Maintenance of the National public *in vitro* potato collection

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PT12007

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June 2013

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Maintenance of the national public *in vitro* potato collection

Purpose of the Project

The purpose of this project is to initiate discussion with industry to seek direction on the future of a National *in vitro* public potato collection and its future maintenance.

June 2013

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Media Summary

The National public potato *in vitro* collection is maintained at ViCSPA, Toolangi with 94 cultivars/clones and at Stoney Rise, Devonport at the Tasmanian Institute of Agriculture having 147 cultivars/clones. This collection is made up of accessions of cultivars and various clones of cultivars that are held in the public domain and they are publically available and not subject to plant breeders rights. All material within the collection is available based on a request.

Alongside the public collection, but separately managed is the private collection of privately funded cultivars which have restricted release based on commercial agreements and plant breeder rights.

The production of pathogen-tested stocks from tissue culture provides the Australian potato industry with a vital cultural control method for the major plant diseases that can adversely affect yield and quality of production.

The shelf life of the *in vitro* collection is limited. Each year all of the accessions of cultivars within the collection go through a sub culturing process to maintain their viability, and undergo testing for fungal and bacterial contamination to maintain the high health status.

The National public potato *in vitro* collection ensures that there is a genetic resource of potato cultivars grown in Australia and is a vital depository of potato cultivars for the generation of high health potatoes and the basis for seed certification.

It is a very important industry resource for maintaining industry access to potato germplasm and biodiversity. As market drivers change, so does the varieties used, which could involve the new exploitation of an old variety. This has been recently observed in the case of Snowden – a variety once discarded now finding a place in modern production.

The future of the public cultivar collection is at risk. ViCSPA and TIA have funded the collection for the past 3 years while alternative funding arrangements were being considered. However, both organisations are unable to continue funding the ongoing maintenance of the public collection without renewed funding from industry.

The purpose of this project is to initiate discussion with industry, to seek direction on the future of a National *in vitro* public potato collection and its future maintenance.

Technical Summary

A major innovation for the potato industry was the adoption in the 1970s of tissue culture – or micro-propagation - as a means of multiplying disease-free plants that can then be used to produce healthy seed tubers for farmers. This concept was first reported in Australia by Harrison and coworkers (1974). From this pioneering research and development, an *in vitro* tissue culture collection of the public potato cultivars is maintained in two laboratories in Australia, under the management of ViCSPA. These collections serve as a germplasm bank and resource for commonly used potato cultivars that have no plant breeders rights and as such are available to all of the industry. The collection provides a source of pathogen tested material that can be multiplied in the ViCSPA accredited laboratories and used in seed certification schemes to generate nucleus seed stocks. The collection is therefore, vital to the entire Australian potato industry.

This project has four main aspects

1. Ensure the routine maintenance of the *in vitro* collection. Including the annual pathogen testing and culturing of potato cultivars to ensure their integrity and viability
2. Establish the industry need to maintain the public collection
3. Identify mechanisms to rationalise the inclusion/exclusion of cultivars/clones within the National public collection
4. Identify mechanisms for funding the National public *in vitro* potato collection

Introduction

The National *in vitro* public potato collection ensures that there is a genetic resource of potato cultivars grown in Australia and is a vital depository of potato cultivars for the generation of high health potatoes and form the basis for seed certification.

The public collection at ViCSPA Toolangi has 94 cultivars/clones (Table 1) and the Tasmanian Institute of Agriculture collection has 147 cultivars/clones (Table 2).

For cultivars held in the public collection there are no royalties or Plant Breed Rights owned on them. If a grower wants a variety, there are no legal requirements needed to get it. Therefore, it is a very important resource for maintaining industry access to potato germ-plasm and biodiversity. As market drivers change, so to the varieties used, which could involve the new exploitation of an old variety. This has been recently observed in the case of the potato cultivar Snowden – a cultivar once discarded now finding a place in modern production.

All potato cultivars introduced into the tissue culture collection are tested for a range of pathogens including but not limited to:

- Blackleg and related soft rots caused by *Pectobacteria* and *Dickeya* spp.,
- Bacterial wilt, caused by *Ralstonia solanacearum* (formerly *Pseudomonas solanacearum*),
- Ring rot, caused by *Clavibacter michiganense* pv *sepodonicum*,
- Powdery scab, caused by *Spongospora subterranea*,
- Black scurf, caused by *Rhizoctonia solani*,
- Silver scurf, caused by *Helminthosporium solani*,
- Gangrene, caused by *Phoma exigua*,
- Wilt, dry rot, caused by *Fusarium* spp.,
- Wilt, caused by *Verticillium* spp.,
- Black dot, caused by *Colletotrichum coccodes*, and
- Potato leafroll virus (PLRV), potato virus A (PVA), potato virus M (PVM), potato virus S (PVS), potato virus x (PVX), potato virus Y (PVY), tomato spotted wilt virus (TSW), and potato spindle tuber viroid. (PSTV)
- Calico, caused by Alfalfa Mosaic Virus
- Late blight, caused by *Phytophthora infestans*
- Common scab caused by *Streptomyces* spp.

The shelf life of the *in vitro* collection is limited. Each year all of the accessions of cultivar/clones within the collection go through a sub-culturing process to maintain their viability and high health status, and undergo testing for fungal and bacterial contamination to maintain the high health status.

Testing for bacterial and fungal contamination is performed using conventional laboratory methods whereby tissue culture plantlets are incubated in selective artificial media (selective for fungi or bacteria). Any material found to be contaminated will go through a clean-up process involving further testing on selective media to ensure culture is free of contamination.

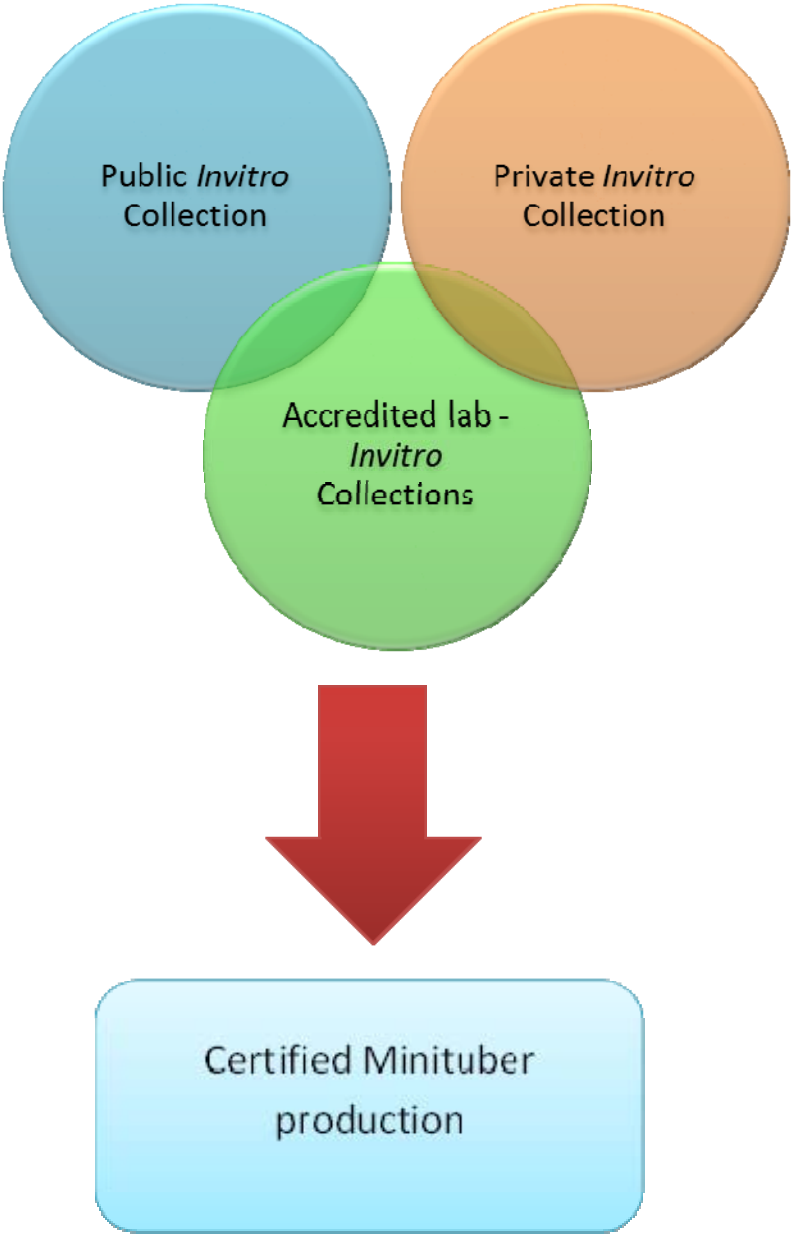
The National *in vitro* public potato collection consists of a number of cultivars/clones, used in the commercial industry and a proportion not currently used in the commercial potato industry. All cultivar/clones in the collection are in the public domain. The Tasmanian collection has a significant number of breeder lines, which have code names. Both collections have cultivars which are unique to Australia e.g. Otway red as well as internationally available cultivars. The collections have various selections of the one cultivar eg Kennebec Line B, Line C, Line D which resulted from

either field selections made or through the *in vitro* refreshment program, a previously funded HAL project PT05005.

Importantly, many clones of potato cultivars maintained in the public collection, are unique to Australia and not available in any other collection worldwide. Therefore, the collection is the sole deposit of these cultivar/clones.

Alongside the public collection, but separately managed is the private collection of privately funded cultivars which have restricted release based on commercial agreements and plant breeder rights.

Many, but not all, of the accredited labs in Australia have their own privately maintained *in vitro* collection, consisting of public and or private cultivars, which they maintain as a basis for commercial minituber production. Accredited labs can renew their collection tissue culture stock from the National public collection as shown below.



Examples of tissue culture plantlets in national public cultivar collection

Consultation with industry

Through this project, there was extensive communication with a large section of the industry including Seed Potatoes Victoria, Victorian Farmers Federation – Potato Council, Processing Potato Association of Australia (PPAA), Western Australia Seed Producers Association and Snack Brands Australia. In addition to organisational, discussions, there was communication with individual growers regarding the National *in vitro* public potato collection.

A meeting of interested parties was held on the 20th June 2013 at the Holiday Inn Melbourne Airport to discuss the collection and agree on strategy for the collection into the future. (Minutes of the meeting attached as Appendix 1)

Developing guidelines for the maintenance of cultivars within the National in vitro public potato collection

In determining the future of the National *in vitro* public potato collection, it is imperative that there are clear guidelines developed to ensure a transparent rational for the inclusion or exclusion of cultivars/clones held in the National *in vitro* public potato collection. In doing so, this project has provided the mechanism and guidelines have been developed for the national collection, in consultation with industry.

The cultivars held with the public *in vitro* collection shall be maintained using the following principles:

1. **For potato cultivars/clones that are not available overseas**

The accession (cultivar/clone) will be maintained in the National *in vitro* public potato collection provided there is a degree of commercial production in the last 10 years. If there is no commercial production of the cultivar/clone then the cultivar/clone shall be scheduled for disposal. In doing so, the industry shall be informed of the potential for disposal (through industry publications such as Potatoes Australia) and the option given to individuals/companies to tender for the future maintenance of the cultivar/clone. There will be a 3 month cooling-off

period between the notification of the removal of the cultivar from the public collection and the physical disposal of the cultivar/clone.

2. For potato cultivars/clones that are available overseas

The accession will be maintained in the National *in vitro* public potato collection provided there is a degree of commercial production in the last 5 years. If there is no commercial production of the cultivar/clone then the cultivar/clone shall be scheduled for disposal. In doing so, the industry shall be informed of the potential for disposal (through industry publications such as Potatoes Australia) and the option given to individuals/companies to tender for the future maintenance of the cultivar/clone. There will be a 3 month cooling-off period between the notification of the removal of the cultivar from the public collection and the physical disposal of the cultivar/clone.

Funding the National in vitro public potato collection

Until recently, the National *in vitro* public potato collection was funded by the industry R&D levy through Horticulture Australia. ViCSPA has been advised that the HAL funding will not continue for the collection and that an alternative funding model must be developed.

The future of the National *in vitro* public potato collection is uncertain without secured funding. ViCSPA and TIA have funded the collection for the past 3 years while alternative funding arrangements were being considered. However, both organisations are unable to continue funding the ongoing maintenance of the public collection without renewed funding from industry.

Several funding models were considered including:

1. Seeking investment through the HAL using grower/industry levies. This model ensures that the entire industry contributes equally.
2. A production tax be imposed on the production of minitubers in Australia, there will be added costs in the calculation and implementation of this tax.
3. No funding – the public collection abandoned and option provided to individuals/companies to privately fund cultivars/clones which may result in restricted access to cultivars as the collection becomes effectively privately owned.

It is a recommendation from this project that the National *in vitro* public potato collection be continued using the support of the industry funds. In achieving this, a project submission will be developed for HAL for funding a 5-year project with a review for ongoing support held every 4 years.

The imposition of a production tax was considered to be difficult to implement and costly to operate as the tax would be seen as an imposition on users of minitubers and not seen as a fair and equitable system for the industry.

Without HAL support, the National *in vitro* public potato collection would be abandoned and accessions from the collection will be tendered to industry and if no offers to invest in the maintenance of accessions within the collection are made, then the cultivar/clone will be destroyed. This will have key implications for the Australian potato industry including.

1. The potential loss of potato cultivars to Australia, in particular those cultivars/clones which are of heritage value or unique to Australia

2. Access to potato cultivars held within the public domain will be controlled by the private ownership of tissue culture stocks of particular cultivars potentially resulting in closed loop marketing of a given cultivar.
3. Without a central National *in vitro* public potato collection, there is greater risk of somaclonal variation in tissue culture stocks contributing to genetic drift or mutation of potato cultivars.
4. Introduce the need to import existing commercial cultivars from overseas to maintain production in Australia of cultivars removed from the national potato collection.

The removal of the collection from the public domain may result in market failure, in particular for cultivar/clones for which there is no alternative funding for maintaining them in the *in vitro* collection eg private funding. The National *in vitro* public potato collection acts as a reserve of potato biodiversity that can be explored with changing market drivers and needs eg. PCN resistance. Without the maintenance of cultivars/clones in the public domain the ability for the industry to adopt cultivars with changing market trends becomes limited, and may require material to be reintroduced into tissue culture or sourced from overseas collections which can be time consuming and expensive.

Rationalisation of the two in vitro public potato collections

To gain efficiency dividends for the industry, the two collections held in Victoria and Tasmania will be forged into to a single collection and managed to maximise the viability and security of the collection. In doing so, the collection at Toolangi will become the working collection and the Tasmania collection will specifically be operated as a long-term back-up. All accessions within the two collections will be identical. This will provide a robust system for the management of the national public collection and provide security in the case of a biosecurity risk or facility failure.

Key recommendations/outcomes

1. It is a recommendation from this project that the National *in vitro* public potato collection be continued using the support of industry. In achieving this, a project submission will be developed for HAL for funding a 5-year project with a review for ongoing support held every 4 years.

2. The conclusion from this project is that without public funding, the National *in vitro* public potato collection will be abandoned and, in doing so, options for private ownership of accessions will be offered. This could result in market failure within industry as access to potato cultivars could be restricted through the conditions of private investment in the ongoing maintenance of i*nvitro* collections of potato cultivars.

3. Principles for the inclusion and or exclusion of accessions within the National *in vitro* public potato collection have been developed and provide a basis to ensure the public collection is maintained based on commercial industry needs. These principles will be introduced within 6 months of the date of this report.

Principles for the inclusion and or exclusion of accessions within the National *in vitro* public potato collection

Cultivar/clone	Period of commercial production[1]	Process of Disposal
Available overseas	Not used in commercial production for 5 years	Published to industry for potential disposal pending private investment with 3 month cooling off period
Not available overseas	Not used in commercial production for 10 years	

4. Rationalisation of the two existing *in vitro* public potato collections held in Victoria and Tasmania into one single collection with a working stock maintained at Toolangi and long-term back up maintained at Stoney Rise. This rationalisation will provide a secure and efficient means of maintaining the *in vitro* collection into the future. This rationalisation will be achieved, subject to the resolution and security of funding for the collection.

References

Harrison, DE., Anderson, R.D., Mattingley, G.H. and Harmsworth, L.J. (1974) Pathogen Tested Seed Potatoes. *Journal of Australian Institute of Agricultural Science*, September (1974), 188-193

[1] Commercial production relates to the use in the certified seed schemes of Australia

Table 1. The list of *in vitro* public potato cultivars/clones maintained by ViCSPA at Toolangi

#	Cultivar/clone	#	Cultivar/clone
1	Alturus Russet (82360 7)	41	King Edward Line B
2	Atlantic (Line A) clone 1	42	Kipfler
3	Atlantic (Line A) clone 2	43	Kipfler B
4	Atlantic C	44	KT 3
5	Atlantic D	45	Maris Piper
6	Banana	46	Nicola
7	Bintje Line B	47	Nicola Line B
8	Bismark	48	Nooksack
9	Bison (Line B) clone 2	49	Nooksack B
10	Bison (Line C)	50	Norland Wisc SR(Clone 2)
11	Brakelight	51	Onka
12	Bremer (WA)	52	Otway Red Line B
13	Brownell	53	Patrones
14	Cadima (WA)	54	Pike A
15	Carlingford	55	*Pike Line B NOT FOR USE*
16	Cherry Red	56	Pink eye
17	Coliban (Line B) Clone 1	57	Pink Fir Apple
18	Coliban (Line B) Clone 3	58	Pink Fir Apple B
19	Coliban C	59	Ranger Russet
20	Cranberry Red	60	Ranger Russet B
21	Crystal	61	Red La Soda
22	Crystal B	62	Red La Soda B
23	Delaware (Line A) (WA)	63	Red Pontiac (Line B)
24	Delaware B	64	Red Pontiac (Line C)
25	Denali (clone 2)	65	Russet BB (Line A, Ruen Strain)
26	Desiree	66	Russet BB (Line A, Ruen Strain)
27	Desiree B	67	Russet BB (Line C Ruen strain)
28	Diament	68	Russet BB British Columbia
29	Dutch Cream	69	Russet BB Netted Gem
30	Eben	70	Russet BB Vancouver (line B)
31	Exton (Line C) clone 2	71	Sapphire
32	Exton (Line E)	72	Sebago B
33	Granola	73	Sebago C
34	Kennebec (Line 2)	74	Sebago D
35	Kennebec (Line B, line 12)	75	Sebago E
36	Kennebec (Line B, line 5)	76	Sebago F
37	Kennebec (Line C)	77	Sebago New Brunswick
38	Kennebec Line 2 Line B	78	Sebago New Brunswick Line B
39	Kennebec Line D	79	Sequoia (Line D) clone 2
40	King Edward	80	Sequoia (Line E)

#	Cultivar/clone	#	Cultivar/clone
81	Shepody	88	Tasman
82	Shepody B	89	Toolangi Delight
83	Simcoe	90	Toolangi Delight B
84	Simcoe B	91	Trent
85	Snowden	92	Trent Line B
86	Spunta	93	Umatilla (Russet)
87	Spunta B	94	Up-to-date

Table 2 List of potato cultivars held in the public *in vitro* collection by TIA

#	Cultivar/clone
1	1-001-18
2	15006
3	66107-51
4	89-27-6
5	92-37-1 Fergie Fry
6	93-6-3
7	78069-17
8	86 C 16 B 12
9	A 76147-2 (Calwhite)
10	A 082611-7 (UMatilla)
11	A 82360-7(Alturas Russet)
12	A 82705-1 Idarose
13	A 84180-8
14	A 8495-1
15	A 8519-5
16	A 8602-1
17	A 8792-1
18	AC 83164-6
19	Akersegen
20	Atlantic 1
21	Atlantic 2
22	Atlantic C
23	ATX 85404
24	Banana
25	Bintje
26	Bintje 1
27	Bintje 2
28	Bison 2005
29	Bison
30	Bismark 1
31	Bismark 2
32	Brakelight (97-57-9)
33	Brownell 1
34	Cariboo
35	Carlingford
36	C 0083008-1 (Legend)
37	Chiefton
38	Coliban
39	Coliban 1
40	Coliban 2
41	Cranberry Red
42	Crystal
43	Dawmor
44	Delware
45	Desiree 1
46	Desiree 2
47	Dev 1
48	Diament
49	Dutch Cream
50	Fontenot
51	Frontier Russet
52	Gold Rush
53	Granola
54	Kenebec D
55	Kenebec 2B
56	Kennebec 2
57	Kennebec 9
58	Kennebec 18
59	Kennebec 27
60	Kennebec 34
61	Kennebec 43
62	Kennebec 46
63	King Edward 1
64	King Edward 2
65	Kipfler 1
66	Kipfler 2
67	Kranz
68	KT3 152
69	Leven
70	Liseta
71	Liseta
72	Lustre
73	Mac Russet (89-27-33)
74	Mainestay
75	Maris Piper
76	Nampa
77	Nicola 1
78	Nicola 2
79	Nooksack 1
80	Nooksack 2
81	Norland Wisc. Super Red
82	Patrones
83	Pentland Dell
84	Pink Eye 1
85	Pink Eye 2
86	Pink Fir Apple
87	PO3 172
88	Pontiac 1

#	Cultivar/clone
89	Pontiac 2
90	Red Pontiac B
91	Purple Congo
92	Ranger Russet 1
93	Ranger Russet 2
94	Red Ruby
95	RR Amisk
96	Ruby Lou (90-40-1)
97	Russet Burbank 1
98	Russet Burbank 2
99	Russet Burbank 3
100	Russet Burbank 4
101	Russet Burbank 5
102	Russet Burbank B.C. – R
103	Russet Burbank Idaho – E
104	Russet Burbank Ruen
105	Russet Burbank Starks
106	Russet Burbank Victoria
107	Russet Nugget
108	Sapphire
109	Sebago
110	Sebago 1
111	Sebago E
112	Sequoia
113	Sequoia 1
114	Sequoia 2
115	Shepody
116	Shepody SSH 1
117	Shepody SSH 4
118	Shepody MSH 4
119	Shepody MSH 5
120	Shepody MSH 7
121	Shepody MSH 9
122	Shepody MSH 10
123	Shine
124	Southern Cross 1
125	Southern Cross 2
126	Spey
127	Spunta
128	Spunta
129	Sunrise
130	Tasman 1
131	Tasman 2
132	Tolaas
133	Tolangi Delight
134	TK51.6 155
135	TX 1385
136	TXAV 657-27
137	Up to Date 1
138	Up to Date 2
139	V 60-31-1
140	W 1005 Russet P89
141	Wilwash
142	Yellow King 1
143	Yellow King 2

Appendix 1

Minutes - Meeting of National *in vitro* public potato collection

20th June, 2013 at 2.00 pm at Melbourne Holiday Inn

Attendees

Ian Simpson (Agtec Agriculture), Dale Spencer (WA), Colin Ayres (WA Grower), Mike Davies (APL WA), Luke Raggatt (AUSVEG), Leonie White (TIA, Tasmania), Brad Mills (HAL), David Carter, (Accredited lab – minituber producer), Kim Weir (NSW grower), Corina Horstra (VICSPA), Colin Birch (TIA, Tasmania), David Hotchkin (President VFF Thorpdale branch) Kay Spierings (Chair VICSPA).

Apologies

Des Jennings, Michael Hicks, Gary O'Neil

Introduction to the National In-vitro Public Potato Collection

Nigel Crump addressed the group on the process in the use of National *in vitro* public potato collection and outlined the objectives listed below:

1. Do we need a collection to continue?
2. How will it be maintained?
3. How will it be funded?

Do we need a collection?

Discussion

- Two public collections maintained by UTAS and ViCSPA, these have been funded internally by ViCSPA and UTAS/ DPIPWE since 2010
- A percentage of varieties in the *in vitro* public collection are used in commercial production while a percentage (around 50%) are not used in the commercial potato industry
- Length of time to import a variety from overseas 12 to 18 months. Cost $2500-$4000
- Cost to reintroduce a variety into tissue culture in Australia approx $1700
- Cost to maintain a variety in the storage collection $ 242.00/ year or $15,000 to $22,000 for each site in Victoria and Tasmania.
- Levy system of accredited laboratories on minituber production for the purposes of funding the collection discussed. Collecting a levy through laboratories was considered to be a difficult option.
- Comments from Gary O Neil and Michael Hicks presented.
- Varieties in the collection fall into two categories
    1. Public varieties that are held in overseas collections
    2. Public varieties that are exclusive to Australia
- Brad Mills (HAL) reminded the group that when making a case in seeking funding to maintain the collection the need exists to address issues such as the "best use of funds for the industry on return of investment and market failure."

Management of the Collection

Value of collection

- A central gene bank that reduces the risk of genetic variation and is a source of true to type material
- A high health source that is tested annually for bacterial and fungal contamination
- A source of publically available material that growers can use who that don't have access to PBR/ privately owned varieties
- Providing growers with choice.
- Heritage varieties that have historical and cultural value.
- The availability of back up varieties in the event of genetic variation eg Pike B not true to type, Pike A was available as a replacement
- The collection provides a resource with changing arket trend

Structure of the collection

- The main public collection to be held by ViCSPA at Toolangi where it will be tested for bacteria and fungi and refreshed annually.
- The "back up" collection: a duplicate of the varieties to be held in Tasmania to ensure that the resource is not lost in the event of facility failure or natural disaster
- Need for pathogen annual testing to continue as part of the process

.

The group suggested that VICSPA in consultation with Tasmania University manage the current collection. This is due to there being appropriate capacity and capability for managing the collection.

The list of accessions within the collection to be managed so that varieties available overseas for will be kept for 5 years and varieties **not** available overseas will be kept for 10 years after which time the position of varieties will be reviewed. If over the nominated period there is no commercial production of these cultivars in the potato industry (determined by minitubers produced through the accredited labs), varieties will be be removed from the public collection and individual growers or organisations will be given the option to maintain a variety at their cost. This policy is to be advertised in the media to advise the industry prior to reducing the collection. It was suggested that Potato Australia magazine be used subject to approval from the AUSVEG CEO. There will be a 3 month period between the announcement for a cultivars disposal and actual disposal allowing sufficient time for consultation

Moved, Ian Simpson seconded, Colin Ayres

Facility

It was agreed that the VICSPA facility be the primary collection centre to service the industry providing a back up collection to the Tasmanian facility for insurance purposes.

Moved, Colin Ayres seconded, Colin Birch

Funding

Discussion

- It is important that whatever funding system is introduced that it does not increase the cost of seed production and thereby make seed more expensive and less attractive to buyers
- The cost of maintaining the collection is not great but the returns to the industry are extremely high

- In the event of no external funding being available the entire collection would go straight to the review process

This group agreed to seek funding through the current levy system for the maintenance of the full public collection that takes into account the motions agreed from this meeting.
Moved, David Hotchkin seconded, Ian Simpson

Report for funding for the maintenance of the National *in vitro* public potato collection based on the outcomes from this meeting to be circulated to attendees and presented to HAL as a final report

Meeting closed 3.15pm