

Horticulture Innovation Australia

Final Report

Implementation Plan for Increasing Children's Vegetable Intake

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CSIRO Food and Nutrition Flagship

Project Number: VG15005

VG15005

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Executive summary

This document reports on a HIAL commissioned project (VG15005) to implement the Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (previously commissioned project VG13090).

Priority Area 1 - Collaboration

A Stakeholder Alliance including stakeholders within and outside the vegetable industry, called the Vegetable Intake Strategic Alliance (VISA) was formed. The VISA attended a one workshop (21st July 2016, Melbourne) and undertook a series of tasks including review of 10 proposed research areas (PRAs) that formed the basis of Requests for Proposals that HIAL could fund (see below) in order to address priorities to raise intake of children's vegetable intake and hence improve demand for vegetables. The PRAs were refined through discussion and were subsequently submitted to HIAL (Milestone report 103, 31st August 2016) and presented to the Consumer Alignment Committee (27th September 2016). There was a strong wish by the majority of the VISA participants to continue in an immediate, low cost way in order to maintain momentum until further funding was secured. CSIRO made recommendations to HIAL for maintaining the VISA in the short term but no response was forthcoming during the duration of this project. A specific PRA was drafted in order to seek funding for the long term maintenance of the VISA (PRA 10).

Priority Area 2 - The right initiatives and impact

In order to publish and endorse best practice guidelines for the development and implementation of new (community) initiatives, a specific PRA was drafted (PRA 1). This PRA received strong endorsement from the VISA. References were made to best practice in other PRAs and a comprehensive assessment and evaluation PRA (PRA 4) was formulated.

Priority Area 3 – Continued research into new initiatives

A series of PRAs describing initiatives that could achieve impact through multi-setting approaches were drafted, including direct industry involvement in initiatives and community and parental initiatives in order to increase exposure to vegetables. Support from the VISA was obtained for the PRAs, prioritisation was based on desirable timing, taking into account importance, potential effect and interdependencies. PRAs recommended for immediate funding are in **bold**.

PRA 1. Develop best practice guidelines for effective interventions

PRA 2. Develop an online register of initiatives

PRA 3. Review of maternal, infant and early years' dietary advice.

PRA 4. Evaluation toolkit

PRA 5. Increase intake through supply chain initiatives

PRA 6. Increase intake through community initiatives

PRA 7. Increase intake through - digital initiatives for parents/caregivers

PRA 8. New methodologies to increase intake

PRA 9. Better effectiveness measures

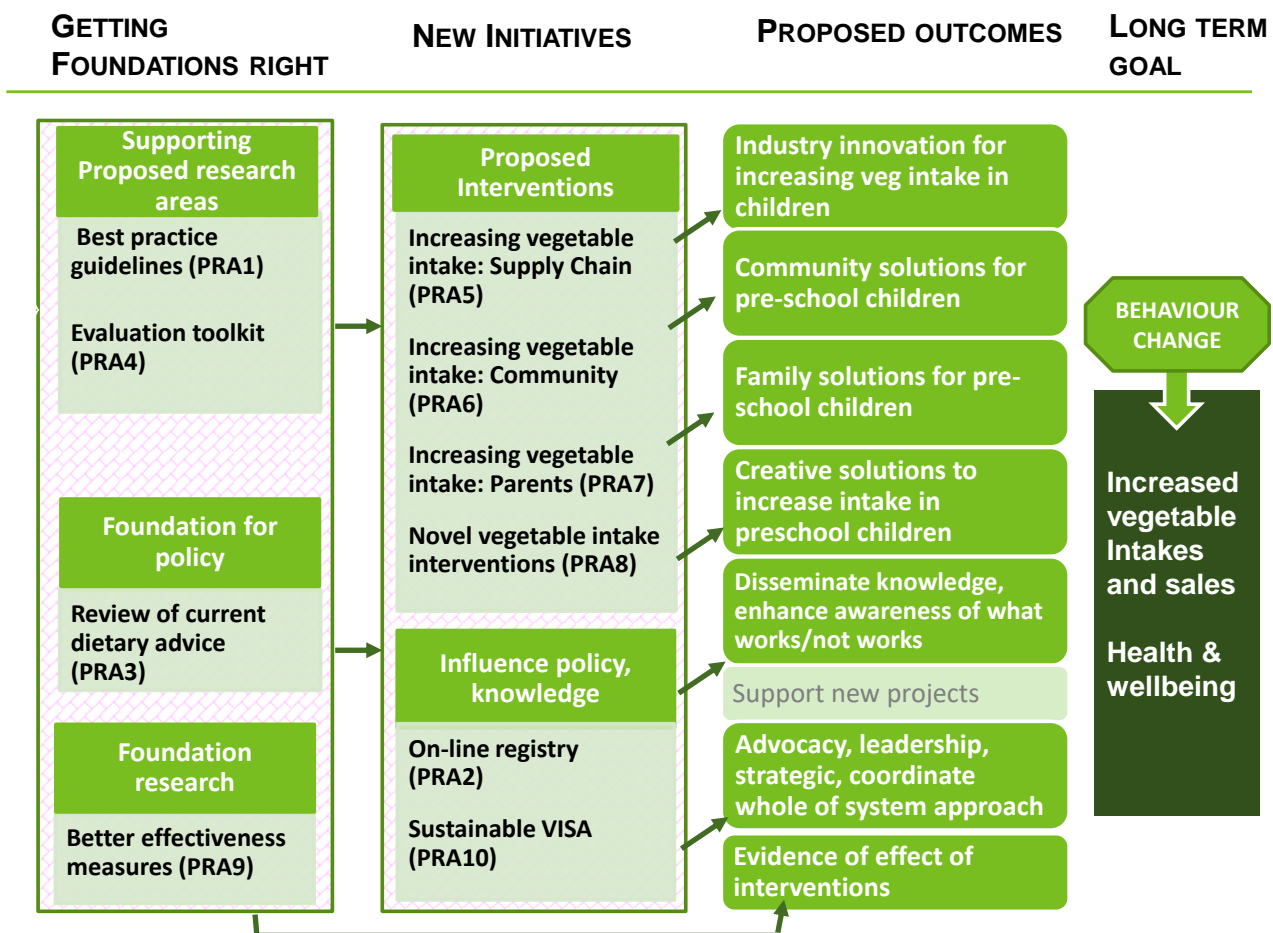
PRA 10. Extend the life of the VISA

Priority Area 4 – Influencing Policy

The potential opportunity to increase intake of vegetables through influencing policy changes took a step forward with the drafting of a PRA that sought to review maternal advice (PRA 3) currently provided and the scientific literature with a view to providing evidence for the industry to lobby for specific maternal / caregiver advice that facilitated early exposure to vegetable flavours in order to encourage consumption. Further initiatives in this area could be undertaken/discussed by the VISA.

Conclusions

A Stakeholder Alliance was formed with key representatives from various organisations that have a shared aim of increasing vegetable intake amongst children. The Proposed Research Areas were considered as important and relevant, and taking these areas to tendering in a staged fashion is recommended to meet the long term aim of the Vegetable Industry to increase vegetable demand in children. A diagram describing the inter-dependencies, independence and immediate direct output potential of the PRAs was constructed and located within an evaluation and impact framework leading to increased demand (behaviour change) and increased vegetable sales.



1 Introduction

1.1 Background

The current project was designed to implement the Strategic Investment Plan (SIP) that was developed in a previously commissioned Hort Innovation project (VG13090) for increasing vegetable intake amongst children. This project comprised a systematic review of worldwide initiatives on increasing vegetable consumption with a view to identifying initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, a consultation with key stakeholders to get their input into the effectiveness of initiatives and opportunities for collaboration, and finally a strategic investment plan (SIP) to prioritise and recommend initiatives that have some evidence of effectiveness in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way off meeting recommended vegetable intakes hence there is an opportunity for the vegetable industry to work with those pursuing public health goals.

Four Priority Areas of Recommendation were put forward and guided the form of the current implementation document:

Priority Area 1 - Collaboration

Establish a Stakeholder Alliance to include stakeholders within and outside the vegetable industry, notionally called Vegetable Intake Strategic Alliance (VISA). Develop a joint agenda and activities with stakeholders within the VISA

Priority Area 2 - The right initiatives and impact

Publish and endorse best practice guidelines for the development and implementation of new (community) initiatives.

Priority Area 3 – Continued research into new initiatives

Initiatives that achieve larger impact (greater than typical ½ serve/day increase) through multi-setting (e.g. complementing School curriculum project with home interventions) or longitudinal studies tracking early exposure through to maturity using age appropriate strategies.

Initiatives focused at peri-natal, weaning and early childhood in order to underpin specific government/health advice to (would be) mothers and fathers.

Direct industry involvement in supplying vegetables to community and school initiatives in order to increase exposure to vegetables.

Priority Area 4 – Influencing Policy

There is a potential opportunity to increase intake of vegetables through influencing policy changes. Hort Innovation could encourage the adoption of specific maternal advice and lobby for food policy in pre-school and schools settings that encourage learning to like vegetables.

1.2 Objectives of the current project were to provide:

Stakeholder Alliance Services

Formation of a Vegetable Intake Strategic Alliance (VISA), an initial meeting to review Proposed Research Areas and sustainable way for such an alliance to continue to assist with increasing demand for vegetables.

Program Development Services

A number of Proposed Research Areas (PRA) will be developed based upon the recommendations from the VG13090 SIP project, and taking into account the diverse range of stakeholders involved in increasing vegetable intake, subject to review by the VISA and refined versions presented to Hort Innovation for transformation into potential Research Funding Proposals (RFPs).

Evaluation of this Project

Regular Project Steering Committee meetings will be scheduled to facilitate open and regular correspondence with the Project Team.

Evaluation Framework and Tools for Initiatives

Within each PRA prepared by the Project Team, reference will be made to an Evaluation Framework document which will outline aspects of best practice evaluation.

2 The Vegetable Intake Strategic Alliance (VISA)

2.1 Background

CSIRO, supported by funding from Hort Innovation, developed a strategic investment plan (SIP) for the vegetable industry to increase children's consumption of vegetables (Cox et al, 2014). Hort Innovation has now commissioned CSIRO to commence the formation and implementation of this SIP with an initial focus on behavioural approaches focused at pre-school children.

One pillar of that SIP was to create a stakeholder working group notionally called the Vegetable Intake Strategic Alliance (VISA).

2.2 Purpose

The purpose of the VISA is to provide advice to Hort Innovation on how it can best support initiatives aimed at increasing vegetable intake in children.

In the short term (6-8 months), the VISA was tasked with:

1. Providing feedback and input on a series of concepts for proposed research areas (PRAs) as the basis for Requests for Proposals that Hort Innovation may potentially fund,
2. Providing feedback and input on a draft Evaluation Framework to be used for initiatives that aim to increase children's intake of vegetables
3. Sharing and learning from initiatives already established that aim to increase children's intake of vegetables
4. Advising on other future ideas and concepts for Hort Innovation to consider that will facilitate an increase in children's consumption of vegetables
5. Contributing to the development of the longer terms goals of the VISA, as well as its structure and function
6. Attending one workshop in Melbourne July 21st.

2.3 Expected Outcomes

1. 6-8 months –PRAs for increasing pre-school children's intake of vegetables will be completed by CSIRO for Hort Innovation to fund, taking into account the feedback and advice from the VISA
2. Ideas for future role and activities for longer term VISA

2.4 VISA Formation & Workshop

A workshop was held at the Park Royal Hotel, Melbourne Airport on 21st July (with a preceding dinner on the 20th). Organised by CSIRO and facilitated by Russel Rankin (of Food Innovation Partners Pty), 23 invited participants, three Hort Innovation staff and five CSIRO staff attended (see Appendix 1 for attendance list). Participants represented a wide range of stakeholders including growers, markets, retailers, food service, a seed company, produce industry organisations, nutrition NGOs, parenting NGOs, early learning organisations, VicHealth and Victorian Department of Health, Health NGOs; public health researchers and dietetics. A potential champion (Geoff Jansz), with a background in media and cuisine, was engaged by Hort Innovation. In addition, seven other stakeholders (including representatives from a parenting NGO, retail and health sectors) expressed interest but were unable to attend (see Appendix 1).

The program and objectives (agreed with the Project Steering Committee) of the workshop have been included as part of this final report (Appendix 2).

2.5 Top 3 Key Themes Raised at the Workshop

1. Initiate formation of the VISA now
2. Seek the normalisation of increased intake of vegetables in children
3. Need for multiple approaches/settings to make an impact

2.6 VISA Workshop Evaluation

A post-workshop survey (n = 16; 52% response rate) revealed positive evaluations of the workshop's objectives and activities (see Appendix 3 for the details). In summary, the majority agreed that all five objectives were met, in particular there was near universal agreement that:

- * Mutual interest was found,
- * PRAs were reviewed,
- * Contributions to a longer term plan for a VISA were made. Additionally, participants' expectations were met or exceeded.

Contributions of participants to a VISA and initiatives were expressed in the key words:

- * Evaluation
- * Access (to communities)
- * Membership
- * Design (of initiatives)
- * Facilitation
- * Partnerships
- * Support

All respondents were interested in participating in the VISA, with roughly half and half reporting medium to high capacity to provide research in the community.

As an interim VISA, a strong suggestion from the meeting, we explored the possibility of creating a low cost electronic collaboration to keep the alliance connected' (until further funding for PRA 10 was realised). It was clear that participants were not yet experienced in using electronic collaboration tools and indications of tool preferences were limited by that lack of experience. The CSIRO team sought to investigate this further.

The overwhelming response to the question of how the VISA should move forward was to build on the current momentum rapidly and create a space for collaboration, communication and strategic guidance. Clearly there is great enthusiasm amongst participants to initiate and sustain a VISA. The Full VISA workshop evaluation can be found in Appendix 3.

However, whilst recommendations for continuing the momentum of VISA were made to HIAL, no further action or funding were forthcoming from HIAL within the timeframe of this current project.

2.7 VISA Workshop: Refinement of Priority PRA's

Workshop participants' opinions were sought on 10 PRAs (drafted by the CSIRO Project Team) through pre-workshop assessment tasks, group discussion and follow-up evaluation (on line survey). These PRAs are listed below:

PRA 1. Develop best practice guidelines for effective interventions

PRA 2. Develop an online register of initiatives

PRA 3. Review of maternal, infant and early years' dietary advice.

PRA 4. Evaluation toolkit

PRA 5. Increase intake through supply chain initiatives

PRA 6. Increase intake through community initiatives

PRA 7. Increase intake through digital initiatives for parents/caregivers

PRA 8. New methodologies to increase intake

PRA 9. Better effectiveness measures

PRA 10. Extend the life of the VISA (Terms of Reference, purpose; funding; role etc.).

It was deemed by the VISA that all drafted PRAs were relevant to increasing vegetable intake in children, and in general these PRAs covered what the VISA saw as important areas to increase vegetable consumption amongst children, although some new areas were also proposed. There was considerable discussion on two PRAs, of which the need/potential was queried:

* PRA9 Better measures – it was suggested that sufficient measures were already available. However, upon review of these resources these were not applicable to many of the contexts (childcare etc..) where vegetable consumption can potentially be applied. Therefore, the background/justification of this PRA was strengthened

* PRA 8 Novel methods – it was suggested that some of the proposed methods were difficult to translate/implement larger scale. Therefore, this PRA has been revised to focus on interventions with good translational opportunities.

Taking into account feedback received, the CSIRO team has drafted "final" versions of all PRAs (Appendix 4).

Prioritisation of the PRAs by VISA members obviously reflects common as well as individual interests. The vegetable industry has common as well as their own individual interests; therefore CSIRO has provided recommendations and justification for RFP priorities. These recommendations take the VISA prioritisation into account, as well as consider dependencies and independencies of the PRAs, as well as the vegetable industry interests. (See appendix 4)

The top 6 are:

PRA 1. Develop best practice guidelines for effective interventions

PRA 2. Develop an online register of initiatives

PRA 3. Review of maternal, infant and early years' dietary advice.

PRA 5. Increase intake through supply chain initiatives

PRA 6. Increase intake through community initiatives

PRA 10. Extend the life of the VISA

3 Final Proposed Research Area's (PRAs)

3.1 PRA 1: Develop Best Practice guidelines for Effective Interventions

Title: Develop best practice guidelines for effective interventions.

About the research

Background / introduction

A Hort Innovation commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). It comprised of a systematic review of worldwide initiatives on increasing vegetable consumption with a view to identifying initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, a consultation with key stakeholders to get their input into the effectiveness of initiatives and opportunities for collaboration and a strategic investment plan (SIP) to prioritise and recommend initiatives that have some evidence of effectiveness in increasing vegetable consumption in children.

As part of the SIP a systematic review (Hendrie et al, 2016) was undertaken to identify the intervention strategies (quality, duration, intensity, setting, age etc.) and Behavioural Change Techniques (BCTs) used in interventions that led to an increase in vegetable intake in children. The review focused upon published studies targeting children aged 2-12 years and focused on interventions delivered in the home or community settings (including community centres, childcare centres, kindergartens, afterschool care settings and internet based programs) with a measurement of effect upon usual intake of vegetables. Furthermore the Australian context suggested that such settings (i.e. outside of schools) would be an efficient way of reaching young children.

For each study included in the review a set of intervention delivery and design components (including the Behavioural Change Techniques (BCTs) used) were coded. A list of these intervention components can be found in Appendix 5.1.1. This enabled the identification of specific intervention components and BCTs that were associated with an increase in vegetable intake. A summary table of the specific intervention components found to be associated with effectiveness are given in Appendix 5.1.2.

Those intervention components and BCTs identified as being associated with effectively influencing vegetable intake will form the basis of the best practice guidelines and will be required to be translated into implementable strategies tailored for each stakeholder group.

Objectives

- Develop and translate best practice guidelines into implementable strategies tailored to meet the needs of each key stakeholder or setting
- Develop promotional, educational, engagement and evaluation tools for each of the key stakeholders, including, but not limited to, possibly using a Registry tool (see PRA#2) and/or ongoing Vegetable Intake Strategic Alliance (VISA) (see PRA #10)
- Engagement with key stakeholders and dissemination of best practice guidelines and their associated implementable strategies

- Undertake a workshop that shares best practice from vegetable initiatives and other relevant domains (what can be learnt from other experiences and applied to vegetable intake initiatives). Seek to refine best practice empirically and construct a theory of dietary change initiatives.

Overview of the activities

Key activities include the review of recent evidence and updating of best practice guidelines as well as the translation of best practice guidelines into implementable strategies tailored for each of the key stakeholder sectors. The best practice guidelines and implantable strategies will be need to be developed and tailored for each key stakeholder into promotional and educational tools to facilitate stakeholder engagement and the dissemination and publication of the best practice guidelines.

Details

1.1 Review and update best practice findings.

- Review and evaluate published studies since 2014 using the same framework criteria as Hendrie et al (2016). Consider including the grey / unpublished literature when outcomes were evaluated using validated measures.
- Update changes to best practice guidelines specified in the SIP.
- Engage with seek to understand the view and needs of each stakeholder including (but not restricted to) childcare and preschools, home environments, before/after-school cares, community groups, NGOs, retailers, Health Departments, health promotion practitioners and researchers

1.2 Develop & translate best practice guidelines for differing stakeholders.

- Create a framework that can be used by Hort Innovation as criteria for judging the quality of proposals
- Develop best practice guidelines for differing settings and stakeholders including (but not restricted to) childcare and preschools, home environments, before/after-school cares, community groups, NGOs, retailers, Health Departments, health promotion practitioners and researchers
- Translate the best practice guidelines into implementable strategies that are tailored for the differing needs and environments of each of the above stakeholders.

1.3 Development of best practice guidelines promotional tools.

- Develop promotional, educational, evaluation and engagement tools (e.g. website, apps, pamphlets, education kits and resources etc.) for each key stakeholder.

1.4 Stakeholder engagement, publication & disseminate of best practice guidelines.

- Develop an engagement, publicity and dissemination plan for each of the above listed stakeholder categories. Within each category consider and target the individual stakeholders likely to have the broadest reach and influence in the area of increasing children's vegetable intakes.
- Engage with individual target stakeholders within each category and disseminate best practice guidelines
- Use the VISA and Registry of Initiatives and other possible communication channels to promote the guidelines
- Seek to refine best practice and draft a working document that contributes to constructing a theory of dietary change initiatives.

1.5 Stakeholder feedback and evaluation.

- Seek evaluation and feedback information from each stakeholder regarding, but not restricted to, the ease of use, applicability, uptake and success of the best practice guidelines and the newly developed associated implementable strategies
- Update the best practice implementable strategies based upon this feedback.

Measures of success

- Adoption and implementation by key stakeholders across states and territories of best practice guidelines and their associated implementable strategies
- Feedback and evaluation from key stakeholders that guidelines and implementable strategies are useful, applicable, easily implemented and successful
- Publication of a synthesis of best practice in a high quality, peer reviewed open access journal.

Suggested timelines:

12 months minimum depending on scope

References:

Abraham C. & Michie S. (2008) A taxonomy of behaviour change techniques used in interventions. *Health Psychology* 27, 379–387.

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. *VG13090 Final Report to Horticulture Innovation Australia*.

Hendrie, G.A., Lease, H.J., Bowen, J., Baird, D.L. & Cox, D.N. (2016). Strategies to increase children's vegetable intake in home and community settings: a systematic review of literature. *Maternal & Child Nutrition*, doi: [10.1111/mcn.12276](https://doi.org/10.1111/mcn.12276).

Michie S., Ashford S., Sniehotta F.F., Dombrowski S.U., Bishop A. & French D.P. (2011) A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: The CALO-RE taxonomy. *Psychology & Health* 26, 1479–1498.

Thomas B., Ciliska D., Dobbins M. & Micucci S. (2004a) A process for systematically reviewing the literature: providing the research evidence for public health nursing interventions. *Worldview Evidence Based Nursing* 1, 176–184.

APPENDIX 5.1.1

For each study included in the review, the following intervention components were coded:

1. Intervention intensity: Encompassing duration of intervention, contact with intervention, type/level of contact (ranging from policy or no face-to-face to group to individual contact) and reach (number of settings targeted).
2. Study Quality: Scored eight components (selection bias, study design, confounders, blinding, data collection methods, withdrawals and drop outs, intervention integrity and analyses) using the Effective Public Health Practice Project Quality Assessment Tool (Thomas et al., 2004).
3. Behaviour Change Techniques: Coded using the 40 standardised definitions outlined in the CALO-RE taxonomy of BCTs (Michie et al., 2011; Abraham & Michie, 2008). Six additional categories were added to the original taxonomy to account for unique, recurring techniques used in the study interventions.

APPENDIX 5.1.2

The following table summarises (1) the intervention delivery and design components and (2) the behaviour changes techniques associated with effective initiatives

Intervention Design & Delivery Components Associated with Effectiveness	
Target Group	Children aged 2-6 years Intervention messages can target children, parent or family as a whole
Setting	Using community groups and educational institutions with integration into the home environment
Intervention Target	Whole of diet: Vegetables within the context of a prudent diet
Level of Contact	High frequency of contact required but can be lower intensity, such as group based activities and newsletters
Behavioural Change Techniques Associated with Effectiveness	
Associated with both long & short term behaviour change	Plan social support and/or social change
Associated with short term behaviour change	Action planning Set graded tasks Teach to use prompts and cues Use of animal stories as role modelling (if age appropriate) Prompt practice
Associated with longer term behaviour change	Provide staff training Provide information or training on when and where to eat vegetables Change availability and accessibility
Commonly used amongst studies but evidence not well established	Use of exposure techniques Provision of information on the consequences of behaviour in general and to the individual Provide instruction on how to perform the behaviour Goal setting Provision of resources
Intervention Evaluation	
Measurement of outcome	Need for validated and comprehensive measure of vegetable intake with long term follow-up up (6 months or more)

3.2 PRA 2: Online Register of Initiatives

Title: Online Register of Initiatives

About the Research

A Hort Innovation commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). It comprised of a systematic review of worldwide initiatives on increasing vegetable consumption with a view to identifying initiatives that have been shown to be effective. As well as, identify gaps and opportunities for new initiatives, a consultation with key stakeholders to get their input into the effectiveness of initiatives and opportunities for collaboration, and a strategic investment plan (SIP) to prioritise and recommend initiatives that have some evidence of effectiveness in increasing vegetable consumption in children. Additionally a second review of the 'grey' literature focused on Australian community interventions and programs.

Evidence of a large degree of inadequacy and inconsistency of program evaluation and reporting in Australia was found. A key issue observed amongst both scientific studies and community initiatives was the lack of evidence informing the program's design at the outset. Many community based programs and initiatives were developed and rolled out in isolation without consultation or sharing of knowledge and expertise between program staff. Similarly there was a lack of adequate consistent, and in many cases non-existent, outcome evaluations to enable comparison of effectiveness between programs and informing best practice guidelines. The key issues observed in the outcome evaluations included: lack of consistency between objectives and outcome measures, usefulness of those measures, no clear performance markers to evaluate, data difficult to interpret or not provided, evaluations based on anecdotal evidence, inappropriate timing of evaluations and lack of follow-up to assess any sustained effect and, in many cases, no evaluation plan at all.

In the current financial climate funding cuts have resulted in the cessation of many public health nutrition programs. Therefore it is important that future programs are evidence- based, well planned, collaborative and appropriately evaluated in order to demonstrate their value. Furthermore there are likely to be efficiency and productivity gains if learnings and effective methodologies are shared. There is a need to develop an online system or registry of Australian initiatives and interventions aimed at increasing vegetable consumption in children in order to promote scientific best practice and effectiveness, avoid duplication of research activities, promote collaboration and provide a framework for evaluation.

Objectives

- Review and evaluate other registries and repositories' in this and associated domains (e.g. The Grey Literature Report (USA) and QIPPS, COOPS (in Australia)) for the purpose of informing the actual setup of the registry
- Review currently available software (including, but not limited to, Microsoft Dynamics, SharePoint, and QIPPS) or develop suitable technology that can house an on-line registry of stakeholder initiatives
- Develop a framework or template for the recording of objectives, design, primary outcome measures and evaluation summaries of stakeholders' initiatives (with reference to PRA#1 and PRA#4)
- Recommend options for, and implementation of promotional activities and engagement tools (e.g. newsletters, dissemination of current findings etc.) to encourage usage of the Registry among a wide range of stakeholders and maximise its long-term use with program and research staff
- Identify options and make recommendations for the long term maintenance and up-keep of the registry, including who would be best placed to take responsibility (including, but not limited to,

Hort Innovation or an alliance of stakeholders) with reference to an ongoing Vegetable Intake Strategic Alliance (VISA) see PRA#10

- Create options for industry access and usage.

Overview of the activities

With the main aim to setup and launch an online registry of Australian Initiatives, activities will include identification of a suitable program tool to house the registry of initiatives, which allows for uploading of external program and research information and devising an evaluation framework tool that can be used by researchers and community staff to evaluate their program. Furthermore the work will be aimed at promoting its use among community, research staff and other stakeholders and maintaining the registry in the long term. The aim is for this registry to be a key collaborative tool to promote best practice in terms of effectiveness.

Details

2.1 Review current and past registries.

- Review and evaluate other worldwide registries & repositories (e.g., The Grey Literature Report (in the US) and COOPs, QIPPS (in Australia) and ACAORN)
- Identify factors that contributed to the demise or cessation of past registries
- Identify factors or characteristics of registries that are successfully maintained that could assist in the development and maintenance of the proposed Registry.

2.2 Review available software.

- Review, evaluate and recommend currently available software that could house an on-line registry of initiatives or develop suitable technology.

2.3 Registry Setup & Maintenance.

- Using the above information, set up an online registry of Australian scientific and community dietary and public health initiatives, that encompasses the developed evaluation framework, as per (PRA #4). Consider including IT expertise on a regular long term basis to both set up and maintain the registry and provide support to the users
- Consider collaborating with other international registries for information sharing

2.4 Promotion of tool and engagement with stakeholders.

- Develop promotional tools to build knowledge and awareness of the registry's existence and encourage uptake of membership among a wide range of stakeholders
- Develop promotional and engagement tools (e.g., newsletters, dissemination of current findings etc.) to maintain current registry members and maximise its long-term use and effectiveness among stakeholders.

2.5 Evaluation of registry.

- Evaluate registry for usefulness, usage, limitations, feasibility, ease of use, and costs of options.

Measures of success

- Widespread uptake and usage of the registry/repository amongst stakeholders, including community program and research leaders
- The registry/repository becomes the gold standard for reporting and evaluating an initiative, program or research study in terms of measuring its effect on vegetable intake and other associated markers
- Registry members give positive feedback and provide sufficient evidence of the registry's usefulness so as to lead to investment in its long-term maintenance and existence as a tool to be used by stakeholders into the future

- Long-term membership and usage of the registry amongst a wide range of initiatives
- Recognition by industry of value.

Suggested timeframe:

2 years to get it started and 5-10 years maintenance funding essential

References:

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. *VG13090 Final Report to Horticulture Innovation Australia.*

3.3 PRA 3: Review of Maternal, Infant & Early Years Dietary Advice

Title: Review of maternal, infant and early years' dietary advice.

About the research

A Hort Innovation commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake among children (Cox et al, 2015). It comprised of a systematic review of worldwide initiatives on increasing vegetable consumption with a view to identifying initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, a consultation with key stakeholders to get their input into the effectiveness of initiatives and opportunities for collaboration and a strategic investment plan (SIP) to prioritise and recommend initiatives that have some evidence of effectiveness in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way from meeting recommended vegetable intakes hence there is an opportunity for the vegetable industry to work with those pursuing public health goals. There are 3 stages where a mother/carer has an opportunity to influence her child's later food preferences and dietary habits (Nehring et al, 2015):

1. Prenatally during pregnancy

There is a body of scientific evidence that flavour transfer from the mother's diet in pregnancy (through amniotic fluid to the foetus) and through lactation (to the infant) facilitates liking of vegetable flavours and subsequent consumption in later life. Specific maternal advice to consume vegetables is required; however dietary advice is often lacking in specifics, explicit purpose and practical guidelines. For example, the Australian Dietary Guidelines, whilst recommending "plenty of vegetables of different colour" during pregnancy do not convey information about flavour transfer and subsequent improved liking by the infant.

2. Postnatally during breast feeding

Whilst breastfeeding is strongly encouraged; the importance of breast milk as a foundation for developing an infant's taste palette and the establishment of food preferences (particularly vegetables) and dietary habits into childhood and beyond is not mentioned.

3. Weaning stage

Weaning provides another opportunity with a wealth of literature and initiatives and yet specific advice may be lacking. Furthermore there is evidence that parents do not persist with exposure for long enough and struggle to cope with their infant's initial refusal to eat foods such as vegetables. Guidance is needed on how to cope with this. Initiatives including, but not limited to, the Australian NOURISH and INFANT (Daniels et al, 2009; Hesketh et al, 2013) and a European initiative HABEAT (www.Habeat.eu), may help to provide some aspects of specific guidance.

Similarly early learning settings, (pre-schools) are further opportunities for learning to like vegetables and yet there is evidence that various initiatives, dietary recommendations and policies may have fallen into disuse, are not monitored nor rewarded (at least in some Australian states). Anecdotal and unpublished evidence suggests that many pre-schools and childcares want and see value in setting specific dietary standards, menu guidelines and assessments. Since the termination of many government funded programs (e.g. Start Right Eat Right in SA) childcare and early education centres no longer have the guideline support to enable them to construct their menus in a way that ensures the children receive optimal vegetable exposure at the most opportune time. The National Quality Standards (<http://www.acecqa.gov.au/>) and licensing require that a weekly menu must be displayed for parents to see but lack specific dietary guidelines that set the minimum nutrition requirements for each meal/eating occasion (e.g. minimum number of serves of vegetables). Current Quality Standards in regards to dietary guidelines are extremely general and lack specificity, tangibility and measurability and hence are difficult to implement and monitor. Quality Standards are implemented at State level, however, resource allocation and their

interpretation and implementation varies. Overall there are many potential opportunities to increase intake of vegetables through understanding current dietary standards and advice (policy) in parental (maternal), early learning and child care settings and recommending changes that are evidence based, specific and measureable. Such an evidence base would enable Hort Innovation and other stakeholders to lobby for specific maternal advice and specific food policy in pre-school / child care settings that promotes vegetable consumption.

Objectives

- Review current dietary recommendations and scientific evidence at each life stage (peri-natal, lactation, weaning and pre-school) for opportunities to encourage vegetable consumption
- Make recommendations for amendments to advice to include evidence on flavour transfer through amniotic fluid and breastmilk
- Make recommendations for amendments to parental advice to include evidence that weaning is an opportunity
- Make evidence based recommendations for amendments to 'early years' food policies that have measurable impact upon children's vegetable consumption
- Engage with Department of Health and appropriate expert committees responsible for drafting advice and recommendations and other stakeholders (including DAA, AMA and Parenting NGOs).

Overview of activities

Undertake reviews of current policy for dietary recommendations for peri-natal, breastfeeding and weaning and current scientific evidence for flavour transfer and exposure that may facilitate vegetable consumption. Similarly undertake reviews of current policy for dietary recommendations in pre-school and child care settings and current scientific evidence for exposure that may facilitate vegetable consumption.

Details

3.1 Undertake a series of reviews that compare current recommendations with scientific evidence at each life stage (peri-natal, lactation, weaning and pre-school), specifically:

- Review current Australian (and state variations) dietary recommendations during pregnancy and lactation
- Review scientific evidence for opportunities for flavour transfer during (1) pregnancy (amniotic fluid transfer) and (2) breast feeding to facilitate infants and children's acceptance and consumption of vegetables
- Review current Australian (and state variations) dietary recommendations at weaning stage
- Review scientific evidence for opportunities for vegetable exposure at weaning that facilitates infants' acceptance and consumption of vegetables
- Review current Australian (and state variations) dietary recommendation guidelines and quality standards for early years childhood education (e.g. pre-school and child care)
- Review scientific evidence for opportunities for vegetable exposure at pre-school/childcare that facilitates infants' acceptance and consumption of vegetables.

N.B. In all reviews and recommendations, take allergies and food safety (e.g. choking hazards) into consideration.

3.2 Recommendations and amendments

- Make recommendations for amendments to advice to include evidence that pregnancy (peri-natal) and lactation are windows of opportunity to transfer flavours of vegetables via amniotic fluid and breast-milk from the mother to the foetus or infant thus facilitating acceptance of vegetable flavours by the child at weaning and later life

- Make recommendations for amendments to parental advice to include evidence that weaning is an opportunity to facilitate exposure, acceptance and consumption of vegetables in infancy and in later life. Amendments should include specific parental instructions and explicit guidelines
- Make recommendations for amendments to 'early years' food policies; Align with childhood 'early years' policy (Federal Govt. policies) and provide evidence in order to arm potential lobby groups for specific implementation of 'early years' food and menu policy, standards and guidelines across all centres (e.g. National Quality Standards) and other childhood policies that have a measurable impact upon children's vegetable consumption.

3.3 Engagement and Evaluation

- Engage with authorities and stakeholders including but not limited to policy makers in the Department of Health, appropriate expert committees, expert groups (e.g. DAA and AMA) and stakeholders (e.g. Parenting NGOs, midwives, fertility specialists, obstetricians, GPs)
- Seek to amend the midwifery curriculum
- Seek to amend high school sex education curriculum
- Consider linking messages to existing nutritional advice (folate) and in particular focus on positive messages that seek to skill parents and give them confidence rather than making them feel guilty
- Submit a summary report of reviews to key stakeholders and decision makers for comment and feedback. Include such comment and feedback in a follow up report
- Quantify impact on vegetable demand at various levels of adoption (high, medium and low) of revised policy specifically targeting vegetable intake in pre-school and child care settings.

Measures of success

- Reviews drafted and available in such a form as can be used to lobby for change through appropriate channels / institutions (possible link to Vegetable Intake Strategic Alliance)
- Adoption and implementation by all States and territories of specific dietary advice at all early life stages (peri natal, breastfeeding, weaning) that details opportunities for flavour transfer and effective exposure (including dealing with refusal) facilitating consumption of vegetables
- Adoption and implementation by all states and territories of tangible, specific dietary guidelines or standards that can be monitored, evaluated and rewarded in pre-school and early child care settings that facilitate the consumption of vegetables
- Reviews published in high impact open access peer reviewed journals.

Suggested Time frame:

- 12 months for review, 5 years to implementation and policy changes

References:

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. *VG13090 Final Report to Horticulture Innovation Australia*.

Daniels, L. A., Magarey, A., Battistutta, D., Nicholson, J. M., Farrell, A., Davidson, G., & Cleghorn, G. (2009). The NOURISH randomised control trial: positive feeding practices and food preferences in early childhood-a primary prevention program for childhood obesity. *BMC public health*, 9(1), 1.

Hesketh, K. D., Campbell, K., Salmon, J., McNaughton, S. A., McCallum, Z., Cameron, A., & Crawford, D. (2013). The Melbourne infant feeding, activity and nutrition trial (InFANT) program follow-up. *Contemporary clinical trials*, 34(1), 145-151.

Nehring, I., Kostka, T., von Kries, R., & Rehfuss, E. A. (2015). Impacts of In Utero and Early Infant Taste Experiences on Later Taste Acceptance: A Systematic Review. *The Journal of Nutrition*, 145(6), 1271-1279.

3.4 PRA 4 Evaluation Toolkit

Title: Develop an evaluation toolkit for interventions aiming to increase vegetable intake in children

About the research

A Hort Innovation commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). It comprised of a systematic review of worldwide initiatives on increasing vegetable consumption with a view to identifying initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, a consultation with key stakeholders to get their input into the effectiveness of initiatives and opportunities for collaboration, and a strategic investment plan (SIP) to prioritise and recommend initiatives that have some evidence of effectiveness in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way from meeting recommended vegetable intakes hence there is an opportunity for the vegetable industry to work with those pursuing public health goals.

All initiatives need to show evidence of effect because continued support is vulnerable when effect cannot be demonstrated. For example, community initiatives have lacked evaluations of effect (Cox et al, 2015) resulting in cessation of funding in some states, e.g. South Australia (McCann report, 2012). All initiatives need to be evaluated to determine what works and what does not. This is an imperative from both an economic and a social 'moral' perspective in order not to waste valuable resources.

As part of another Hort Innovation commissioned project (VG 15005), an Evaluation Framework was developed that integrated the inputs, the indicative activities of 10 relevant Proposed Research Areas (PRAs) that relate to increasing the vegetable intake amongst children, some indicative outputs, some proposed short and medium term outcomes and longer term impacts. Each of the PRAs will have clearly articulated objectives that align with achieving the desired outcomes and longer term impacts. Consistent measures used for evaluation provides comparability across different interventions in different settings.

More specific evaluation criteria need to be developed so that they can be used (as appropriate) across all the PRAs to ensure Hort Innovation can measure the outcomes and impact of the body of work that is addressed across the 10 PRAs. The settings, confounding factors (e.g. SES), types of data (quantitative, qualitative), control/comparison groups or settings and how data are to be analysed will also need to be considered.

Objectives

- Update the Evaluation Framework (as needed) to ensure that planned outputs and outcomes are captured and aligned across the PRAs
- Develop a series of recommended validated evaluation criteria (Evaluation Tool Kit for Increasing vegetable intake in children) that can be used across all PRAs relevant to increasing the intake of vegetables in children
- Disseminate this Framework and Set of Evaluation Criteria to the VISA and other stakeholders.

Overview of the activities

Activities will include updating of the Evaluation Framework (as needed) and development of the Evaluation Tool Kit based on the agreed activities for the other 9 PRAs. The settings/stakeholders relevant to this activity need to be part of the consideration and could include preschool/childcare directors, day-care providers, CYWHS, Long Day Care Directors, parents, children, family members, P&C/P&F Committees, retailers, growers.

Details

4.1 Develop a guiding set of principles for conducting evaluation of interventions

Examples include – evaluation measures aligning to the objectives of the intervention, undertaking measures shorter term and sustained changes of vegetable intake, use of a comparison group, taking measures pre- and post-intervention, collect information on known and potential confounders, feasibility of administration in different settings by different partners in a project.

4.2 Develop user-friendly logic model frameworks for different types of interventions in different settings (including community, home, education, care providers, food supply)

- Define the impact desired and outcomes being sought for each of the intervention settings

4.3 Develop recommended measures to be used for evaluation of intervention projects, including process evaluation and short to longer term outcomes

Using the logic model frameworks developed in 4.2, develop recommended measures of evaluation across the path to impact. Recommendations should be based on measures that have evidence of being validated in each setting for given target ages (e.g. 2-6 years and children <12yrs). Consideration needs to be given to measures that are responsive to shorter term interventions. Whenever possible, efforts should be made to include long term follow-up (3 – 6 months post-intervention) of usual vegetable intake by validated quantitative measures. Indicative examples are given below for some key domains to be considered.

- Intake of vegetables or sales/purchases of vegetables (quantitative)
- Process evaluation of an intervention program (e.g. resource uptake, evaluation of program by participants, drop-outs, level of engagement of key stakeholders etc.)
- Include documentation of behavioural change taxonomy (Michie et al, 2011) and appropriate amendments in order to determine “what” works (refer to PRA #1 Best Practice and Hendrie et al, 2015)
- Shorter term ‘facilitating’ outcomes: Knowledge, attitudes, beliefs, behaviours, neophobia (including vegetable purchasing as facilitating exposure)
- Environmental changes (i.e. as facilitators or barriers) that may significantly impact on children’s consumption of vegetables (e.g. accessibility, cost)
- Measures of known confounders that are known to be associated with different vegetable intakes (e.g. SES, family structure, parenting style, feeding style, family functioning etc.)

4.4 Control/comparisons & data analyses

- Review the existing PRAs and make recommendations on the most appropriate control/comparison groups/community (e.g. RCT for a clinical trial, matched control groups for cohort studies, quasi experimental approach in community)
- Make recommendations on the most appropriate pre- and post-intervention measures, analyses and inclusion of key confounders/co-factors and longer term follow-up (as appropriate).

4.5 Finalise the Evaluation Toolkit and disseminate to stakeholders

- Update the Evaluation Framework as needed
- Finalise the Evaluation Toolkit, including the Evaluation Framework, logic models, recommended measures etc. and disseminate this to key stakeholders

4.6 Evaluation of the project

- Evaluation is part of each PRA prepared by Hort Innovation
- Evaluation Tool Kit and the (modified) Evaluation Framework is adopted by Hort Innovation, the proposed Vegetable Intake Strategic Alliance (VISA) (links to PRA 10) and a future Registry of initiatives (links to PRA #2)

Measures of success

- Every Hort Innovation project that is undertaken prepares and implements an evaluation plan using appropriate and best-practice criteria and reports on the effectiveness of the initiative. A final report (or peer-reviewed publication) is included in the on-line registry for wider dissemination
- Evaluation Framework and the ToolKit becomes the gold standard framework for measuring the impact of national interventions with the goal of increasing vegetable intake in children in Australia
- High quality scientific evidence is developed around effective intervention strategies to increase the intake of vegetables in children and to inform funding bodies where they should invest.

References:

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. *VG13090 Final Report to Horticulture Innovation Australia*.

Hendrie, G.A., Lease, H.J., Bowen, J., Baird, D.L. & Cox, D.N. (2016). Strategies to increase children's vegetable intake in home and community settings: a systematic review of literature. *Maternal & Child Nutrition*, doi: 10.1111/mcn.12276.

McCann, W. (2012). Review of non-hospital based services: Office of Public Employment and Review, Government of South Australia.

Michie S., Ashford S., Sniehotta F.F., Dombrowski S.U., Bishop A. & French D.P. (2011) A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: The CALO-RE taxonomy. *Psychology & Health* 26, 1479–1498.

3.5 PRA 5: Increasing Children's Vegetable Intake through Supply Chain Partners

Title: Increasing vegetable intake amongst children through supply chain partners

About the research

The Vegetable Industry has recognised that increasing vegetable intake amongst children is a sustainable way to increase longer term demand for vegetables. A Hort Innovations commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). As part of this project, a systematic review of worldwide initiatives on increasing vegetable consumption was undertaken with a view to identify initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, and consultation with key stakeholders was undertaken. The developed Strategic Investment Plan (SIP) prioritised and recommended initiatives for which evidence of effectiveness is available in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way from meeting recommended vegetable intakes. Hence the vegetable industry, its supply chain partners and organisations with public health goals have a common interest in increasing vegetable demand amongst children.

This Proposed Research Area (PRA) is aimed at initiatives from industry partners to increase vegetable intake in children through supply chain initiatives. Whilst children are not responsible for household grocery shopping, there is evidence that parents (indirectly) take their children's preferences into account when making family purchasing decisions. Children can also have a more direct influence on the decision making process on family food purchases, depending on the food and food category (De Bourdeaudhuij and Paulette Van Oost, 1998, Kümpel Nørgaard et al, 2007).

Objectives

- To undertake a scientific literature review of studies to increase vegetable acceptance and intake in children through manipulation of variables under control of the supply chain
- To undertake a scientific study that aims to increase vegetable acceptance and intake in children through manipulation of any (combination of) variables in control of the supply chain of vegetables (e.g. sensory properties, preparation, presentation, packaging)
- To demonstrate clear pathways for commercial adoption of results in the actual supply chain
- Provide recommendations for further opportunities to increase vegetable acceptance and intake amongst children using supply chain initiatives
- To publish the results of the study in a high quality open access peer reviewed journal
- To disseminate findings to a wide range of vegetable industry stakeholders, and make recommendations for further usage.

Overview of the activities

A collaboration between a supply chain partner (e.g. vegetable processor, retailer, seed manufacturer) and a research organisation (e.g. university, research institute) is envisaged to ensure that commercial viability and path to adoption as well as scientific evidence of intended outcomes are all met.

Activities will include the design and/or production of products with improved intrinsic or extrinsic product properties, or an 'intervention campaign' at the supply chain level to increase acceptance and intake of vegetables amongst children. A few examples are provided however these examples should not be seen as limiting:

- Examples of intrinsic attributes could be an improvement of sensory properties of vegetables to meet children's preferences, through changing the product attributes itself or matching with other products (meals, dips...)

- Examples of extrinsic attributes could be convenience, packaging or presentation that change the child's expectations and predispose them to be more willing to taste vegetables
- Examples of supply chain interventions could be a promotion campaign, opening of new channels for vegetable provision to children, finding champions to promote vegetable intake.

The designed product or intervention will be evaluated in a scientific study for effectiveness, and results will be communicated, disseminated and be made adoption-ready. The product or intervention should be aimed at younger children (including primary school age).

Details

5.1 Review barriers to innovation in the vegetable product space (consider international examples as well as local)

5.2 Design of the product/campaign and preparations

- Undertake a literature review that summarises the scientific evidence (and grey literature) of successful interventions/product manipulations at the supply chain stakeholder level, and indicate whether these provide high quality evidence that these have been successful in increasing acceptance, intake or both
- Design/produce the product, campaign or intervention, using evidence based best practice
- Design a controlled trial that measures the effect of the designed product/campaign/intervention on children's acceptance and intake of vegetables
- Undertake ethical approvals for research with children as needed.

5.3 Undertake the scientific evaluation of effect

- Undertake research with the target population using a adequately powered design
- Outcome measures should include a validated measure of consumption (e.g. intake, consumption) and include a longer term measurement (e.g. repeated intake or a follow up validated measurement of usual intake of vegetables, 3 – 6 months post-test).

5.4 Evaluation and dissemination

- Evaluate the product/intervention against comparable initiatives for size of effect and recommend areas for optimisation
- Evaluate for usage, limitations, feasibility, ease of use, costs relative to alternatives, adoption readiness
- Evaluate the performance of the project and the project team, advisory group and relationship with stakeholders
- Publish results in a peer-reviewed open access journal with high impact, and disseminate to vegetable industry stakeholders.

Measures of success

- The new product/packaging/intervention has a demonstrated significant, substantial and lasting effect on increasing intake of vegetables amongst children
- The new product/packaging/intervention increases vegetable acceptance amongst children
- Adoption of the new product/packaging/intervention is already ongoing, or clear and feasible pathways for large scale adoption are available.

Additional opportunities to pursue the overall objective have been identified for other supply chain partners or initiatives.

Suggested time frame: 3-5 years

References:

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. *VG13090 Final Report to Horticulture Innovation Australia*.

De Bourdeaudhuij, I., & Van Oost, P. (1998). Family members' influence on decision making about food: differences in perception and relationship with healthy eating. *American journal of health promotion*, 13(2), 73-81.

Kümpel Nørgaard, M., Bruns, K., Haudrup Christensen, P., & Romero Mikkelsen, M. (2007). Children's influence on and participation in the family decision process during food buying. *Young Consumers*, 8(3), 197-216.

3.6 PRA 6: Increasing Vegetable Intake through Community Settings

Title: Increasing vegetable intake through community settings interventions

About the research

The Vegetable Industry has recognised that increasing vegetable intake amongst children is a sustainable way to increase longer term demand for vegetables. A Hort Innovations commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). As part of this project, a systematic review of worldwide initiatives on increasing vegetable consumption was undertaken with a view to identify initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, and consultation with key stakeholders was undertaken. The developed Strategic Investment Plan (SIP) prioritised and recommended initiatives for which evidence of effectiveness is available in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way from meeting recommended vegetable intakes. Hence the vegetable industry, its supply chain partners and organisations with public health goals have a common interest in increasing vegetable demand amongst children.

This Proposed Research Area (PRA) is aimed at initiatives from stakeholders to increase vegetable intake in children through a relevant community intervention. Vegetable intake in children is affected by many factors including availability and accessibility, educational level of the mother, food preferences, socio-economic status and preparation skills (Blanchette & Brug, 2005, Brug et al, 2008, Burchett, 2003, Rasmussen et al, 2006). Sensory acceptance of vegetables is a key driver of intake in children, in particular as they tend not to respond to health messages positively. There is an abundance of scientific literature on increasing vegetable acceptance in children, however its effects on overall vegetable intake are less well understood. Moreover, there is a lack of translation from scientific evidence into community interventions that have widespread impact.

Objectives

- To undertake a controlled trial that aims to increase vegetable acceptance and intake in children through a community intervention
- To demonstrate clear pathways for larger scale roll-out of the developed intervention including the partners involved in such roll-out
- Provide recommendations for further opportunities to increase vegetable acceptance and intake amongst children using community interventions
- To publish the results of the study in a high quality open access peer reviewed journal
- To disseminate findings to a wide range of vegetable industry stakeholders and make recommendations for further usage.

Overview of the activities

This PRA seeks to determine the effectiveness of a new community intervention on vegetable acceptance and intake in children. The intervention can be either a newly established community intervention based on sound evidence and/or theoretical framework, an existing intervention that is currently not yet operating in Australia, or an existing intervention applied to a different setting/region. Out of scope for this PRA are existing interventions currently operating in Australia which currently lack scientific validation (these could be addressed in another PRA such as 2: Online Registry/Repository of initiatives).

The intervention needs to be an actual community intervention (ideally targeting multiple settings within the community), therefore, no laboratory based interventions will be considered. Although measurements of effectiveness can be assessed in a laboratory environment if needed.

The intervention will be evaluated in a controlled trial for effectiveness in achieving sustained changes in vegetable intake, and results will be communicated, disseminated and be made adoption-ready.

Research proposals need to take the scientific evidence and recommendations from the SIP review (VG13090, Cox et al, 2015) and resulting peer-reviewed publication (Hendrie et al, 2016) into account and address how these recommendations have been incorporated in the study. In particular, interventions in pre-schools and /or pre-school age childcare are strongly encouraged.

Details

6.1 Design of the intervention

- Design or adapt an evidence-based community intervention that aims to increase vegetable acceptance and intake in children.
- The design should consider extension and continuity in the community including:
- Consider in any design the capacity (or other priorities) of any community institution to deliver the intervention into the future.
- Consider accreditation type incentives for community organisations to take part (eg meeting minimum servings of veg per day)
- Train the trainer type format (or chain reaction teaching) e.g., one school teaches another.
-
- Design a scientifically robust study that measures the effect of the intervention on children's acceptance and intake of vegetables
- Undertake ethical approvals for research with children and/or parents as needed. 6.2 Undertake the scientific evaluation of effect
- Undertake research with the target population using a adequately powered design
- Outcome measures should include a validated measure of consumption (e.g. intake, biomarker of consumption) and include a longer term measurement (a follow up validated measurement of usual intake of vegetables, 3 – 6 months post-test).

6.3 Evaluation and dissemination

- Evaluate the intervention against comparable initiatives for size of effect, and recommend areas for optimisation
- Evaluate for usage, limitations, feasibility, ease of use, costs relative to alternatives, adoption readiness, cost/benefit analysis
- Evaluate the performance of the project and the project team, advisory group and relationship with stakeholders
- Publish results in a peer-reviewed open access journal with high impact, and disseminate to vegetable industry and other stakeholders.

Measures of success

- The community intervention has a demonstrated significant, substantial and sustainable effect on increasing intake of vegetables amongst children
- The community intervention increases vegetable acceptance amongst children
- The community intervention can be demonstrated to be cost-effective is transferable to other states/communities than those tested.

Adoption of the intervention is already ongoing, or clear and feasible pathways for large scale adoption are available.

Proposed Time frame:

5 years

References:

Blanchette, L., & Brug, J. (2005). Determinants of fruit and vegetable consumption among 6–12-year-old children and effective interventions to increase consumption. *Journal of human nutrition and dietetics*, 18(6), 431-443.

Burchett, H. (2003). Increasing fruit and vegetable consumption among British primary schoolchildren: a review. *Health Education*, 103(2), 99-109.

Brug, J., Tak, N. I., te Velde, S. J., Bere, E., & De Bourdeaudhuij, I. (2008). Taste preferences, liking and other factors related to fruit and vegetable intakes among schoolchildren: results from observational studies. *British Journal of Nutrition*, 99(S1), S7-S14.

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. VG13090 Final Report to Horticulture Innovation Australia.

Hendrie, G.A., Lease, H.J., Bowen, J., Baird, D.L. & Cox, D.N. (2016). Strategies to increase children's vegetable intake in home and community settings: a systematic review of literature. *Maternal & Child Nutrition*, doi: 10.1111/mcn.12276.

Rasmussen, M., Krølner, R., Klepp, K. I., Lytle, L., Brug, J., Bere, E., & Due, P. (2006). Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: quantitative studies. *International Journal of Behavioral Nutrition and Physical Activity*, 3(1), 1.

3.7 PRA 7: Increase intake through digital initiatives for parents/caregivers

Title: Increase intake through digital initiatives for parents/caregivers

About the research

The Vegetable Industry has recognised that increasing vegetable intake amongst children is a sustainable way to increase longer term demand for vegetables. A Hort Innovations commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). As part of this project, a systematic review of worldwide initiatives on increasing vegetable consumption was undertaken with a view to identify initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, and consultation with key stakeholders was undertaken. The developed Strategic Investment Plan (SIP) prioritised and recommended initiatives for which evidence of effectiveness is available in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way from meeting recommended vegetable intakes. Hence the vegetable industry, its supply chain partners and organisations with public health goals have a common interest in increasing vegetable demand amongst children.

This Proposed Research Area (PRA) is aimed at initiatives that directly support parents/primary caregivers through a digital technology platform intervention. Vegetable acceptance as well as parental ability to effectively and positively promote vegetable intake in children are critical factors to promote vegetable intake on the shorter and longer term (Johnson, 2016). Repeated exposure as a sensory learning mechanism has been shown to be efficient and powerful, There is also a body of evidence (Cooke et al 2011; Corsini et al, 2013) suggesting that small appropriate (non-food) rewards (positive reinforcement) improves exposure (tasting) and leads to improved liking. However the influence of parent-child interactions to promote vegetable acceptance and intake remains problematic, particularly surrounding dealing with refusals (Corsini et al, 2013, Johnson, 2016). To date, such parental interventions have been implemented at a research level and have been labour intensive e.g. requiring home visits by researchers to collect data and monitor compliance. With advances in digital technology, intervention programs can be made directly available to participants, with various support options. E.g. a smart phone app / website that monitors children's exposure (tastings) and provides rewards is a very real possibility for future home based interventions. Examples of existing support programs in the nutritional (weight loss) intervention area include the on-line CSIRO Health and Wellbeing Diet, and in the parental education area, an example is the Triple P program.

Objectives

- To design and scientifically evaluate a digital intervention for parents to use with their children, based on evidence of sensory acceptance i.e. repeated exposure and appropriate reward (positive reinforcement) that aims to increase children's vegetable acceptance and intake
- Provide, within the platform, an integrated monitoring and improvement facility for parental influence and interactions that will provide feedback to users (and researchers)
- Monitor and evaluate (digitally and otherwise) usage and liking of features of the program for future refinement / upgrades
- To demonstrate clear pathways for larger scale roll-out of the developed intervention, including the partners (e.g. parenting NGOs) involved in such roll-out
- Provide recommendations for further opportunities to directly support parents to increase their child's vegetable intake
- To publish the results and evaluations of the study in high quality open access peer reviewed journals
- To disseminate findings to a wide range of stakeholders, including the vegetable industry and public health, and make recommendations for further usage.

Overview of the activities

This PRA seeks to develop and measure the effectiveness of a digital technology intervention to support parents to increase vegetable acceptance and intake in their children. There are many interventions in the scientific literature that have reviewed how to increase vegetable acceptance, and the parental factors that influence children's intake and acceptance of vegetables. However, most of these studies have been conducted by academics and technology translation of the findings was not part of the scope of the research. Parents are mostly unaware of the principles of food preference development, rarely persist with repeated exposure and unaware of how they can support their children effectively, in particular at the peak of food neophobia, when food refusals are common.

The digital technology intervention will be evaluated in a controlled scientific study for effectiveness in achieving sustained changes in vegetable acceptance and intake by children, and results will be communicated, disseminated and be made adoption-ready.

Details

7.1 Design of the intervention

- Design and develop an intervention aimed at directly supporting parents, that will be delivered through digital technology, without or with a limited need for face-to-face consultation (however one-on-one support of the parent can be included). Consider incorporating vegetable exposure and reinforcement techniques into a gamification type model that would appeal to children.
- Develop and pre-test parental support tools that encourage parental self-efficacy and appropriate interactions with the child i.e. dealing with refusals
- Pilot test the intervention with a small group of users for clarity of instructions, user-friendliness
- Design a scientifically robust study that measures the effect of the intervention on children's acceptance and intake of vegetables
- Undertake ethical approvals as needed.

7.2 Undertake a controlled intervention and conduct parent survey

- Undertake research with the target population using a adequately powered design
- Measures should include relevant parental measures, (e.g. parental self-efficacy and Parental Style) as co-variables/ possible confounders)
- Outcome measures in the child should include a measure of hedonics and consumption of both target vegetable(s) and usual vegetable intake including longer term measurements at 3 – 6 months post-test for extinction / sustainable effects on hedonics and usual vegetable intake (e.g. a follow up measurement of acceptance intake) using validated measures
- Conduct evaluation of the program, digitally (e.g. usage patterns of features) and by parents (e.g. parental survey).

7.3 Evaluation and dissemination

- Evaluate the intervention against comparable initiatives for size of effect and recommend areas for optimisation
- Evaluate for usage, limitations, feasibility, ease of use, for future refinement and upgrades
- Evaluate costs relative to alternatives
- Evaluate adoption readiness including uptake or promotion by suitable stakeholders (e.g. Parenting NGOs and advisories)
- Evaluate the performance of the project and the project team, advisory group and relationship with stakeholders
- Publish results in a peer-reviewed open access journal with high impact, and disseminate in a suitable format(s) to vegetable industry stakeholders.
- Consider including continuous improvement through usage monitoring of electronic platforms

Measures of success

- The digital intervention has a demonstrated significant, substantial and lasting effect on increasing intake of vegetables amongst children
- The digital intervention increases vegetable acceptance amongst children
- The digital intervention can be conducted and supported at low cost and can be used nationwide
- Adoption of the intervention is already ongoing, or clear and feasible pathways for large scale adoption are available.

Suggested timeframe:

3 years

References:

Cooke, L. J., Chambers, L. C., Añez, E. V., Croker, H. A., Boniface, D., Yeomans, M. R., & Wardle, J. (2011). Eating for pleasure or profit the effect of incentives on children's enjoyment of vegetables. *Psychological Science*, 22(2), 190-196.

Corsini, N., Slater, A., Harrison, A., Cooke, L., & Cox, D. N. (2013). Rewards can be used effectively with repeated exposure to increase liking of vegetables in 4–6-year-old children. *Public Health Nutr*, 16(5), 942-951.

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. VG13090 Final Report to Horticulture Innovation Australia.

Johnson, S. L. (2016). Developmental and environmental influences on young children's vegetable preferences and consumption. *Advances in Nutrition: An International Review Journal*, 7(1), 220S-231S.

3.8 PRA 8: New methodologies to increase intake

Title: New methodologies to increase intake

About the research

A HI commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). It comprised of a systematic review of worldwide initiatives on increasing vegetable consumption with a view to identifying initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, a consultation with key stakeholders to get their input into the effectiveness of initiatives and opportunities for collaboration and a Strategic Investment Plan (SIP) to prioritise and recommend initiatives that have some evidence of effectiveness in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way off meeting recommended vegetable intakes hence there is an opportunity for the vegetable industry to work with those pursuing public health goals.

A systematic review (Hendrie et al, 2016) identified initiatives that led to an increase in vegetable intake in children but there was a paucity of initiatives that increased intake by more than ½ serve of vegetables per day. There is a need for novel research that aims to determine whether larger increases in vegetable intake could be achieved and sustained. One potential area may be utilising knowledge from food preference development and clinical practice.

1. Clinical Programs and Behavioural Approaches

Paediatric feeding programs commonly run within a clinical setting target problem feeding areas such as food refusal, picky eating, food avoidance and assist in the development of oral motor skills and confidence to try new foods. Effective evidence based programs such as the S.O.S (Sequential-Oral-Sensory) program are run by trained allied health therapists undertaken within a clinical setting either one-on-one or with small groups of children. Typically, parents are supported with education sessions about the complexities of feeding and given strategies to support their child's learning at home. Most paediatric feeding programs follow staged sensory exposure seeking to reduce anxiety and increase acceptance (1) Sight; (2) Touch; (3) Smell; (4) Taste.

The behavioural approach that runs most frequently through many clinical programs is one of positive reinforcement (the delivery of a reinforcer contingent on achieving a target behaviour such as touching, smelling and eventually tasting a target food) and shaping (reinforcing successive approximations towards the target behaviour). However other behavioural approaches can be used in conjunction and are often used within the clinical setting including physical prompting, escape extinction, differential reinforcement and texture fading. Another technique with demonstrated effectiveness also used within the clinical setting is Applied Behaviour Analysis (ABA), and encompasses the precise and systematic use of all these behavioural techniques to target (among many things) problematic feeding and food refusal behaviours. ABA systematically utilizes the principles of operant conditioning (the process of shaping and strengthening the likelihood of a specific behaviour by using consequences (reinforcement scheduling) and establishes a functional relationship between antecedents and behaviour. Many environmental variables such as parent-child interaction contribute to the onset and maintenance of food selectivity problems eating (such as inadvertent training of inappropriate eating patterns). Thus teaching correct behavioural reinforcement and modelling techniques and training parents, using an ABA approach, may also be a strong possible method in achieving a behavioural change in vegetable consumption. In general, it has been proven to be a valid and effective way of learning competencies, attitudes and normative behaviour. Previous studies in the vegetable domain (e.g. Corsini et al, 2013) and experience from infant feeding programme support

have suggested that successful exposure is dependent upon parental (caregiver) style, in regard to interactions with the child and self-efficacy in dealing with refusals to taste. There is a need to design support tools and processes to assist parents (caregivers) whilst recognising that different segments may have different needs.

Such programs and behavioural approaches, while shown to be highly effective in the clinical setting could be adapted and translated into community type settings (home, childcare) to extend the impact and to influence the wider communities overall vegetable intake. Here in lies the challenge and focus of this PRA to translate the methods used in clinical programs and behavioural approaches and incorporate them into a non-clinical community setting to widen the scope of the impact.

2. Food Approaches

There is evidence that single target vegetable exposure does not generalize to acceptance of a wide range of vegetables therefore exposure to variety may be a better strategy; however, it is unknown what type of variety is needed (flavour, texture, botanical variety, frequency, combinations, level of initial liking etc.) nor is there strong evidence that variety exposure amongst pre-school children effects generalised acceptance of vegetables.

Objectives

- Justify a novel, evidence based, behaviourally focused controlled community clinical trial from the suggestions above including a A) behavioural approach that translates optimised reward interval strategies from the clinical setting into a community setting; role modelling; and strengthening parents (caregivers) self-efficacy / appropriate interaction with their children; and/or B) a food approach centred around optimising strategies for variety exposure with an outcome of generalised vegetable acceptance.
- Design a controlled intervention study that tests one or more of the novel strategies amongst pre-school children in a community based setting (outside the lab) such as in the family home or childcare.
- Define the optimal design in terms of maximising effects on exposure (tasting), hedonics and usual consumption of vegetables
- Make long term assessments of effects to test for (absence of) extinction and sustainable effects (3 – 6 months post-test).

Overview of the activities

- A randomised controlled community trial will test different strategies on the effect of improving children's exposure (tasting) to (a) target vegetable(s)
- Subsequent liking, consumption of (the) target vegetable(s) and potential effects upon usual vegetable consumption will be measured
- Follow-up at three – six months post-test will be undertaken and parents'/caregivers' attitudes and experiences measured.

Details

8.1 Intervention study activity

- Design a randomised controlled intervention study with treatment arms and a (wait-listed) control group with sufficient power to detect differences in hedonics and vegetable intake between treatments
- Choose an appropriate setting that maximises potential compliance and data collection and minimises participant burden outside of a laboratory (eg family home, childcare etc).
- Identity neutral (neither liked nor disliked) target vegetable(s)
- Choose appropriate rewards (positive reinforcement)
- Provide guidance for parents/care-givers on role modelling, dealing with refusals and appropriate communication with children

- Expose children to target vegetable tastings on a daily basis (for a minimum of 10 exposures).

8.2 Evaluation

- Measure pre-test, post-test and follow-up (3 - 6 months)
- hedonics (using a suitable scale for the age group)
- Intake of the target vegetables using validated measures
- Intake of usual vegetable intake using validated measures
- Measure (post-test), using suitable behavioural theory, parental attitudes to the treatments (by questionnaire or qualitative methods), seeking to understand facilitators and barriers.

Measures of success

- Optimal design identified and publicised through appropriate media reports
- Publication(s) in an open access high impact peer reviewed journal
- Uptake of guidance (provided in a suitable format) by a wide range of stakeholders interested in the promotion of vegetable consumption, including but not limited to, early-learning settings, parents and caregivers
- Increased demand for vegetables.

Suggested timeframe:

3-5 years (closer to 5)

References:

Corsini, N., Slater, A., Harrison, A., Cooke, L., & Cox, D. N. (2013). Rewards can be used effectively with repeated exposure to increase liking of vegetables in 4–6-year-old children. *Public Health Nutr*, 16(5), 942-951.

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. *VG13090 Final Report to Horticulture Innovation Australia*.

Hendrie, G.A., Lease, H.J., Bowen, J., Baird, D.L. & Cox, D.N. (2016). Strategies to increase children's vegetable intake in home and community settings: a systematic review of literature. *Maternal & Child Nutrition*, doi: [10.1111/mcn.12276](https://doi.org/10.1111/mcn.12276).

3.9 PRA 9: Better Effectiveness Measures

Title: Better effectiveness measures

About the research

A Hort Innovation commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). It comprised of a systematic review of worldwide initiatives on increasing vegetable consumption with a view to identifying initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, a consultation with key stakeholders to get their input into the effectiveness of initiatives and opportunities for collaboration, and a strategic investment plan (SIP) to prioritise and recommend initiatives that have some evidence of effectiveness in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way off meeting recommended vegetable intakes hence there is an opportunity for the vegetable industry to work with those pursuing public health goals.

All initiatives need to show evidence of effect because continued support is vulnerable when effect cannot be demonstrated. For example, community initiatives have lacked evaluations of effect (Cox et al, 2015) resulting in cessation of funding in some states, e.g. South Australia (McCann report, 2012). Currently there are limitations to the accurate measurement of the intake of vegetables. Self-report suffers from bias (social desirability or answers to please) and is difficult to administer to very young children. Observation of consumption is costly, only momentary and may prompt socially desirable behaviour change and inaccuracy. Alternatives such as collecting bloods for biomarkers (serum carotenoids) are costly, resource demanding, subject to diurnal variation, may reduce participation and are often infeasible amongst children. Although there are surveys available with validated biomarkers for vegetable intake (notably the Australian Eating Survey developed by the University of Newcastle), such surveys will need completion by the parent for young children, and cannot be completed by the child itself due to immature cognitive ability and reporting skills, or by teachers, childcare staff or health professionals due to insufficient information on the child's eating behaviour. There is a need for alternatives that are cost-effective, easy to administer and analyse, do not rely on recall, and validated (accurate). For example, a possible alternative are skin carotenoids measured by resonance Raman spectroscopy (Aquilar et al, 2014 <http://dx.doi.org/10.1016/j.jand.2014.04.026>) in response to fruit and vegetable consumption. However, other options could be explored and realised, including but not limited to, measures of breath metabolites, saliva, urine or eye scanning. Any measure would need to consider the half-life of the marker. In all cases, justification for the marker must be made and a definitive time-frame, particularly if requiring development of a novel marker, would have to be agreed.

Objectives

- Identify or develop suitable technology that is non-invasive and does not rely upon self-report or observation of consumption
- Undertake a series of feeding trials (including controlled and longer term free living settings) and measure intakes using novel tool across a range of children from different ancestry (ethnicity)
- Undertake one or more validation tests against reference standards over time (so as to estimate usual intake), analyse for differences using high quality statistical tests
- Seek to calibrate instrumental responses to different types vegetables consumed for example, account for vegetables that may not be rich sources of carotenoids
- Consider supporting or complimentary measures that could also be used
- Seek to calibrate instrumental responses to portions of vegetables consumed
- Have the ability to detect small changes in intake (i.e. half a 75g serving)
- Published study in a high quality open access peer reviewed journal
- Compare costs to previously used methods (e.g. self-report, observed report and invasive measures and analyses)
- Make recommendations for usage, e.g. service provision to other stakeholders' initiatives, costings.

Overview of the activities

Activities will include identification of a suitable tool to test and validate in the short and long term upon young children from diverse backgrounds as the focus of intervention trials. Furthermore the work will assess the suitability for usage by stakeholders as a tool to assess initiatives broadly and aim to become the gold standard for objective measurement of effect of vegetable initiatives.

Details

- Review options for novel intake or biomarker measures of vegetable intake suitable for pre-school children
- Identify options that provide a non-invasive objective measure or biomarker of vegetable intake (not subject to reporting bias) and;
- Justify choice of a specific measure to further test
- Test a novel measure compared to suitable reference measures (gold standard) by undertaking controlled trial of intake, ensuring compliance, for example, in clinical feeding trials
- Undertake a free living community intervention and measure intake using the novel method compared to measures of usual intake
- In all tests control for vegetable variety and other dietary intake, additional to vegetables, that may influence responses
- The instrument should be suitable for a wide range of children's ancestry/ethnicity.

Evaluation

- Evaluate against other measures both short term and long term (usual intake)
- Evaluate for usage, limitations, feasibility, ease of use, costs relative to alternatives
- Evaluate the performance of the project and the project team, advisory group and relationship with stakeholders.

Measures of success

- A low cost, convenient, responsive measure with high specificity and sensitivity is developed, validated and adopted
- Widespread usage of the tool both domestically and internationally as a biomarker for changes in vegetable consumption
- The tool becomes the gold standard for measuring the effect of vegetable interventions as recognized by the scientific community (cited in the peer reviewed literature) and other stakeholders
- Acceptance of the feasibility and business plan for providing the tool's usage as a service to a range of domestic stakeholders' future initiatives
- Government health stakeholders are convinced that there is sufficient evidence of initiatives' effects so as to invest in future large scale initiatives and specific food policy changes in early learning, care and educational settings
- Changes in demand for vegetables measured.

References:

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. *VG13090 Final Report to Horticulture Innovation Australia.*

McCann, W. (2012). Review of non-hospital based services: Office of Public Employment and Review, Government of South Australia.

3.10 PRA 10: Extend the life of the VISA

Title: Extend the life of the VISA

About the research:

A Hort Innovation commissioned project (VG13090) developed a Strategic Investment Plan (SIP) for increasing vegetable intake amongst children (Cox et al, 2015). It comprised of a systematic review of worldwide initiatives on increasing vegetable consumption with a view to identifying initiatives that have been shown to be effective as well as to identify gaps and opportunities for new initiatives, a consultation with key stakeholders to get their input into the effectiveness of initiatives and opportunities for collaboration, and a strategic investment plan (SIP) to prioritise and recommend initiatives that have some evidence of effectiveness in increasing vegetable consumption in children. Setting good eating behaviours as a child is essential as it forms the basis for future eating behaviours for life. Results from the latest Australian Health Survey suggest children are a long way off meeting recommended vegetable intakes hence there is an opportunity for the vegetable industry, government, education, NGOs, health professionals, food service and retailers to work together to help improve vegetable consumption by children.

We have found from previous consultation that whilst many of these key stakeholders wish to work together, there is still significant disconnect. This project addresses forming sustainable connections across sectors to provide national leadership in increasing vegetable intake in children.

It is recognised that a multi-sector/setting, longer-term, approach is needed to achieve comprehensive modification of the eating behaviours of infants, children, and their families in order to consume more vegetables. Leadership across multi-sectors/settings is needed and HI seeks to build upon a newly formed Vegetable Intake Strategic Alliance (VISA) by providing support for long-term activity. An aligned group of stakeholders across multiple sectors is likely to be more effective as advocates/spokespersons if they have an agreed vision that they can clearly communicate, a vision that needs the whole value chain to work together to achieve success, a defined role including the imprimatur to be a credible voice on children's vegetable consumption, a clear and integrated action plan designed to achieve impact, a sustained level of support and is composed of individuals within the sectors who have the passion, opportunity and capacity to influence outcomes across the whole value chain for a triple bottom line impact upon industry (increased demand), public health (achieving consumption targets associated with weight control and reduced risk of chronic disease) and the environment (lower impact).

Objectives

- To identify the critical success factors needed to create a sustainable, active and effective multi-sectoral/setting VISA for a minimum term of 5 years
- To define the role, strategy and vision of this 5-year VISA
- Provide moderate level of detail to Hort Innovation on immediate next steps needed to appoint a 5 year VISA within 3-4 months of completion of this project.

Overview of the activities

Through collation of the following (but not limited to) - stakeholder consultation, reviewing learnings from similar international alliances, review of the literature that highlights success factors for alliances, consideration of suggestions from the initial VISA workshop 21st July 2016, and develop an understanding of what projects Hort Innovation is considering undertaking in the short to medium term - synthesise into critical success factors that are relevant to increasing children's vegetable intake.

Work with Hort Innovation to define the agreed value proposition and role of the VISA and make recommendations to HI on the vision, strategy and action plan of the 5 year VISA.

Details

10.1 Critical success factors for a longer term alliance

- Undertake targeted stakeholder consultation re role and vision of a 5 year VISA (including within Hort Innovation and across the value chain)
- Collate existing information - reviewing learnings from similar international alliances, conduct a narrative review of the literature that highlights success factors for alliances, consideration of suggestions from the initial VISA workshop 21st July 2016, and develop an understanding of what projects Hort Innovation is considering undertaking in the short to medium term
- Undertake a review of online collaborative tool platforms that could be used to initiate and house a virtual alliance and to maintain communication between members.
- Identify critical success factors that must be met if a 5 year VISA is to be successful and provide recommendations to HI regarding;
- Funding & level of support (e.g. secretariat) needed for 5 years
- Governance (including role of Chair)
- Membership (take into account skill set diversity and inclusion parameters)
- How the VISA can achieve visibility
- How the VISA relates to existing Australian industry organisations both within Hort Innovation (e.g. Hort Innovation Committees such as Consumer Alignment) and associated industry organisations (e.g. Ausveg, Produce Marketing Association, Primary Producers associations) and to existing national activities (e.g. National Food and Nutrition R&D & TT Strategy, FIAL/Food & Ag Growth Centre, Healthy Food Partnerships) as well as international activities (e.g. National Fruit and Vegetable Alliance [USA])
- Action oriented meetings that could be undertaken by specific smaller working parties within the VISA
- How linkages to the other national alliances including (but not restricted to) the Health Food Partnership
- How to evaluate success and
- How linkages to other projects that Hort Innovation is considering funding (e.g. evaluation framework (PRA #4), Registry of Initiatives (PRA #2)) could be realised.

10.2 Define the value proposition, role, vision, and strategy and action plan for the 5 year VISA

- Working with stakeholders, clearly articulate an agreed value proposition of the 5 year VISA for the multiple key stakeholders (growers, parents/caregivers, education, care providers, health professionals, government (Agriculture/ Health) and Hort Innovation etc.). Consider also linkages to ongoing vegetable events (World Vegetable Day, Nutrition Week etc.) and initiating other events including online conferences etc.
- Define the role and vision of a 5 year VISA and update the Terms of Reference (ToR)
- Define the role of the Chair and secretariat (to expedite early & timely appointment)
- Draft a high level strategy and action plan for the VISA, working with the Chair if appointed
- Outline in moderate detail all the steps that Hort Innovation would need to complete for Hort Innovation to appoint a 5 year VISA within 3-4 months.
- Consider a specific of a secretariat role to maintain both the Registry of Initiatives and VISA

10.3 Evaluation

- Evaluate the cost-effectiveness of establishing the VISA compared to expected outcomes and impacts
- Evaluate the performance of the project and the project team, advisory group and relationship with stakeholders.

Measures of success

- Hort Innovation appoints a longer-term VISA within 3-4 months, adopting the ToR and the role as outlined from this PRA with a suitable level of governance and funding set aside for it to remain funded for a minimum of 5 years
- The 5 year VISA achieves high visibility and delivers on action plan
- The 5 year VISA is able to evaluate its progress along the planned path to impact consistent with the evaluation framework.

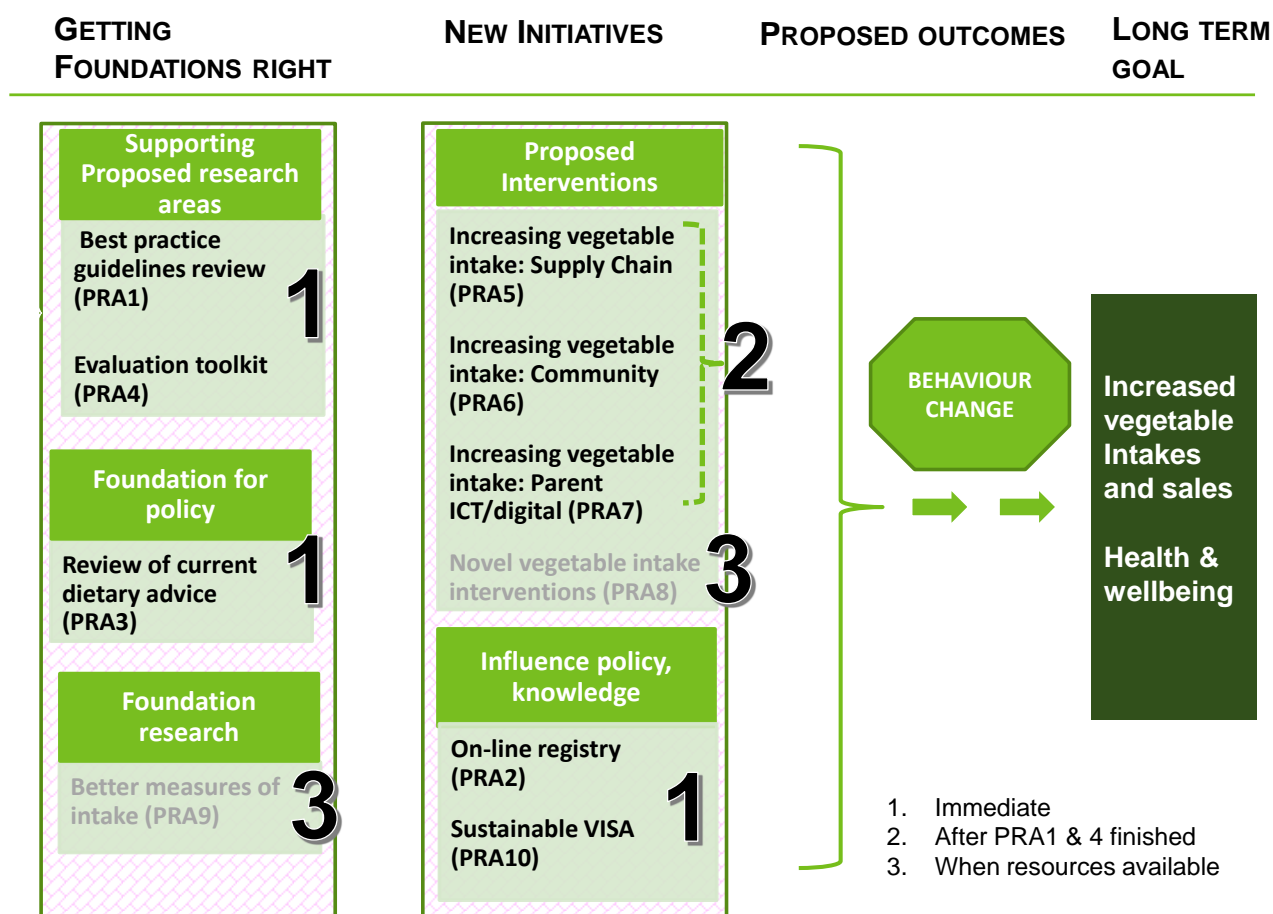
References:

Cox, D., Kacker, A., Hendrie, G., Baird, D., Lease, H., Bowen, J., Poelman, A & Mojet, J. (2015). Increasing vegetable intake amongst children: A strategic investment plan for Australian Vegetable Industry. *VG13090 Final Report to Horticulture Innovation Australia.*

4 Evaluation Tools

1) In the initial proposal the project team indicated that preparation of an evaluation tool kit would be one component of the evaluation outputs of this project. However, following further discussion with Hort Innovation, followed by ratification by the PSC (meeting held 8/8/16), it was agreed that this was beyond the scope of the current project's activities

2) A draft integrated impact and evaluation framework was presented to the PSC on 24/6/16 and to the VISA participants during the first meeting (21/7/16)



a. A follow-up discussion with Hort Innovation led to suggestion that the Evaluation Framework may have progressed sufficiently within this current Project and could potentially be removed from PRA#4

3) All PRAs include an evaluation component (including evaluation of project and consideration of eventual impact)

4) See Appendix 3 for an evaluation of the VISA workshop

5 Project Evaluation

- Fortnightly CSIRO project team meetings held to discuss activities and progress, with minutes and actions distributed
- Regular PSC meetings held with minutes and actions distributed to Hort Innovation, PSC, CSIRO Team members
- First Progress Report (Milestone 102) submitted on time 16/5/16 and accepted by Hort Innovation
- Second Progress Report (Milestone 103) submitted on time 31/8/16 (to include update on VISA workshop, development of RFPs (target of 9 exceeded), evaluation tools)
 - 10 PRAs included
 - Update & evaluation of VISA workshop included
 - Evaluation Framework included
 - Additional request: Make recommendation to Hort Innovation on priorities of PRAs and timing of RFPs
- Delivery of this, the Final report (Milestone 104) on 31/10/16

6 Outcomes

An initial Vegetable Intake Stakeholder Alliance (VISA) has been formed. A first meeting was held successfully and participants expressed a strong will to participate in an ongoing VISA. Initial considerations have been undertaken to continue the VISA using low cost electronic collaboration tools until further funding is realised (Proposed Research Area 10).

Recommendations for priority funding have been made (see Appendix 4) taking into account impact, evaluations by the VISA participants and strategy. Creating a solid foundation by supporting a VISA and establishing best practice for interventions were seen as priorities. Community, industry led and parental (digital) interventions are recommended for initial impact; however, best practice guidelines are required first. Some PRAs could be undertaken without dependencies quickly. A presentation was given to the Consumer Alignment Committee suggesting further action and priorities (see Appendix 5).

Appendix 1: VISA Attendance List

FIRST NAME	SURNAME	Institution/Company
Aloysa	Hourigan	Nutrition Australia
Amy	Rossignoli	Nutrition Australia
Anthony	Worsley	Deakin University / Consumer Alignment Committee
Astrid	Poelman	CSIRO
Belinda	Adams	Coastal Hydroponics / Ausveg / Consumer Alignment Committee
Candice	Dyer	CSIRO
Christian	Patterson	Hort Innovation
Christina	Pollard	Curtin University
Claire	Hewat	Dietitians Association Australia
Clare	Collins	University of Newcastle
David	Cox	CSIRO
Felicity	Sicari	Vic Dept Health
Fritz	Meyer	Yum Restaurants International
Gail	Woods	Brismark
Geoff	Jansz	Broadcaster and Chef
Geoffrey	Annison	Australian Food & Grocery Council
Haidee	Lease	CSIRO
Jason	McNeill	Premium Fresh
Jo	Gardner	Healthy Kids Association
Judith	Atkinson	The Australian Childcare Alliance
Karen	Campbell	Deakin University
Lucy	Bell	Flinders University
Lynne	Cobiac	CSIRO
Margaret	Rozman	Nutrition Australia
Margaret	Miller	Edith Cowan University
Martina	Fanning	Perfection Fresh
Melissa	Tinney	Heart Foundation
Nina	Tan	Cancer Council NSW
Philippa	Lorimer	Hort Innovation
Renee	Harrison	Produce Marketing Association Australia - New Zealand
Russel	Rankin	Food Innovation Partners
Sarah	Robins	Hort Innovation
Sonya	Stanley	VicHealth

Steven	Roberts	Rijk Zwaan
interested but unable to attend		
Bruce	Bolam	Vic Health
Rebecca	Golley	UniSA
Julie	Green	Raising Children Network
Shane	Lucas	Early Learning Association Australia
Todd	Chapman	Qcatering
Paul	Turner	Woolworths
Kelvin	King	Commonwealth Dept of health

Appendix 2: VISA Workshop Program & Objectives

Workshop Program

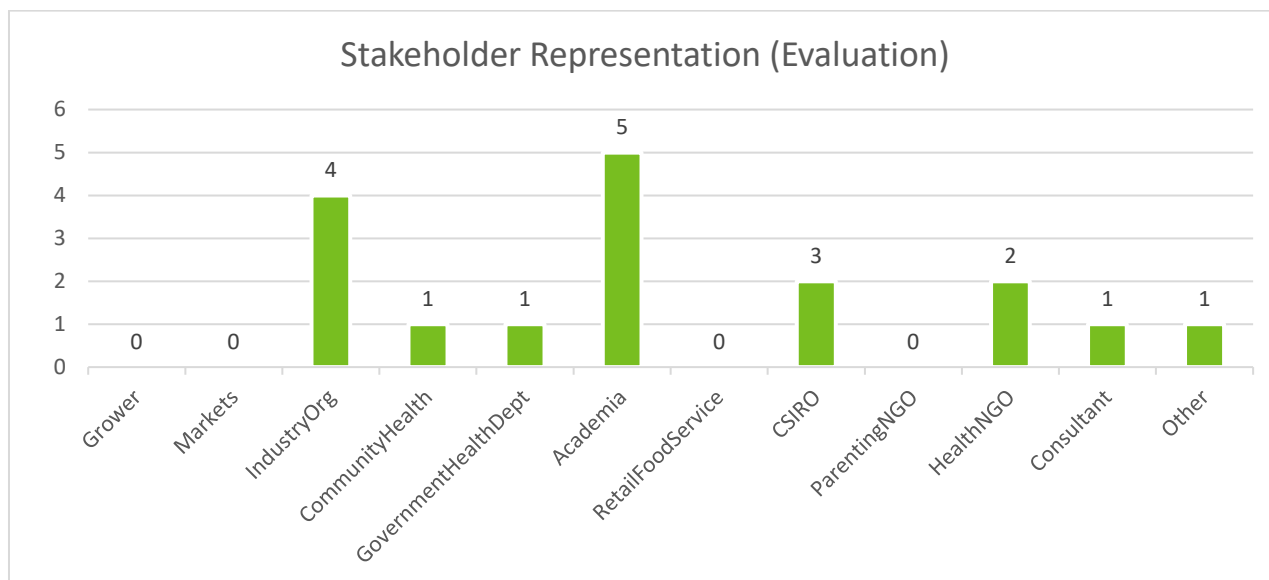
20 th July		
7pm – 10pm	Dinner Airo Restaurant, Park Royal Hotel Including talk from our 'VISA champion' Geoff Jansz	
21 st July		
8.45am	Workshop Introductions (including Christian Patternson HIA)	
9.00 – 9.15	Summary of the previous Strategic Investment Plan	
9.15 – 9.20	Summary of Primary School Curriculum Vegetable Education Resource (see Appendix A)	
9.20 – 9.40	Finding Common Ground - small groups exercise using the Dilemma Framing Tool (DFT)	
9.40 – 10.10	Groups to report back on DFT	
10.10-12.40	10.10 - 11.05	55 min discussion of 10 x Proposed Research Areas (PRA) in 4 groups – each discuss a selection of PRA's (ad hoc morning tea-break)
	11.05 - 11.20	Report back & group discussion for PRA 1
	11.20 - 11.35	Report back & group discussion for PRA 2
	11.35 -11.50	Report back & group discussion for PRA 3
	11.50 - 12.05	Report back & group discussion for PRA 4
	11.05 - 12.20	Report back & group discussion for PRA 5
	12.20 - 12.35	Report back & group discussion for PRA 6
12.40 – 1.30	Lunch and networking	
1.30 – 2.45	1.30 -1.45	Report back & group discussion for PRA 7
	1.45 – 2.00	Report back & group discussion for PRA 8
	2.00 – 2.15	Report back & group discussion for PRA 9
	2.15 - 2.45	Report back & group discussion for PRA 10
2.45 – 3.15	TOPIC: How partnerships and alliances work to achieve community impact Presentations (2 x 7minute presentations) + 15 minute discussion	
3.15 – 3.30	Tea or activity break	
3.30 – 4.00	Evaluation	
4.00 – 5.00	Interactive activity or discussion– what initiatives are we missing? How can we deepen engagement with key networks and stakeholders?	
5.00 – 5.15	Actions and Close	

Workshop Objectives:

1. Coming together and finding mutual interest
2. Providing feedback and input on a series of concepts for Proposed Research Areas (PRA) that Hort Innovation may potentially fund
3. Providing feedback and input on a draft evaluation framework to be used for initiatives that aim in increase children's intake of vegetables
4. Advising on other future ideas and concepts for Hort Innovation to consider that will facilitate an increase in children's consumption of vegetables
5. Contributing to the development of the longer term goals of the VISA, as well as its structure and function

Appendix 3: VISA Evaluation Results

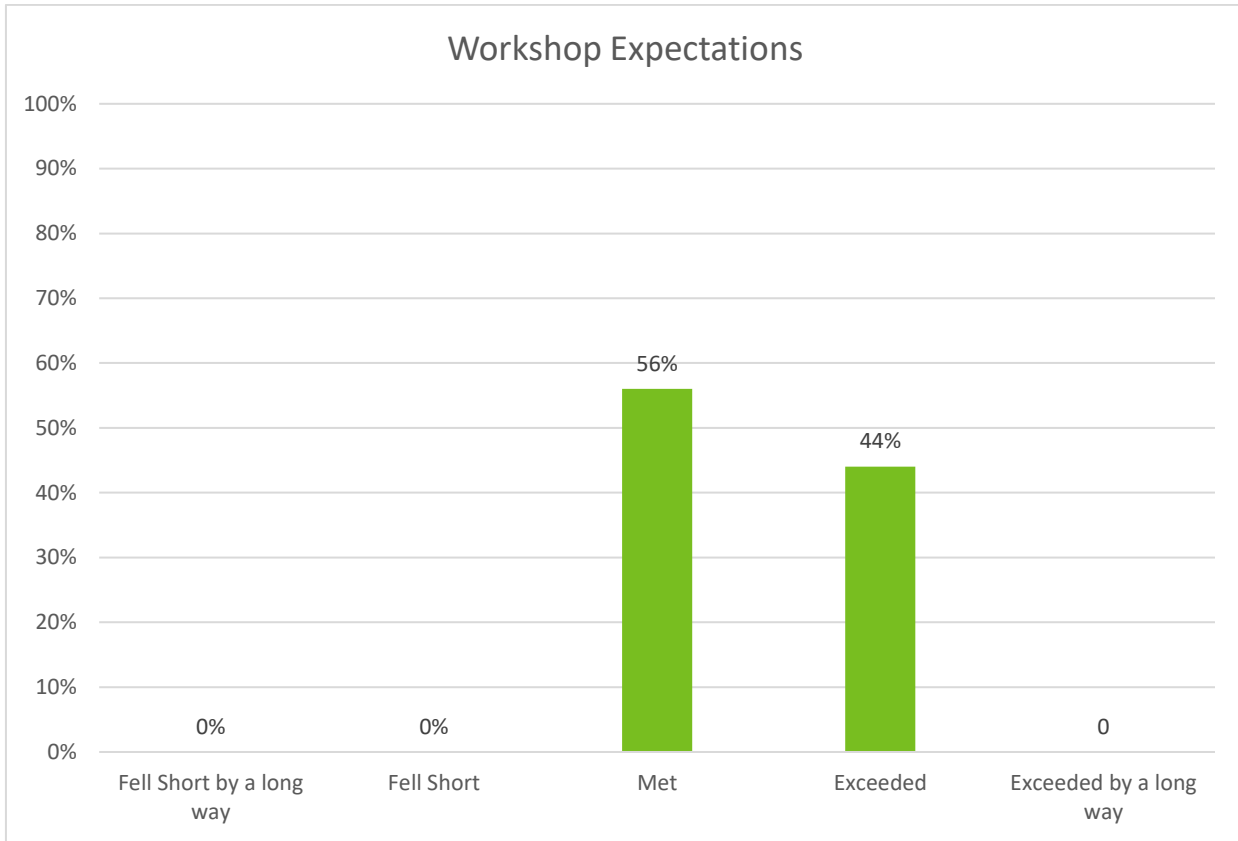
6. Stakeholder representation of those completing the evaluation



7. Achievement of Workshop Objectives

- **Objective 1: Coming together and finding mutual interest:** 100% agreed this was achieved
- **Objective 2: Providing feedback and input on a series of concepts for Proposed Research Areas (PRAs) that Hort Innovation may potentially fund:** 100% agreed this was achieved
- **Objective 3: Providing feedback and input on a draft Evaluation Framework to be used for initiatives that aim to increase children's intakes of vegetables:** 56% agreed this was achieved, 44% undecided
- **Objective 4: Advising on other future ideas and concepts for Hort Innovation to consider that will facilitate an increase in children's consumption of vegetables:** 69% agreed this was achieved, 31% undecided
- **Objective 5: Contributing to the development of the longer term goals of the VISA as well as its structure and function:** 94% agreed this was achieved, 6% undecided

8. Did the workshop meet your expectations?

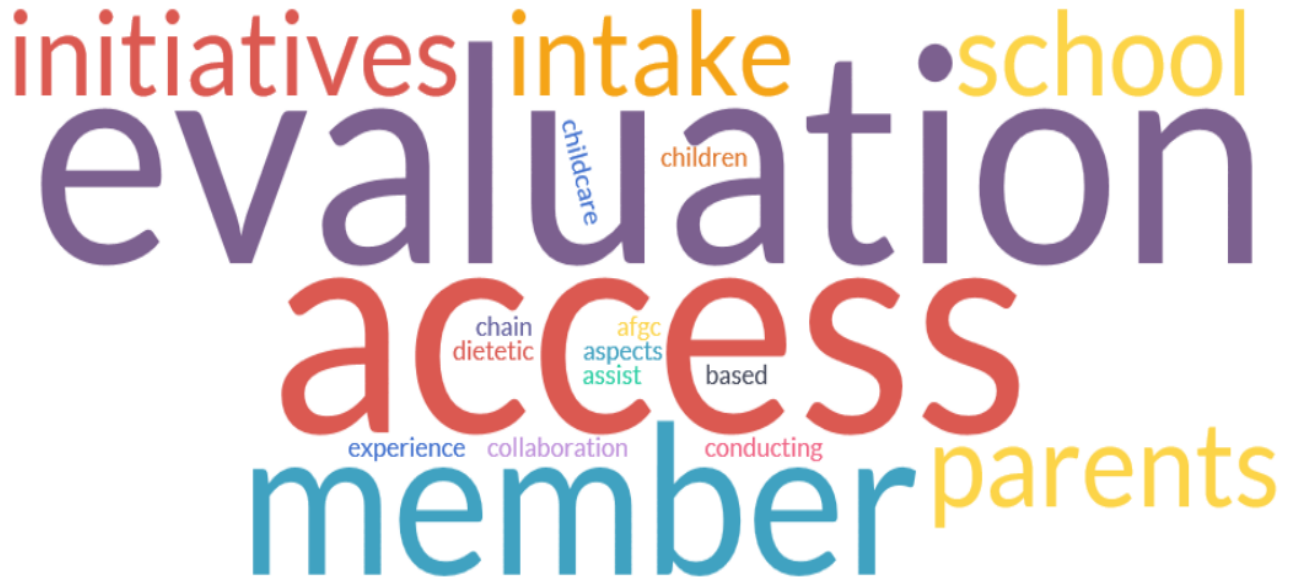


9. PRA Order of Importance (median)

- PRA 1
- PRA 2, 3, 10
- PRA 4, 5, 6
- PRA 7
- PRA 9 PRA 8

10. Contributions to the VISA

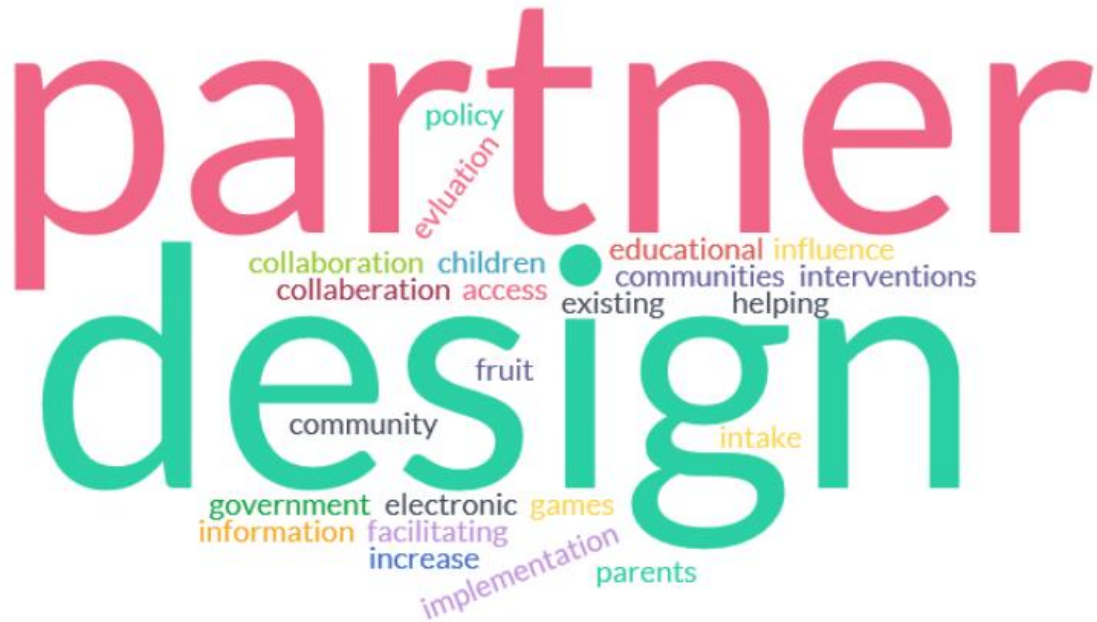
Contribution 1:



Contribution 2:



Contribution 3:



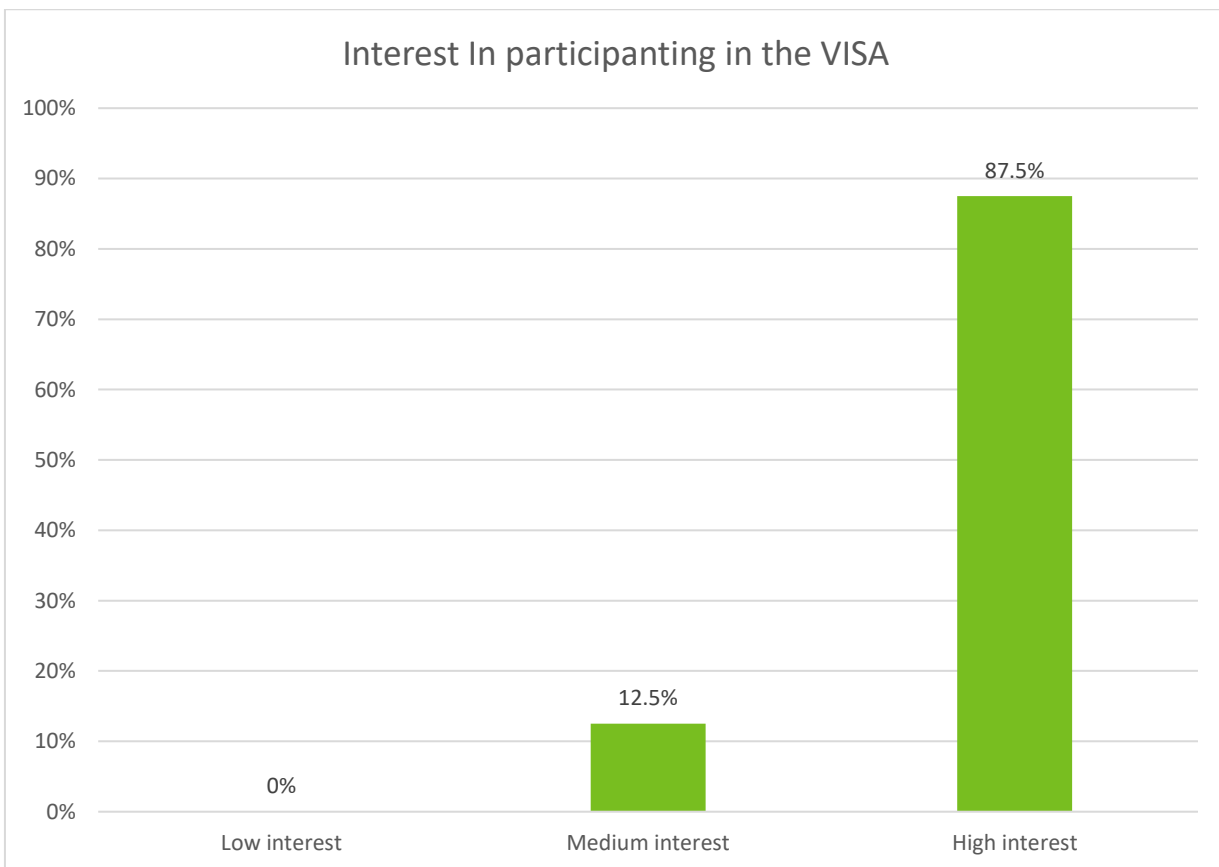
Contribution 4:



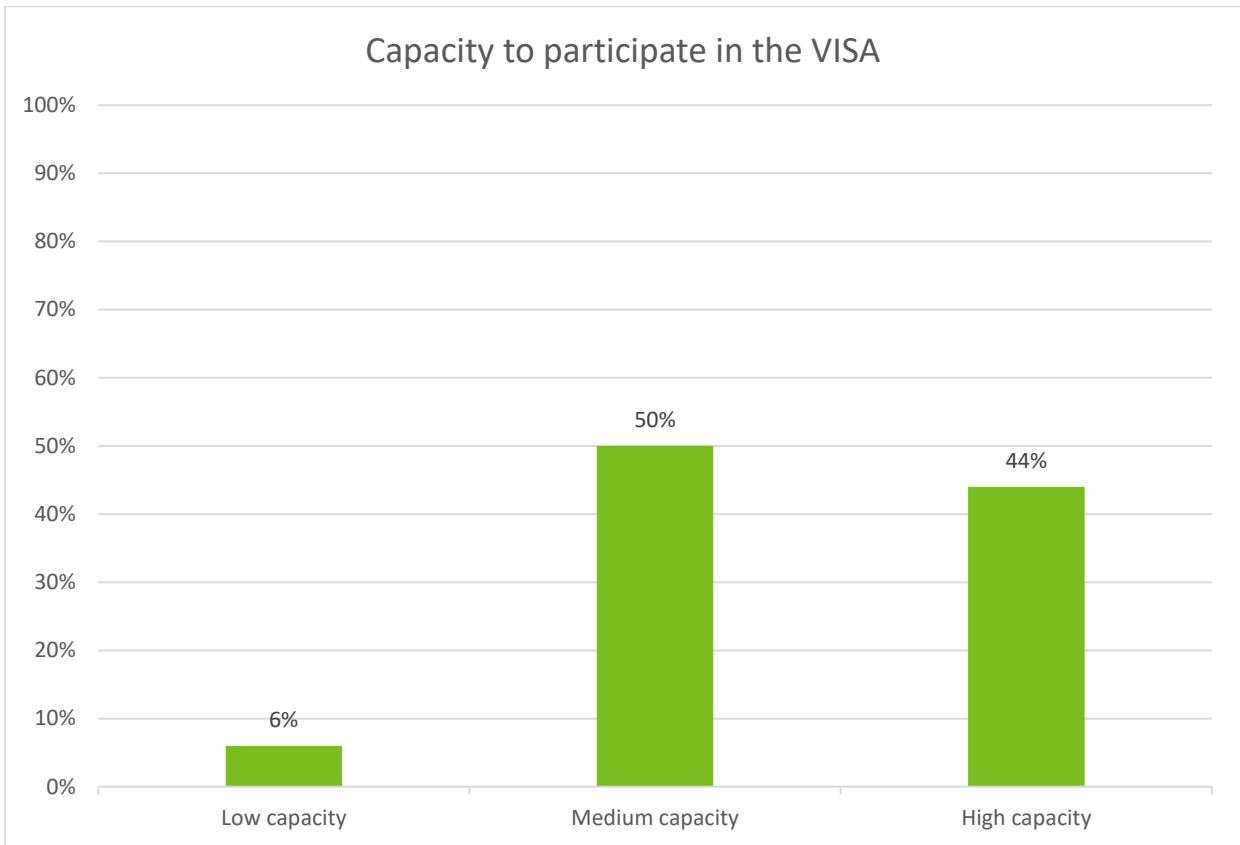
Contribution 5:

identification
produce fresh industry
marketing consumer participate
communications
initiative community
helping future
implement
intervention

11. Level of interest in participating in the VISA



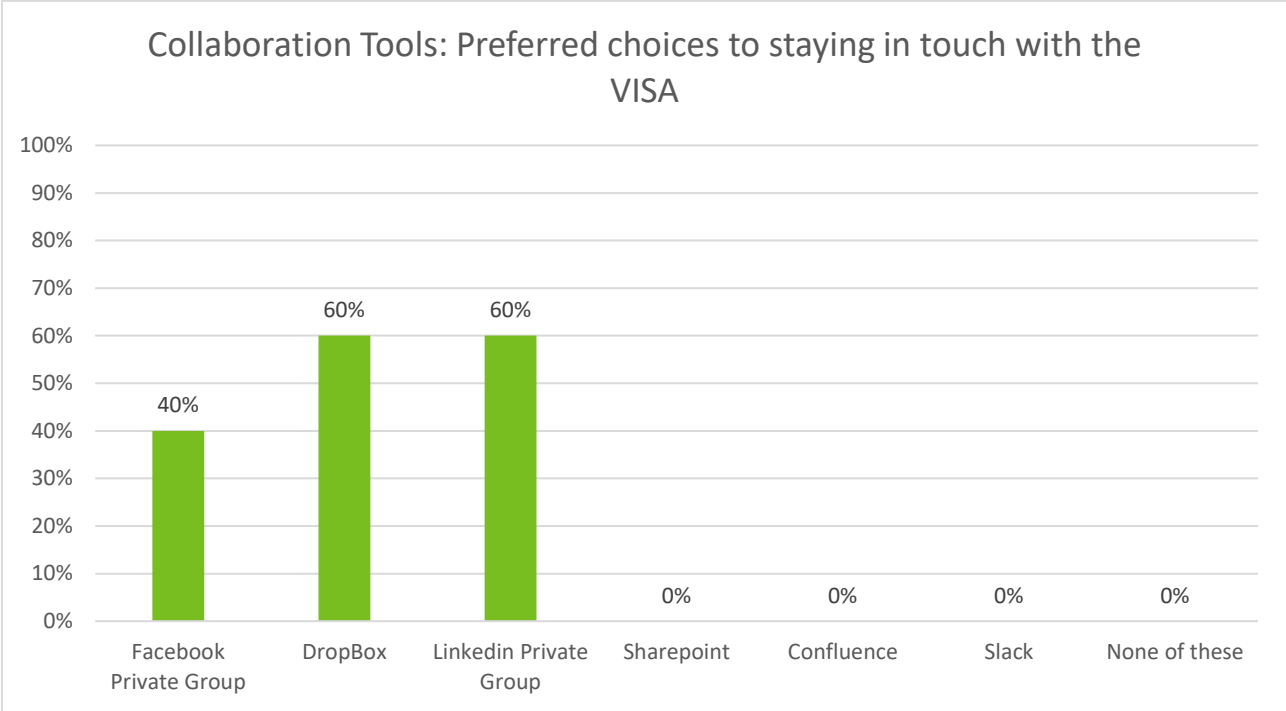
12. Capacity to participate in the VISA



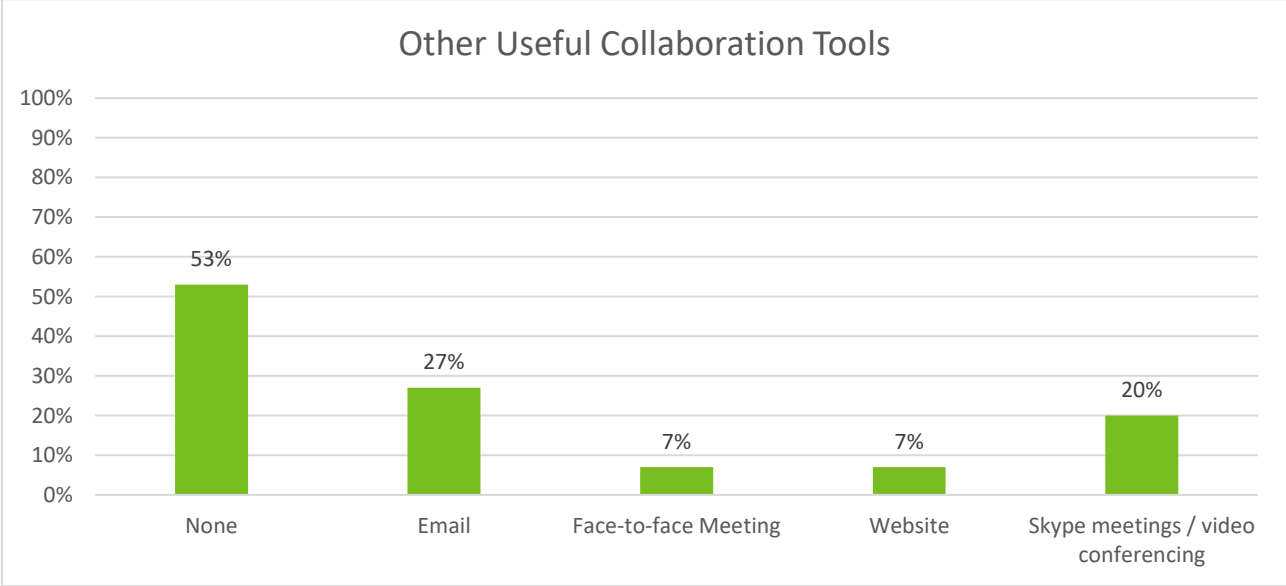
Capacity description:



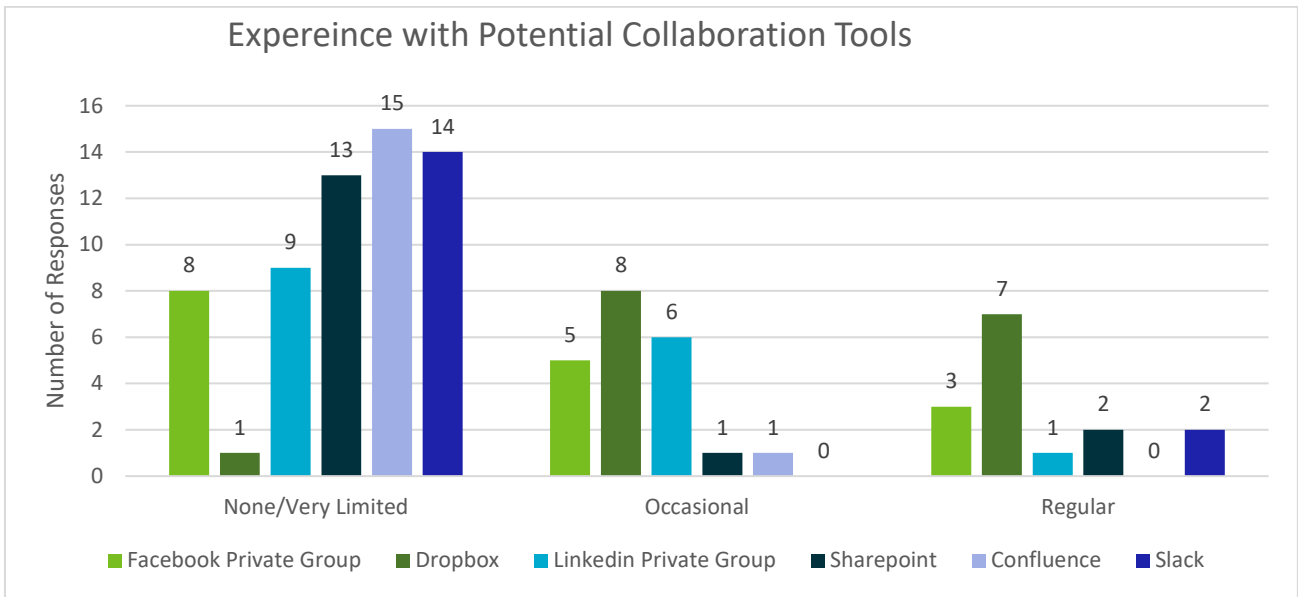
8a. Collaboration Tools (could tick more than one option)



8b. Other Collaboration Tools Considered Useful



8c. Experience With These Collaboration Tools (could tick more than one item)



9. How would you like to see the VISA move forward in the medium term?



- Quickly & rapidly build the momentum that is current and maintain communication between the interested agencies so not to lose the interest of the stakeholders, needs non- competitive RFP to initiate secretariat and online communication.
- Build and maintain regular contact and communications re outcomes of meetings, next steps and what is happening and who's doing what in the veg space, provide opportunities for collaboration and ways to contribute and to provide consultative, strategic advice for the future.
- VISA needs to have a formal management and communication structure with defined goals and concrete deliverables and terms and funding agreed upon. VISA also need to include more community and educational organisations
- Establishing the online registry and guides for effective interventions and evaluation of interventions in collaboration with relevant partners already engaged in the VISA.

Appendix 4: Recommendations for Priority Funding

PRA	Median rank (VISA evaluation)	CSIRO's RECOMMENDATIONS	Direct Impact on veg intake/sales Small/Medium/Large	Indirect Impact on veg intake/sales Small/Medium/Large	Other key impacts	Timing to completion Short/med/Long
1. Develop best practice guidelines for interventions	1	Immediate	--	M	Informs high quality interventions, better resource utilisation, stronger impact	Short
10. Extend the life of the VISA (ToR, purpose; funding; role etc).	2	Immediate	--	M	Creates a strategic suite of activity; becomes HI's extension arm; supports industry; raises awareness, lobbying, influence policy	Short
2. Develop an online register of initiatives	2	Immediate	--	M - L	Something tangible, better resource utilisation, keeps Industry informed; evidence suggests very important.	Short
3. Review of dietary advice for health professionals	2	Immediate	--	M-L	Will have impact via policy and changes in advice provided to children	medium
6. Increase acceptance/intake - community	3	Follows completion of PRA #1	S-L	--	Can address multiple settings across the community.	Short to medium

					Immediate effect on demand for veg / Short term win	
4. Develop assessment and evaluation criteria	3	Immediate	--	--	Critical if HI want an integrated and high quality program	
5. Increase acceptance/intake - supply chain	3	Follows completion of PRA #1	S-L	--	Important to have industry as part of the solution	Short to medium term
7. Increase acceptance/intake - parents	4	Follows completion of PRA #1	M-L	--	Get in on the trend for personal digital help before other industry does.	short
9. Better effectiveness measures	5	Independent, when resources available	--	--	Make interventions easier to evaluate objectively in order to demonstrate effect (encourage Govt. Health stakeholder support for industry)	medium
8. New methodologies to increase acceptance/intake	6	Independent, when resources available	S-L		Important to look to future; bigger community impact.	Short to medium

Appendix 5: Presentation to Consumer Alignment Committee

Implementation of HI Strategic Investment Plan to increase children's acceptance and intake of vegetables



Consumer Alignment Panel

Prof Lynne Cobiac

HEALTH AND BIOSECURITY
www.hia.gov.au

Horticulture
Innovation
Australia



Four key strategic priority areas identified in the SIP:

Priority Area 1 – Need for Collaboration

- Establish a Stakeholder Alliance to include stakeholders within and outside the vegetable industry, notionally called Vegetable Intake Strategic Alliance (VISA).
- Develop a joint agenda and activities with stakeholders within the VISA

Priority Area 2 - The right initiatives and impact

- Publish and endorse best practice guidelines for the development and implementation of new initiatives.
- Establish a registry of initiatives
- Develop a validated evaluation tool to quantify the impact of initiatives
- Establish an Initiatives Working Group (IWG) to develop/refine design of impact
- HIA to support local, state and nationwide initiatives



Priority Area 3 – Continued Research into New Initiatives

- Initiatives that achieve larger impact (greater than typical ½ serve/day increase)
- Multi-setting (e.g. complementing school & home interventions)
- Longitudinal studies tracking early exposure through to maturity using age appropriate strategies.
- Initiatives focused at peri-natal, weaning and early childhood in order to underpin specific government/health advice to (would be) mothers.
- Direct industry involvement in supplying vegetables to community and school initiatives in order to increase exposure to vegetables.

Priority Area 4 – Influencing Policy

- There is a potential opportunity to increase intake of vegetables through influencing policy changes.
- HIA could encourage the adoption of specific maternal advice
- Lobby for food policy in pre-school and school settings that encourage learning to like vegetables



Strategic investment plan



Logic or impact model for SIP implementation



Implementation considerations

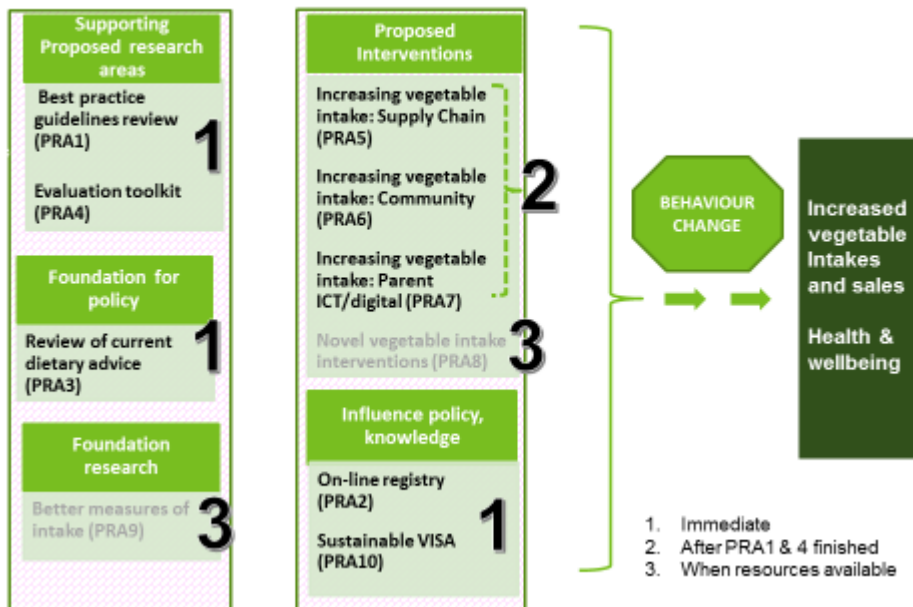
- Have we got the foundations right?
- Are any PRAs dependent on the outcomes of another?
- Are there some early wins for HI?
- Will the PRAs have a direct or indirect impact on vegetable intakes/sales?
- Can the PRAs be run in parallel?
- What else is going on already?

GETTING FOUNDATIONS RIGHT

NEW INITIATIVES

PROPOSED OUTCOMES

LONG TERM GOAL



Best practice interventions: PRA 1

Proposed Research Area: 1	
Title:	Develop best practice standards and strategies for effective interventions
Summary:	The aim of this PRA is to (1) translate best practice guidelines into implementable strategies for each stakeholder/setting and (2) dissemination and publication of best practice guidelines through promotional, education and engagement tools that leads to adoption and implementation by stakeholders.

Online Registry/repository: PRA 2

Proposed Research Area: 2

Title: Online Registry/repository of Initiatives

Summary: The aim of this PRA is to (1) setup and launch an online registry of initiatives that allows for uploading of program or research information and use of an evaluation tool for evaluating effectiveness and (2) promote and maintain its use amongst community and research stakeholders as a key collaborative tool to promote initiative awareness and best practice.

Review dietary advice to be more specific: PRA3

Proposed Research Area: 3

Title: Review of maternal, infant and early years dietary advice

Summary: The aim of this PRA is to (1) review dietary recommendations and scientific evidence at peri-natal, lactation, weaning and preschool for opportunities to encourage vegetable consumption, (2) make recommendations for amendments to advice and (3) engage with Department of Health and expert committees responsible for drafting policies and recommendations.

Evaluation tool kit: PRA 4

Proposed Research Area: 4

Title:	Develop an evaluation toolkit for interventions aiming to increase vegetable intake in children
Summary:	The aim of this PRA is to develop an evaluation framework and set of best practice criteria that can be used as the gold standard for measuring the impact of initiatives aimed at increasing vegetable intake in children.

Supply chain innovation: PRA 5

Proposed Research Area: 5

Title:	Increasing children's vegetable acceptance and intake – supply chain partners
Summary:	The aim of this PRA is to (1) undertake a scientific study with the aim to increase children's vegetable intake through manipulation of variables in control of the supply chain (e.g. sensory properties, preparation, presentation, packaging etc.) and (2) demonstrate commercial viability and a pathway for commercial adoption.

Community setting intervention: PRA 6

Proposed Research Area: 6	
Title:	Increasing children's vegetable acceptance and intake –community setting interventions
Summary:	The aim of this PRA is to (1) determine the effectiveness of a community intervention on sustained increases in children's vegetable intake in a controlled trial and across multiple sectors and (2) demonstrate a pathway for larger scale roll-out.

Parental digital intervention: PRA 7

Proposed Research Area: 7	
Title:	Increasing children's vegetable acceptance and intake – parent digital intervention
Summary:	Using the evidence of sensory acceptance (repeated exposure & positive reinforcement) the aim of this PRA is to (1) design and evaluate a digital intervention study, for parents to use, to increase their children's vegetable intake that includes an integrated monitoring, interaction and improvement facility to support parental influence and (2) demonstrate a pathway for larger scale roll-out.

Novel initiatives: PRA 8

Proposed Research Area: 8	
Title:	Novel vegetable intake initiatives
Summary:	The aim of this PRA is to design and conduct a controlled trial to test novel, evidence based strategies (such as (1) optimising reward, (2) strengthening parent self-efficacy, (3) exposure) and (4) hedonics and usual consumption.

Revised: Controlled intervention study that tests one or more novel strategies amongst school children in the community. Emphasis on translating approaches that work in clinic, out into the community for greater impact.

Better measures: PRA 9

Proposed Research Area: 9	
Title:	Better measures of vegetable intake
Summary:	This aim of this PRA is (1) to develop/identify technology that will enable the development of a non-invasive novel tool to measure vegetable intake without relying upon self-report or observation methods (for example, skin carotenoids measure), (2) validate and calibrate instrumental responses to different types of vegetables and portions consumed and (3) compare costs and accuracy to other methods of measuring vegetable intake.

Vegetable Intake Stakeholder Alliance: PRA 10

Proposed Research Area: 10	
Title:	A long term plan for a sustainable VISA
Summary:	Through stakeholder consultation, reviews of learnings from similar international alliances, literature reviews and suggestions from this workshop, the aim of this PRA is to work with Horticulture Innovation to define and provide recommendations regarding the role, vision, strategy and action plan for a 5 year sustainable Vegetable Intake Strategic Alliance (VISA).

Potential timelines

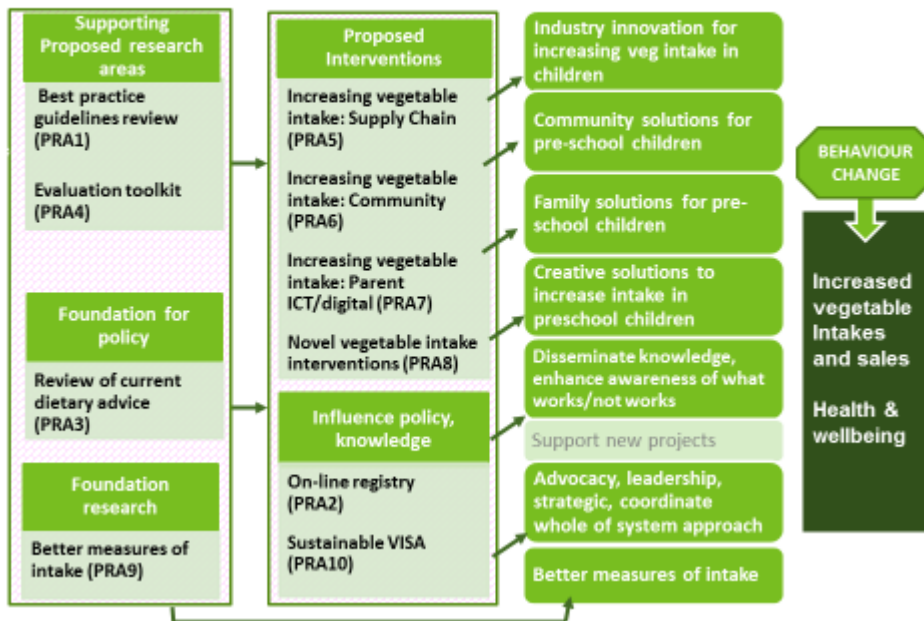
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
VISA	X ----->					
Registry	-----> X ----->					
Best practice interventions	-----> X					
Evaluation	-----> X					
Review advice	-----> X					
Supply chain	-----> X					
Parental intervention	-----> X					
Community Intervention	-----> X					
Better measures	-----> X					
Novel & translatable	-----> X					



More detailed frameworks

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GETTING FOUNDATIONS RIGHT **NEW INITIATIVES** **PROPOSED OUTCOMES** **LONG TERM GOAL**



Inputs	Activities	Planned outputs across sectors	Proposed outcomes (medium term)	Impact (long term)
Resources • SIP • Literature reviews Investment • Hi \$ • Partner investment Partners & collaborators • Consumer Alignment Panel • Industry, education • Health professionals Proposed research areas • PRA: Review diet advice health professionals • PRA: Develop best practice guidelines • PRA: Develop assessment & evaluation criteria Social cognitive models influencing behaviour change Evidence base Coordination & alliances	PRA: Sustainable VISA	Society – enabling capacity Publications, presentations, reports, training programs Long standing active, effective & influential VISA	Changes in health professional and industry practice & changes to policy	  SOCIAL IMPACT Improved health and wellbeing ECONOMIC IMPACT Increased vegetable sales
	PRA: Supply chain – industry intervention	Industry/Food supply chain Validated effective supply chain interventions to increase children's intake of vegetables through new products, promotions etc.	New vegetable products, innovators acceptable to children Improved desirability, availability of vegetables	
	PRA: Community intervention	Community – changing the environment Effective community intervention(s)	Scaled community program to support increase in children's intake of vegetables	
	PRA: On-line registry	Organisational – supporting & endorsing (eg schools, childcare) Effective health professional and industry resource Effective primary school education resource	Sharing of knowledge to inform further interventions and evaluation of initiatives Increasing primary school children's knowledge of, and willingness to try more vegetables	
	PRA: Parent/caregivers ICT/digital intervention	Family – engaged participation Validated effective ICT intervention(s) with parents to increase children's vegetable intake	More vegetables offered and consumed in the home environment Increased motivation, knowledge, self-efficacy, attitudes of parents and family members	
	PRA: Novel vegetable intake initiatives	Individual – the child New validated intervention(s) to increase vegetable intake Validated non-invasive objective vegetable intake measures	More positive attitude toward & greater consumption of vegetables by children Non-invasive objective vegetable intake measures used in evaluation, national surveys	
	PRA: Better intake measures			

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FOR FURTHER INFORMATION

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