for trials, regardless of season/weather events.

Delays, where experienced, were most commonly due to a lack of time and/or lack of resources to complete work, including efficacy trials.

Progress towards achievement of outputs by 2016

Table 3 demonstrates that overall progress in achieving the programme's intended outputs by 2016 is good. Completion of outputs is contingent on completion of work-stream activities.

Table 3: Achievement of contractual outputs

Output	Contributing work-stream	Overall assessment of work-stream achievement	Has output been achieved?
By 2016 efficacy data for at least one alternative to methyl bromide will be available for [MPI] to use in market access negotiations.	1.1 Phosphine	Partially achieved: efficacy dataset partially delivered, further testing on conditions for effectiveness is underway.	**Partial progress:** efficacy data is available on some options and being further tested on others.
	1.2 Alternative fumigants	Partially achieved, awaiting efficacy testing and techno-economic assessment.	
	1.5 Non-fumigant risk management	Partially achieved: awaiting confirmation of guidelines.	
By 2016 at least one alternative treatment to methyl bromide will be available for forestry and horticultural produce.	1.1 Phosphine	Partially achieved: efficacy dataset partially delivered, further testing on conditions for effectiveness is underway.	**Partial progress:** efficacy data is available on some options and being further tested on others.
	1.2 Alternative fumigants	Partially achieved, awaiting efficacy testing and techno-economic assessment.	
	1.5 Non-fumigant risk management	Partially achieved: awaiting confirmation of guidelines.	
By 2016 at least one alternative treatment to protect New Zealand's border will be available to treat imported products.	1.1 Phosphine	Partially achieved: efficacy dataset partially delivered, further testing on conditions for effectiveness is underway.	**Partial progress:** efficacy data is available on some options and being further tested on others.
	1.2 Alternative fumigants	Partially achieved, awaiting efficacy testing and techno-economic assessment	

Output	Contributing work-stream	Overall assessment of work-stream achievement	Has output been achieved?
By 2016 efficacy data supporting a rationalization of the treatment requirements for methyl bromide will have been made available to [MPI] to use in trade negotiations.	1.4 Reduce methyl bromide emissions	Partially achieved	**Partial progress:** Awaiting efficacy dataset and commercial investment in recapture techniques.
By 2016 new tools to apply to components of the product pathway will be available to increase the pathway security for use in one forest and one horticultural product.	1.3 Fumigation monitoring and modelling	Partially achieved	**Partial progress:** New fumigation reporting system in place which meets EPA requirements. Monitoring trials are underway but as yet incomplete. Phosphine monitoring studies awaiting completion.
	1.5 Non-fumigant risk management	Partially achieved	
By 2016 a dispersion model, revised monitoring protocols and national monitoring recording data base will be in use.	1.3 Fumigation monitoring and modelling	Partially achieved	**Partial progress:** New fumigation reporting system in place which meets EPA requirements. Cannot roll out monitoring techniques until trials /outputs have been completed. Phosphine monitoring studies awaiting completion.
	1.5 Non-fumigant risk management	Partially achieved	

Achievement of intended outcomes

The outcomes described within the STIMBR PGP outcome logic (Appendix 1) include short-, medium- and long-term outcomes, and, as is common for PGP programmes, go beyond the term of the STIMBR PGP programme agreement. The outcome logic was finalised in 2014, two years after the programme started. The outcomes in the model were referred to by MPI as 'stretch goals' and would act as guidance for the remainder of the programme. Short-term outcomes are scheduled to be achieved between 2013 and 2018.

The principles behind the intervention logic suggest that programme activities and outputs will contribute to achievement of a programme's outcomes. Given that activities and outputs are yet to be achieved in full, we would not yet expect to see short- or longer-term outcomes being achieved.

Assessing progress towards these outcomes is a more complicated task, in part because the STIMBR PGP programme's work-streams and outputs are not mapped directly against the intended outcomes within the logic model. Table 4 aims to align programme activities and outputs[7] with intended outcomes and provides commentary on progress toward the programme's outcomes.

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[7] Outputs: 1. By 2016 efficacy data for at least one alternative to methyl bromide will be available for [MPI] to use in market access negotiations; 2. By 2016 at least one alternative treatment to methyl bromide will be available for forestry and horticultural produce. 3. By 2016 at least one alternative treatment to protect New Zealand's border will be available to treat imported products. 4. By 2016 efficacy data supporting a rationalization of the treatment requirements for methyl bromide will have been made available to [MPI] to use in trade negotiations. 5. By 2016 new tools to apply to components of the product pathway will be available to increase the pathway security for use in one forest and one horticultural product. 6. By 2016 a dispersion model, revised monitoring protocols and national monitoring recording data base will be in use.

Table 4:   Progress toward short-term outcomes (2013-2018) at November 2014

Short-term outcome	Contributing work-stream / objective	Progress in achieving objectives	Relevant output	Progress in achieving outputs	Progress toward short-term outcomes
Robust data proves efficacy of alternative treatment options.	1.1 Phosphine	Partially achieved: awaiting full efficacy dataset	1, 2, 3	Partially	**Partial progress:** Efficacy data is available on some options and being further tested on others.
	1.2 Alternative fumigants	Partially achieved, awaiting efficacy testing and techno-economic assessment			
	1.3 Non-fumigant	Achieved			
Alternative non fumigants are identified that are efficient, cost effective, and minimise environmental impacts and health concerns.	1.1 Phosphine	Partially achieved: awaiting full efficacy dataset	1, 2, 3	Partially	**Partial progress:** Efficacy data is available on some options; cost effectiveness and environmental assessments are partially complete.
	1.2 Alternative fumigants	Partially achieved, awaiting efficacy testing, techno-economic assessment and development of negotiation-ready datasets			
	1.3 Non-fumigant	Achieved			
Greater local and global awareness of methyl bromide alternatives, and willingness to accept changes.	1.1 Phosphine	Partially achieved	No specific indicators around improving awareness and utilisation	N/A	**Limited progress:** Trials on alternatives (phosphine efficacy trial, EDN techno-economic assessment) need to be complete before STIMBR can promote alternatives to methyl bromide.
	1.2 Alternative fumigants	Partially achieved			
	1.5 Non-fumigant	Achieved			
Alternative treatments, best practice technologies and processes are increasingly used where appropriate.	1.1 Phosphine	Partially achieved	6	Partially	**Limited progress:** Studies (phosphine efficacy trials, phosphine monitoring model, and EDN techno-economic assessment) need to be complete before STIMBR can promote their use.
	1.2 Alternative fumigants	Partially achieved			
	1.5 Non-fumigant	Achieved			
Improved fumigant safety monitoring and reporting.	1.3 Fumigation monitoring and modelling	Partially achieved	6	Partially	**Partial progress:** New fumigation reporting system in place which meets EPA requirements. Further refinement of the completed model is required by regulatory bodies.
Effective technologies and infrastructure developed to reduce methyl bromide emissions.	1.4 Reduce methyl bromide emissions	Partially achieved	4, 6	Partially	**Limited progress:** awaiting efficacy dataset and commercial investment in recapture techniques.

Outputs 1-6 are listed on the previous page.

As Table 4 demonstrates, while good progress has been made in achieving objectives and outputs, further steps are required to achieve intended outcomes by 2016. In particular, there is need to develop outputs ready for industry use, and to engage with industry users to encourage utilisation.

Several evaluation participants expressed disappointment that, by 2014, the programme had not progressed further toward the reduction and/or elimination of the use of methyl bromide as a phytosanitary treatment for export timber/logs. They generally acknowledged that the wide-ranging nature of the STIMBR PGP programme, combined with trials that delivered negative results, had resulted in expectations not being met.

> *Scientific research comes with no guarantees and in many instances the work undertaken within this programme has resulted in STIMBR gaining an understanding of what will not provide a solution to the challenge of preventing methyl bromide emissions.[8]*

Some evaluation participants suggested that, with hindsight, more basic research could have been completed before the PGP programme began, in order to identify the most promising techniques to bring through the value chain.

Overall however, they agreed that the programme had made good progress by narrowing the range of available options, and provided data on the optimal conditions for using alternatives, thereby providing a 'menu' of phytosanitary treatments.

Unintended positive outcomes

A strengthened industry body (STIMBR) and improved collaboration

Evaluation participants agreed one of the most important, if unintended outcomes of the STIMBR PGP programme was the industry body was now stronger and more disciplined. Previously, fragmentation and competition within the industry had hindered cooperative efforts towards shared goals such as reducing the impact of methyl bromide. The STIMBR PGP programme built up the sector's research capability, encouraged industry and science to leverage one another, and facilitated collaboration, eg between forestry and horticultural sectors.

All participants identified that the improved coordination within the forestry sector may in future facilitate the attraction of research funding, to the benefit of both MPI and the sector.

These 'unintended' outcomes, ie not specified within the programme's outcome logic, are consistent with the broader PGP short-term outcomes,[9] and as such, are valuable.

A more focused approach

In the early stages of the programme, teams in individual work-streams experienced disappointment as promising alternatives to methyl bromide were found to be unfeasible, either because of their lack of efficacy or high costs. This was always a technological risk and to some extent was mediated by the deliberately broad research programme designed to explore other options. As noted within the

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[8]   STIMBR Final report (2014, p3).

[9]   MPI (2013). Outcomes model for Primary Growth Partnership Fund Portfolio; http://www.mpi.govt.nz/funding-and-programmes/primary-growth-partnership/governance-and-monitoring/

STIMBR PGP programme's final report, while there were disappointments, these also helped to focus future work:

> While the removal of a potential solution can be disappointing such results narrow the field allowing funding to be placed in areas of greatest potential and informing discussions with regulators and society.[10]

By eliminating some options and working towards commercialisation of remaining options, this programme has brought STIMBR and the industry closer to conclusions about whether science can provide viable alternatives to methyl bromide.

Building the knowledge base

The programme has undertaken activities (including those not anticipated within the original research design) which have contributed to New Zealand's knowledge base about phytosanitary treatments. These include developments in insect breeding, capture and destruction technologies, and studies of the 'in-hold' environment, which were described as innovative by STIMBR and MPI stakeholders.

The STIMBR PGP programme final report suggests that this new, reliable information (in particular pertaining to the methyl bromide monitoring system, and plume dispersion monitoring) can be used to:

- provide reassurance to communities about the safe use of methyl bromide and
- inform future discussions between regulators, industry and the community
- while unintended, this outcome is also in line with the enablers identified within the broader PGP outcome logic[11], although further work is be required to enhance uptake of this knowledge.

Enablers and barriers

Stakeholder buy-in

Stakeholder buy-in continues to be one of the key enablers of the STIMBR PGP programme. STIMBR and the sector it represents appear strongly motivated to identify alternatives to methyl bromide, driven by the potential risk to forestry exports of not having treatments available that export markets (China, India, and Australia) will accept. Work toward achieving this goal is ongoing; investments in both infrastructure and an ongoing programme of research have been made by the sector and invested in by other parts of government (MBIE).

Design and intent

The STIMBR PGP programme was described by several evaluation participants as an 'unusual' PGP programme, and questions were raised about whether the original design and intent may have hindered it from achieving some of the outcomes expected from PGP programmes.[12]

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[10] STIMBR PGP programme Final Report (2014).

[11] MPI (2013). Outcomes model for Primary Growth Partnership Fund Portfolio; http://www.mpi.govt.nz/document-vault/906.

[12] The short term outcomes expected from PGP programmes are improved infrastructure, safer/more skilled workplaces, increased adoption of best practice, new, market led products, new/more profitable markets, higher/more consistent production, more efficient, predictable and consistent supply and more efficient processing. MPI (2013). Outcomes model for Primary Growth Partnership Fund Portfolio; http://www.mpi.govt.nz/funding-and-programmes/primary-growth-partnership/governance-and-monitoring/

While considered scientifically rigorous, the exploratory nature of the research programme, and the indirect nature of intended economic benefits, appears to have created challenges in achieving economic and path-to-market outcomes within expected timeframes. There is also a degree of misalignment between the programme's activities and its intended outcomes, as demonstrated within Table 4. For example, the short-term outcome of 'greater local and global awareness of methyl bromide alternatives, and willingness to accept changes' for example, has no related output and a limited number of activities within work-streams address this goal.

It is important to note that the programme was designed during PGP's formative stages, when policies and processes were under development. In response to MPI's developing requirements, the programme's outcome logic model including intended outcomes were redesigned part way through the programme. The new intended outcomes were related but more ambitious than the original outcomes; however the programme's contracted outputs and activities did not change, creating additional challenges in achieving revised outcomes[13]. Programme monitoring focused on completion of objectives and milestones over progress toward outcomes. A simpler design may have linked research activities directly to intended outcomes; identifying gaps and streamlining less directly related activities.

Programme management and governance

The most significant barriers to the programme achieving its intended goals were challenges in programme management particularly during implementation, particularly the under-estimation at the initial business planning stage of the activity, time and budget required to reach those goals. The initial business plan lacked specific detail, and failed to communicate the breadth of the work required to co-investors; additional detail was added annually. This created challenges in forward planning and keeping to a limited budget.

Scientific uncertainty also proved challenging, causing unexpected delays and expenditure. While technological risks were identified during business planning, hindsight shows these too were underestimated. The high level of risk and uncertainty in undertaking such research may result in delays and additional costs in achieving intended outcomes.

In response, STIMBR applied for two funding extensions, both of which were declined. Scion was, however, successful with an MBIE funding application that had STIMBR as the commercial investor.

STIMBR's informal governance arrangements over the period of the PGP programme created challenges for MPI when it sought to resolve concerns about whether the programme was meeting expectations. These were addressed through a close working relationship developed between MPI and the STIMBR research programme manager during the final 18 months of the programme.

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[13]   Achievement of outcomes was not within the terms of the PGP agreement, however this evaluation measures progress against the outcomes within the outcome logic model.

Next steps

Based on the work completed within the PGP programme, STIMBR has developed a five-year research strategy designed to reduce methyl bromide emissions and identify alternative phytosanitary treatments. What is less clear, however, is how this strategy will be funded. STIMBR is currently negotiating with its members about a levy increase to continue their work programme. Some areas of work are being completed with ongoing MBIE funding. There is some uncertainty, however, about the industry's willingness to fully fund this work programme without further government funding.

The programme has revealed there are few viable alternatives to methyl bromide.

Likelihood of achieving priority outcomes

It is very difficult to judge whether the programme's highest priority outcomes – the reduction and/or elimination of methyl bromide as a phytosanitary treatment for export timber – will be achieved by 2020. There are many dependencies:

- that funds can be located for specific projects
- that trials can be completed in time and with positive results
- that new technologies will be cost effective and accepted by industry
- that trade partners will accept the scientific findings and amend treatment schedules.

Although STIMBR has no further contractual obligations to MPI, they have proposed a forward plan for achieving outcomes, and is negotiating with both government and business about priorities and potential funding opportunities. This commitment, combined with a strong driver (risks to exports), creates a sound platform for ongoing progress.

Value of investment

Contributors to the evaluation considered the STIMBR PGP programme represented good value for money. Outputs and intended outcomes have not yet have been achieved; however, participants were satisfied that significant progress has been made, the pathway to meeting EPA requirements is now clearer, and STIMBR is a stronger, more cohesive industry body focused on pursuing a solution.

This last achievement, together with improved knowledge and sector collaboration, perhaps should have been amongst the programme's intended short-term outcomes. These unintended outcomes are consistent with the intentions of the broader PGP[14] and have the potential to drive the achievement of longer-term outcomes. As such they can be considered valuable programme outcomes.

Considering the potential risks to high value export trade and to the environment arising from the continued use of methyl bromide, our conclusion is that the investment was in justifiable proportion to the gains achieved. Identifying a solution to methyl bromide has potential public and private benefits. It is questionable, given the disjointed nature of the sector prior to the investment, whether such a comprehensive programme of work would have been implemented in order to achieve the EPA's 2020 deadline without investment from PGP.

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[14]   MPI (2013). Outcomes model for Primary Growth Partnership Fund Portfolio; http://www.mpi.govt.nz/funding-and-programmes/primary-growth-partnership/governance-and-monitoring/

LESSONS LEARNED

Lessons for MPI management of PGP

The following lessons can be inferred from this evaluation for the administration and oversight of PGP by MPI:

- That clear guidance for industry partners on PGP requirements (eg criteria, reporting, monitoring and business planning) at the outset may reduce administrative and programme management challenges.

- That MPI may wish to seek expert advice on specialised and exploratory research programmes; particularly on the likelihood that programme activities and outputs can achieve intended short and medium-term outcomes within agreed timeframes, and that programme risks have been fully explored. Where programmes are exploratory in nature, and intended economic benefits are long term, there may be challenges in achieving path-to-market outcomes within PGP timeframes.

- Experiences in this programme reinforce MPI's requirements that co-investors require sound governance arrangements and demonstrated experience in programme management[15].

- Ensure a good working relationship between co-investors from the start of the programme. Stronger support from MPI at the business planning stage may have helped to avoid some of the challenges this programme experienced.

- Clarify links between activities, outputs and outcomes, and monitor progress towards short, medium and longer term outcomes, in addition to programme activity. MPI now requires an outcome logic model, including measures and indicators, to be developed during business case development[16].

We note that many of these lessons are addressed in current PGP guidelines and processes. Industry participants also felt that these have become increasingly embedded in MPI practice.

Lessons for industry

Some of the lessons above can be extended to lessons for industry, both when developing proposals for and implementing PGP programmes. Industry co-investors should ensure they have fully considered programme implementation risks and mitigation strategies as well as commercial and technical risks. In some cases they may require external support in developing their business case to meet PGP requirements. Evaluation participants suggested that industry should engage end-users (eg government agencies) before or early in the life of a programme, to seek their advice and involve them in programmes from the beginning.

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[15]   MPI (2014). PGP guidelines for co-investors, version 4.1.

[16]   MPI (2014). PGP guidelines for co-investors, version 4.1.

APPENDIX 1: STIMBR OUTCOME LOGIC

Stakeholders in Methyl Bromide Reduction Research Programme - Outcome Logic Map

A collaborative STIMBR-New Zealand Government venture to find and implement sustainable treatments for NZ exported forest and other primary sector products

March 2014

Long term outcomes (NZ impact) 2016 – 2030	**Protect and grow the value of New Zealand 's primary produce export sector** (*STIMBR Vision*)	**Additional benefits** for the wider sector and government/NZ Inc
	NZ remains internationally competitive in global market / Enhanced 'clean green' international reputation for NZ / Reduced environmental and health related harms	

Medium term outcomes (Sector impact) 2013 – 2025

- Maintained and expanded market access for NZ forest and other products
- Sustainable economic growth of forestry sector, including Maori/Treaty assets
- Reduced likelihood of pest interception
- Improved environmental management of methyl bromide: NZ meets UN ozone treaty obligations & EPA's 2020 ban
- Methyl bromide emissions (per m³ logs exported) decrease. Risk of negative impacts is reduced leading to increased public reassurance
- Reduced trade risk: methyl bromide alternatives are accepted by importing countries
- Reduced export costs
- Improved sector safety
- Increased risk reduction as focused science explores promising leads

Additional benefits (continued):
- Enhanced global reputation for NZ as leading researcher in phytosanitary treatments
- Enhanced reputation for sector and NZ for biosecurity best practice standards

Short term outcomes 2013 – 2018

New & improved technologies are developed, while improving effective risk management

- Robust data proves efficacy of alternative treatment options
- Greater local and global awareness of methyl bromide alternatives, & willingness to accept changes
- Alternative treatments, best practice technologies and processes are increasingly used where appropriate
- Alternative non/fumigants are identified that are efficient, cost-effective, and minimise environmental impacts and health concerns
- Improved fumigant safety monitoring & reporting
- Effective technologies and infrastructure are developed to reduce methyl bromide emissions

- Enhanced public awareness of issues faced by (and support for) the primary industry
- Investment in new technologies creates IP and new sector income/ markets and opportunities
- Flow-on uptake of technology by other primary sectors

If the STIMBR Research programme is successful ...

Activities & Outputs 2011 – 2014

Implement a co-ordinated research [& education/awareness-raising] programme to reduce methyl bromide emissions, and provide innovative treatments for NZ forest and other primary sector products

| **Phosphine and alternative fumigants:** evaluate potential of phosphine (& other fumigants) as cost-effective alternatives to methyl bromide | **Fumigation monitoring and modelling:** refine & implement fumigant monitoring strategies to ensure continuing safe use of methyl bromide | **Reduce methyl bromide emissions:** explore emission reduction strategies, eg, reduced treatment rates or concentrations, & new methyl bromide recapture and recycling, and destruction technologies | **Non-fumigant risk management:** research ways to reduce pest presence and manage product pathway risks (from source to port), explore non-fumigant treatment options (eg, heat) | **Intellectual assault:** facilitate expert forum to generate lateral ideas & solutions |

- Capability & resource building of support sectors including the research and engineering community, expanded science knowledge base eg insect colonies for research, fumigant test matrix
- Expanded networks, collaboration and knowledge sharing across researchers and primary sector/related players (eg, forestry and other fumigant users /exporters, chemical importers)

Enablers & Inputs

- STIMBR as collaborative venture across a wide range of organisations with a common interest in reducing methyl bromide use, and finding viable alternatives
- Government and industry co-investment
- Research builds on local and international knowledge, and NZ's reputation as leader in biosecurity treatments

Problems & Opportunities

- NZ exports of forest and other products requiring phytosanitary treatment (fumigation to ensure they are pest-free) are at risk due to reliance on methyl bromide - at a time of growing international consumer demand for NZ products, especially China and India
- Increasing local and international pressure to restrict / ban methyl bromide - it is an ozone depleting substance with environmental, worker safety and perceived public health risks, eg, NZEPA ban (2020) on methyl bromide emissions
- Opportunity to create co-ordinated research into viable alternatives to methyl bromide that are cost-effective, minimise impacts, and meet or improve international export market' phytosanitary requirements