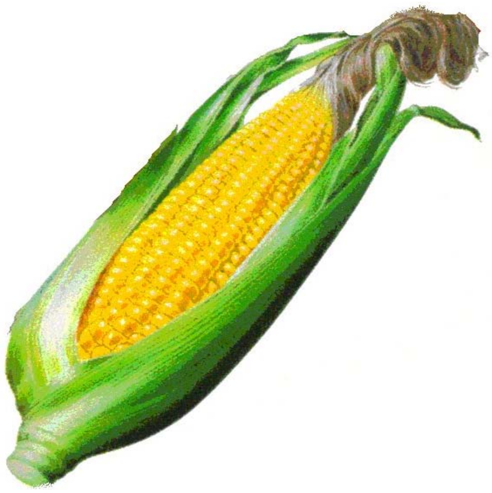
FINAL IRA PAPER

Importation of Sweetcorn seed (Zea mays L.)
from Idaho (United States of America) for the purpose of Field Sowing in Australia



April, 2002

AGRICULTURE, FISHERIES AND FORESTRY - AUSTRALIA

Foreword

The following is my determination in relation to Biosecurity Australia’s policy on the importation of sweetcorn (*Zea mays* L.) seed for field sowing in Australia from Idaho, USA:

1. Importation of sweetcorn seed from Idaho be permitted subject to the application of phytosanitary measures as specified in section 9 of this final import risk analysis (IRA) paper. These requirements maintain Australia’s appropriate level of protection and accord with Australia’s international rights and obligations under the WTO *Agreement on the Application of Sanitary and Phytosanitary Measures*. The import risk analysis has been conducted in accordance with *The AQIS Import Risk Analysis Process Handbook.*

2. This policy be applied in accordance with the *Quarantine Act 1908* and *Quarantine Proclamation 1998* as amended (‘the Proclamation’). The phytosanitary measures specified in section 9 of this final IRA paper are designed to limit the quarantine risk to a level, which is acceptably low, consistent with section 70 of the Proclamation.

Simon Hearn
Executive Manager
Market Access and Biosecurity

March 2002

Information Privacy

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GLOSSARY OF TERMS AND ABBREVIATIONS

ABARE	Australian Bureau of Agricultural and Resource Economics
AFFA	Agriculture, Fisheries and Forestry - Australia
ALOP	appropriate level of protection
APHIS	Animal and Plant Health Inspection Service
AQIS	Australian Quarantine and Inspection Service
Area	an officially defined country, part of a country or all or parts of several countries
Biosecurity Australia	a major operating group within the Commonwealth Department of Agriculture, Fisheries and Forestry - Australia. Biosecurity Australia protects consumers and animal and plant health, and facilitates trade, by providing sound scientifically based and cost-effective quarantine policy
Control (of a pest)	suppression, containment or eradication of a pest population
DPIE	Department of Primary Industries and Energy (former name of AFFA)
Endangered area	an area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss
Entry (of a pest)	movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled
Entry potential	likelihood of the entry of a pest
Establishment	the perpetuation, for the foreseeable future, of a pest within an area after entry
Establishment potential	likelihood of the establishment of a pest
FAO	Food and Agriculture Organization of the United Nations
HPV	High Plains tenuivirus
ICON	AQIS Import Conditions database
Introduction potential	likelihood of the introduction of a pest
Introduction	entry of a pest resulting in its establishment
IPPC	International Plant Protection Convention, as deposited in 1951 with FAO in Rome and as subsequently amended
IRA	import risk analysis
ISDA	Idaho State Department of Agriculture
ISPM	International Standard on Phytosanitary Measures
MDMV	Maize dwarf mosaic potyvirus

National Plant Protection organisation	official service established by a government to discharge the functions specified by IPPC
Non-quarantine pest	pest that is not a quarantine pest for an area
Official	established, authorised or performed by a National Plant Protection Organization
Official control (of a regulated pest)	the active enforcement of mandatory phytosanitary regulations and the application of mandatory phytosanitary procedures with the objective of eradication or containment of quarantine pests or for the management of regulated non-quarantine pests
Pathway	any means that allows the entry or spread of a pest
PBPM	Plant Biosecurity Policy Memorandum
PEQ	Post entry quarantine
Pest	any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products
Pest categorisation	the process for determining whether a pest has or has not the characteristics of a quarantine pest or those of a regulated non-quarantine pest
Pest free area	an area in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained
Pest risk analysis	the process of evaluating biological or other scientific evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it
Pest risk assessment	determination of whether a pest is a quarantine pest and evaluation of its introduction potential
Pest risk assessment (for quarantine pests)	evaluation of the probability of the introduction and spread of a pest and of the associated potential economic consequences
Pest risk management	the decision-making process of reducing the risk of introduction of a quarantine pest
Pest risk management (for quarantine pests)	evaluation and selection of options to reduce the risk of introduction and spread of a pest
Phytosanitary measure	any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests

Phytosanitary regulation	official rule to prevent the introduction and/or spread of quarantine pests, by regulating the production, movement or existence of commodities or other articles, or the normal activity of persons, and by establishing schemes for phytosanitary certification
PRA	abbreviation for pest risk analysis
PRA area	area in relation to which a pest risk analysis is conducted
QP	Quarantine Proclamation
Quarantine pest	a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled
Regulated non-quarantine pest	a non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party
Spread	expansion of the geographical distribution of a pest within an area
Spread potential	likelihood of the spread of a pest
SPS	Sanitary and Phytosanitary
SPS Agreement	WTO Agreement on the Application of Sanitary and Phytosanitary Measures
USA	United States of America
USDA	United States Department of Agriculture
WCM	Wheat curl mite
WSMV	Wheat streak mosaic rymovirus
WTO	World Trade Organization

EXECUTIVE SUMMARY

This final import risk analysis (IRA) has been prepared by Biosecurity Australia, formerly part of the Australian Quarantine and Inspection Service (AQIS), of the Department of Agriculture, Fisheries and Forestry – Australia (AFFA).

AQIS received several requests to facilitate imports of sweetcorn seed from Idaho by removing the current post-entry quarantine requirements. They ranged from requests to import sample quantities of seed for breeding requests to import unrestricted quantities of seed for producing new varieties of super-sweet cobs for domestic consumption and export. AQIS has also received a proposal for the import of bulk maize grain from the USA.

The IRA was conducted in accordance with the government-endorsed procedures described in *The AQIS Import Risk Analysis Process Handbook*. AQIS commenced a routine IRA of the proposed sweetcorn seed imports from Idaho. The routine process includes technically rigorous risk analysis, and is conducted in full consultation with stakeholders and external scientists as necessary. The draft IRA was circulated to stakeholders for comments. This final IRA paper includes consideration of technical issues raised by stakeholders. It presents a pest risk assessment and the phytosanitary measures to be implemented for managing potential risks of pests of quarantine concern to Australia. Biosecurity Australia is conducting a separate non-routine IRA of the USA bulk maize grain imports.

The IRA has identified nine arthropods, one fungus, three viruses, and 23 weed species of quarantine concern to Australia in association with imports of sweetcorn seed from Idaho. Various pest risk management options were examined in this paper. The options were assessed for their capacity to provide an appropriate level of protection by mitigating the potential risk of introducing the quarantine pests to Australia. Inspection and, if necessary, fumigation will be required to manage the risk of quarantine arthropod pests. Seed treatment with appropriate fungicide(s) will be required to manage the risk of the boil smut fungus, *Ustilago zeae*. Pest-free area status of export fields, verified by inspection and testing, will be required to manage the risk of High Plains *tenuivirus*, maize dwarf mosaic *potyvirus* and wheat streak mosaic *rymovirus*. Seed cleaning is an effective measure for removing weed seeds and other extraneous matter from the sweetcorn seed.

Although many management options are available for addressing the pest risks associated with Idaho-grown sweetcorn seed, most of these options would not be practical for addressing quarantine risks associated with imports of unprocessed bulk maize grain from the USA.

Biosecurity Australia is satisfied that the conditions set out in this IRA will manage the risks of quarantine pests entering Australia on imports of high-health Idaho-grown sweetcorn seed for sowing. Sweetcorn seed from Idaho may be imported to Australia subject to mandatory conditions consistent with Australia's appropriate level of protection.

1. INTRODUCTION

The import risk analysis (IRA)[1] was conducted using the routine IRA process outlined in *The AQIS Import Risk Analysis Process Handbook* (AQIS, 1998) and in accordance with the *International Standards for Phytosanitary Measures – Principles of Plant Quarantine as Related to International Trade, ISPM No. 1* (FAO, 1995); *International Standards for Phytosanitary Measures – Guidelines for Pest Risk Analysis, ISPM No. 2* (FAO, 1996a); and other standards being developed by the Interim Commission on Phytosanitary Measures (ICPM) of the International Plant Protection Convention (IPPC) of the Food and Agriculture Organization of the United Nations (FAO).

The primary purpose of an IRA is to identify regulated pests (quarantine pests and regulated non-quarantine pests) potentially associated with the commodity, to analyse their risk of introduction, establishment, spread and potential economic importance in Australia; and to evaluate candidate management options to mitigate such risks in the least trade restrictive manner. Having identified the quarantine pests associated with the importation, Biosecurity Australia considers whether management options are available to mitigate the risks of entry of those pests and their subsequent establishment and spread. Prior to finalising the IRA, a draft version, based on the best available scientific evidence, is circulated to the stakeholders to ensure that the decision-making process is transparent and technically justifiable.

This IRA considers the quarantine risks associated with the proposed importation into Australia of sweetcorn (*Zea mays* L.) seed for field sowing from the State of Idaho (hereafter referred to as Idaho) in the United States of America (USA). It then considers strategies to manage these risks. The IRA includes specific details of pests associated with sweetcorn seed from Idaho. In this paper, the term ‘pest’ is used for ‘any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products’ as defined in FAO (1999).

The pest risk management measures described in this paper have been developed in accordance with the relevant provisions, in particular Article 5, of the WTO’s Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement). They will achieve Australia’s appropriate level of protection by mitigating the risk of introducing quarantine pests to Australia.

[1] In this document the term import risk analysis is synonymous with the term pest risk analysis as defined in the FAO Glossary of Phytosanitary Terms (FAO, 1999).

2. PURPOSE

This IRA describes the risk analysis of the proposed importation of sweetcorn (*Z. mays*) seeds for sowing from Idaho, USA and the phytosanitary measures to be implemented for managing potential quarantine pest risks. The IRA includes consideration of stakeholder comments on the draft IRA circulated previously.

3. BACKGROUND

3.1 Australia's Sweetcorn Seed Import Policy

Australia's current legislation prohibits the import of sweetcorn seed except where AQIS issues import permits that specify phytosanitary measures to manage quarantine risks (*Quarantine Proclamation 1998* made under the *Quarantine Act 1908*).

3.1.1 Open quarantine

Before 1990, imports of restricted quantities of seed of inbred lines of sweetcorn were permitted from the USA and other countries for growing at an AQIS-approved quarantine field, referred to as open quarantine (AQIS, 1990). The seed from plants grown in open quarantine was released to the importer, providing no quarantine pests were detected during two visual inspections of the plants. The open quarantine option was suspended in 1990 following concerns about the potential risk of establishment and spread of downy mildews (*Peronosclerospora* spp.) and Stewart's bacterial wilt (*Pantoea stewartii* subsp. *stewartii*).

3.1.2 Post-entry quarantine

Current conditions for the import of sweetcorn seed for sowing into Australia from all countries, with the exception of New Zealand (section 3.1.3), include the requirement to grow imported seed in an AQIS-approved quarantine glasshouse, i.e. post-entry quarantine (PEQ). Because space in quarantine glasshouses is limited, only sample quantities of sweetcorn seed sufficient for establishing a line are grown in PEQ. Plants are inspected for the presence of quarantine pests or disease symptoms. If no quarantine pests or disease symptoms are found, the seed from these plants is released from quarantine.

3.1.3 Free entry

Australian sweetcorn producers can currently import unrestricted quantities of sweetcorn seed from New Zealand subject to on-arrival inspection, without the PEQ or open quarantine requirements, because seed-borne quarantine pathogens of sweetcorn are not known to occur in New Zealand. The imported seed is planted in the field for various purposes, including multiplication of inbred parent lines, production of hybrid seed and cultivation of sweetcorn for the production of fresh cobs for consumption. New Zealand-grown progeny of sweetcorn seed that has been imported into New Zealand in accordance with New Zealand's quarantine requirements may be exported to Australia. Consequently, Australian importers can access seed of new varieties of sweetcorn from the USA and other countries through New Zealand.

3.2 History of Import Proposals

AQIS has received several requests to facilitate the importation of sweetcorn seed from Idaho. They range from requests to import seed for breeding to requests to import seed for producing new varieties of super-sweet cobs for domestic consumption and export.

In 1993, AQIS commenced a risk analysis of proposals to import sweetcorn seed from Idaho, and requested information from the Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA) about the pests of sweetcorn present in Idaho. However, AQIS did not pursue the issue further at that time because of uncertainty over the potential risk of High Plains *tenuivirus* (HPV).

Following clarification of the significance of HPV, AQIS recommenced consideration of the proposals for the importation of sweetcorn seed for sowing from Idaho, using the IRA process as described in *The AQIS Import Risk Analysis Process Handbook* (AQIS, 1998). On 9 September 1998, AQIS informed stakeholders of its intention to undertake the IRA. On 20 October 1998, stakeholders were advised of the proposed timeframe for the IRA, and invited to comment on the proposal to conduct the IRA using the routine process. Stakeholders were informed on 8 February 1999 of AQIS's decision to proceed with the IRA using the routine process. The routine process was chosen because the USA's request met the following criteria from the handbook 'analysis is technically less complex or the proposal appears *prima facie* not to require assessment of significantly greater or different risks than those previously examined.' The routine process includes technically rigorous risk analysis, and it is conducted in full consultation with stakeholders and draws upon the advice of external scientists as appropriate. Use of the routine process does not in any way diminish the rigour of the risk analysis.

In 1998/99, AQIS collected a great deal of information on sweetcorn pests for an IRA of bulk maize (*Z. mays*) grain imports from the USA (AQIS, 1999). The relevant information from that work has been considered in this IRA. AQIS notes that pest risks associated with Idaho sweetcorn seed are much lower than those for bulk maize grain imports from the USA given the relatively pest-free status of Idaho and feasibility of a much wider range of pest risk management measures for certified sweetcorn seed than for bulk maize grain.

A draft version of the sweetcorn seed IRA was circulated to stakeholders for comment in January 2000 and AQIS held a meeting with stakeholders in March 2000 to discuss technical issues raised by them.

3.3 The Sweetcorn Industry in Australia

In Australia, about 50 000 ha is cultivated for commercial sweetcorn production for the fresh, frozen and canned food industries. The primary production areas are in Queensland, Western Australia and Victoria. In 1996, the Australian sweetcorn market was valued at $30.6 million at the farm gate, and $145 million overall. Australia imports about 28 000 tonnes of sweetcorn, mainly frozen, and exports about 6 000 tonnes of fresh and canned sweetcorn. A summary of sweetcorn production statistics is given in Table 1.

Approximately 75 to 80 tonnes of sweetcorn seed is produced per annum, and 60 percent of the seed is exported (Table 1), mainly to Asia, China, Europe and South America.

Table 1: Australian sweetcorn industry statistics

Year	Sweetcorn cob	Sweetcorn seed[2]	
	Production[1] (tonnes)	Production (tonnes)	Exports (tonnes)
1994-95	72 686	75	55
1995-96	74 055	75	53
1996-97	81 091	75	50
1997-98	64 785	80	50
1998-99	77 670		
1999-00	57 172		
2000-01	45 215		

1 Australian Bureau of Statistics 2 Seed Industry Association of Australia

Maize grain is an important cereal crop in Australia, ranking seventh in area sown after wheat, barley, oats, sorghum, rice and triticale. Production area, yield and production tonnages are shown in Table 2. In Australia, most of the maize grain is produced in New South Wales and Queensland, and small quantities are produced in Western Australia and Victoria (ABARE, 1998).

Table 2: Australian maize grain production statistics[1]

Year	Area (000 ha)	Production (tonnes)
1994-95	50	242
1995-96	58	325
1996-97	68	398
1997-98	57	271
1998-99	66	338
1999-00	82	406
2000-01	75	355

1 Australian Commodity Statistics: Australian Bureau of Agricultural and Resource Economics (ABARE), 2001, Canberra. 354 pp.

3.4 The Sweetcorn Industry in Idaho

South-western and south-central Idaho are the major sweetcorn production regions in Idaho. Sweetcorn is produced in the following Idaho counties: Ada, Canyon, Elmore, Gooding, Jerome, Payette, Twin Falls and Washington. These regions provide a long growing season required for sweetcorn production. Sweetcorn is an important export crop, and acreage fluctuates from year to year in response to variable export market demand and market price (Fuchs & Hirnyck, 2001).

Idaho is one of the largest producers of sweetcorn seed in the USA, producing an average of 2 049 tonnes per year between 1988 and 1998. Eighty-three percent of sweetcorn seed produced in Idaho is exported. Export destinations include Argentina, Canada, France, Israel, Japan, Mexico, the Netherlands, New Zealand, South Africa, Taiwan and the United Kingdom. In 1997, Idaho produced 138 618 tonnes of sweetcorn for processing, 157 628 tonnes of maize grain, and 1 768 680 tonnes of maize silage (ISDA, 1998).

Idaho is ideal for high-health sweetcorn seed production because the arid conditions prevent the development of many of the sweetcorn pests found in other parts of the USA. Weather conditions during the sweetcorn seed production period are dry, with low relative humidity and low rainfall. To maintain dry production conditions, overhead irrigation is not used for sweetcorn crops.

In Idaho, sweetcorn seed crops are generally grown under contract for seed companies. The grower is required to implement the pest management and agronomic practices specified by the contracting seed-company. Cobs are generally picked well above ground level with special harvesters thereby minimising weed seed and soil contamination. The cobs are transported to packinghouses, de-husked, sorted to remove poor grade cobs, and threshed. The resultant seed is dried, cleaned and sorted to remove poor quality seed and extraneous matter. The harvesting, sorting, threshing, and cleaning procedures virtually eliminate contamination of sweetcorn seed with weed seeds, soil and trash. The seed is generally treated with an appropriate fungicide(s), and control measures are implemented to prevent infestation with storage pests and other arthropod pests during storage and transport.

Idaho-grown sweetcorn seed is highly regarded for its high health status and is much sought after by sweetcorn growers worldwide.

Many pests of quarantine concern to Australia that could enter with imported sweetcorn seed have not been recorded in Idaho. These include *Clavibacter michiganensis* subsp. *nebraskensis,* maize chlorotic mottle *machlomovirus, Peronosclerospora maydis, Peronosclerospora philippinensis, Peronosclerospora sacchari, Peronosclerospora sorghi, Prostephanus truncatus, Sclerophthora rayssiae* var. *zeae, Striga* species and *Trogoderma granarium*. In addition, *Pantoea stewartii* subsp. *stewartii*, (Stewart's wilt) has never been recorded in commercial crops in Idaho. This bacterium was detected once in Idaho on glasshouse plants grown from imported seed in 1967 and its introduction to production fields was prevented (Pepper, 1967).

3.5 Bulk Maize Grain Imports from the USA

Biosecurity Australia is conducting a non-routine IRA of proposed imports of bulk maize grain from the USA for processing and use as animal feed, in accordance with *The AQIS Import Risk Analysis Process Handbook* (AQIS, 1998). In March 1999, AQIS released the draft IRA paper (AQIS, 1999) for stakeholder comments. The draft IRA identified 108 quarantine pests (AQIS, 1999). AQIS's preliminary view was that any treatment, which would effectively devitalise maize and destroy pests, could achieve Australia's appropriate level of protection. In August 2000, a revised draft IRA paper containing issues raised by the stakeholders was released for comment.

4. STAKEHOLDER COMMENTS ON THE DRAFT IRA

AQIS circulated the draft IRA on 6 January 2000 to 392 stakeholders. In accordance with *The AQIS Import Risk Analysis Process Handbook* (AQIS 1998), stakeholders were invited to comment on the technical issues raised in the draft IRA within 60 days. AQIS received 21 written responses from four state departments of agriculture, six seed companies (with two responses from one company), two consultants, four industry associations, three research stations, and the Idaho State Department of Agriculture (ISDA). Twelve stakeholders supported the draft IRA with some qualification; five opposed the draft IRA, two provided comments and two acknowledged receipt of the draft IRA but made no comment (Annex 1).

ISDA is the state agency responsible for monitoring and managing plant health requirements in Idaho in collaboration with APHIS. ISDA, representatives of the Idaho sweetcorn seed companies and the University of Idaho provided combined comments, and indicated that the prescribed management options are technically sound, reasonable and achievable by Idaho seed companies, and enforceable by ISDA. ISDA also assured AQIS that only sweetcorn seed produced in compliance with AQIS import requirements would be certified for export to Australia. ISDA agreed with AQIS's recommendation that, to reduce the risk of introduction of quarantine pests to export fields, only Idaho-grown seed should be used for planting export crops.

Stakeholders raised technical and management issues concerning arthropod pests, bacterial and fungal pathogens and weed seeds. Issues raised included: the quarantine status of pests; monitoring programs; pest-free status; production systems; inspection efficacy; registration and certification of fields and seeds; fumigation and fungicide treatments; and grain security. Biosecurity Australia has addressed these issues and detailed information is provided in Annex 1. The views of stakeholders disagreeing with aspects of the analysis in the draft IRA can be grouped into seven broad categories. A summary of the issues is provided below, and a detailed response to each issue raised by each stakeholder, including general comments of support of the draft IRA, is presented in Annex 1.

Stakeholders raised concerns over the potential damage to the Australian grains industry. The view of Biosecurity Australia is that the potential risk to the Australian grains industry posed by several of the identified quarantine pests is high. The mandatory import requirements were developed on this basis and are designed to effectively address such risks.

Some stakeholders were concerned quarantine conditions would be relaxed. Biosecurity Australia is not relaxing quarantine measures for sweetcorn seed imports. The risk management measures described in this IRA will provide a degree of rigour that exceeds current restrictions on the importation of New Zealand-grown sweetcorn seed into Australia. At present, there is no active viral indexing system in-place for imports of Idaho-grown seed into New Zealand to detect symptomless viral infection in plants of *Z. mays,* the progeny of which would be grown in Australia. The mandatory import requirements outlined in this IRA for Idaho-grown sweetcorn seed include two-year production area freedom from viral disease, two inspections of the export fields and virus indexing on random leaf samples.

Several stakeholders expressed strong concerns about the risk posed by the viral quarantine pathogens, in particular High Plains *tenuivirus* (HPV) and wheat streak mosaic *rymovirus* (WSMV). The main concerns were about the potential effect of these viruses on the Australian grains industry, the amount of scientific information available and the efficacy of the proposed measures to detect the viruses. Biosecurity Australia is satisfied that the phytosanitary measures set out in this IRA will manage the risk posed by these viruses. Detailed information addressing all comments on the virus issues are given in Annex 1 and further information is provided in the data sheets in Annex 2.

Stakeholders were concerned that the sweetcorn IRA would set a precedent for the importation of other forms of *Z. mays* from the USA. This IRA does not establish any conditions for the importation of *Z. mays* from outside Idaho. Import proposals are handled on a case-by-case basis, e.g. bulk feed maize from the USA is the subject of a separate IRA. Applications to import other forms of *Z. mays* from Idaho would be considered by Biosecurity Australia on a case-by-case basis. AQIS may grant permits to import other forms of *Z. mays* subject to the same or similar conditions outlined in this IRA for the importation of Idaho-grown sweetcorn seed.

After detailed consideration of the comments made by stakeholders, Biosecurity Australia has made appropriate revisions to the categorisation of pests (Tables 3, 4 and 5). Three weeds were removed from the list of quarantine pests and the taxonomy was revised for six weed species. Quarantine pest data-sheets in Annex 2 were revised. Non-quarantine pest data-sheets in Annex 3 were revised and data-sheets included for a further two non-quarantine arthropod pests, *Helicoverpa zeae* (Boddie) and *Sitobion avenae* (Fabricius). Minor revisions were also made to improve the clarity and rigour of some of the import conditions as set out below:

- Field Sanitation and Pest Control Measures

  Export crops must be planted in April/May, to minimise the risk of HPV and WSMV infection by wheat curl mites (WCM), which may migrate from senescing-infected hosts, particularly wheat, to the export crop at the seedling stage when sweetcorn is susceptible to infection. Earlier sowing of export sweetcorn crops will minimise the likelihood of their infestation by mite vectors because the susceptible seedling stage will not coincide with senescing wheat crops, because the mites tend to remain on wheat plants while they remain green.

- Packing House Registration and Procedures

  APHIS officers must inspect the packinghouse and cleaning equipment before commencement of processing of export seed to Australia, to determine hygiene conditions and product identity.

- Packing, Labelling and Storage

  APHIS must inspect packinghouses during the packing and storage of export seed to monitor and verify that the necessary requirements are being met, including a pest control program. During pre-export storage, necessary precautions must be taken to prevent re-infestation with trash, soil, weed seeds and arthropod pests.

  Each bag would be clearly labelled "*FOR EXPORT TO AUSTRALIA*" and bear the serial number of the approved export field and packinghouse. Sweetcorn seed packages must not be opened in transit from Idaho to Australia. A consignment must not be stored, split or have its packaging changed while in transit between Idaho and the port of export or while in another country en route to Australia.

Overall, Biosecurity Australia considers that the mandatory conditions set out in this IRA will manage the risk introducing quarantine pests to Australia on imports of sweetcorn seed from Idaho.

5. BIOLOGICAL ASSESSMENT OF POTENTIAL QUARANTINE PESTS OF CONCERN TO AUSTRALIA

Biological assessments of pests associated with bulk maize grain from the USA were undertaken by the Risk Analysis Panel (RAP) for the IRA of the importation of bulk maize grain from the USA (AQIS, 1999), with assistance from Technical Working Groups (TWGs) on pathogens, arthropod pests, weeds and operational procedures. The following is a brief summary of the findings of the TWGs and the RAP on the assessment of pests associated with bulk maize grain:

- The TWG on pathogens of maize identified 402 pests of maize from the USA. Of these, 17 were assessed to be quarantine pests.
- The TWG on arthropod pests of maize identified 114 pests associated with maize from the USA. Of these, 14 were assessed to be quarantine pests. The TWG also considered mollusc pests and found none associated with maize from the USA.
- The TWG on weeds identified 136 weeds associated with maize from the USA. Of these, 80 were assessed to be quarantine pests.

The potential quarantine pests that may be associated with the pathway (Idaho-grown sweetcorn seed) were analysed in detail following the FAO guidelines (FAO, 1996a), and using information from the ISDA and other technical experts, available databases, and published scientific literature. The analysis took into account host range, distribution, biology, life history, entry potential, establishment potential, spread potential and economic damage potential of the pests that may be associated with sweetcorn seed from Idaho. Pests were categorised as quarantine or non-quarantine pests as defined in the *Glossary of Phytosanitary Terms* (FAO, 1999).

Table 3 summarises the quarantine status of pests that may be associated with Idaho-grown sweetcorn seed. The final column of Table 3 identifies the need for managing the potential risks of these quarantine pests. Data-sheets for the quarantine pests likely to be on the pathway are provided in Annex 2. Summary data-sheets for the pests that are considered non-quarantine pests or quarantine pests not on the pathway are given in Annex 3. Both annexes are available on request and accessible on the AQIS web site at:

http://www.affa.gov.au/docs/market_access/biosecurity/plhome2.htm.

Table 3 Quarantine status of pests associated with sweetcorn seed

Pest	Common name	Distribution in		Australian Quarantine Status	Present on Pathway[1] (seed)	Economic Importance	Quarantine Management Required
		Idaho	Australia				
ARTHROPODS							
Acari [mites]							
Aceria tosichella (Keifer) [Acarina: Eriophyidae]	Wheat curl mite	yes	yes	non-quarantine			
Coleoptera [Beetles; weevils]							
Bruchus pisorum (Linnaeus) [Coleoptera: Bruchidae]	Pea weevil	yes	yes	non-quarantine			
Cryptolestes turcicus (Grouvelle) [Coleoptera: Laemophloeidae]	Flat grain beetle	yes	no	quarantine	yes[2]	high	yes
Cynaeus angustus **(**LeConte) [Coleoptera: Tenebrionidae]	Large black flour beetle	yes	no	quarantine	yes[2]	high	yes
Diabrotica undecimpunctata Mannerheim [Coleoptera: Chrysomelidae]	Southern corn rootworm	yes	no	quarantine	no		
Diabrotica virgifera LeConte [Coleoptera: Chrysomelidae]	Western corn rootworm	yes	no	quarantine	no		
Dinoderus minutus (Fabricius) [Coleoptera: Bostrichidae]	Bamboo powder-post beetle	yes	yes	non-quarantine			
Glischrochilus quadrisignatus (Say) [Coleoptera: Nitidulidae]	Four-spotted sap beetle	yes	no	quarantine	yes[2]	high	yes
Lema melanopus (Linnaeus) [Coleoptera: Chrysomelidae]	Cereal beetle	yes	no	quarantine	no		
Tribolium audax Halstead [Coleoptera: Tenebrionidae]	American black flour beetle	yes	no	quarantine	yes[2]	medium	yes

Pest	Common name	Distribution in		Australian Quarantine Status	Present on Pathway[1] (seed)	Economic Importance	Quarantine Management Required
		Idaho	Australia				
Tribolium brevicornis (LeConte) [Coleoptera: Tenebrionidae]	Flour beetle	yes	no	quarantine	yes[2]	low	
Trogoderma glabrum (Herbst) [Coleoptera: Dermestidae]	Glabrous cabinet beetle	yes	no	quarantine	yes[2]	low	
Trogoderma inclusum LeConte [Coleoptera: Dermestidae]	Large cabinet beetle	yes	no	quarantine	yes[2]	high	yes
Trogoderma ornatum (Say) [Coleoptera: Dermestidae]	Ornate cabinet beetle	yes	no	quarantine	yes[2]	low	
Trogoderma variabile Ballion [Coleoptera: Dermestidae]	Warehouse beetle	yes	no	quarantine	no	high	yes
Diptera [Flies]							
Delia platura (Meigen) [Diptera: Anthomyiidae]	Seed corn maggot	yes	yes	non-quarantine			
Hemiptera [Aphids, leafhoppers, mealybugs, psyllids, scales, true bugs, whiteflies]							
Rhopalosiphum maidis (Fitch) [Hemiptera: Aphididae]	Corn leaf aphid	yes	yes	non-quarantine			
Rhopalosiphum padi (Linnaeus) [Hemiptera: Aphididae]	Oat aphid; wheat aphid	yes	yes	non-quarantine			
Sitobion avenae (Fabricius) [Hemiptera: Aphididae]	English grains aphid	yes	no	quarantine	no		
Lepidoptera [moths; butterflies]							
Ephestia kuehniella (Zeller) [Lepidoptera: Phycitinae	Mediterranean flour moth	yes	yes	Non-quarantine			
Helicoverpa zea (Doddie) [Lepidoptera: Noctuidae]	Corn earworm	yes	no	quarantine	no		

Pest	Common name	Distribution in		Australian Quarantine Status	Present on Pathway[1] (seed)	Economic Importance	Quarantine Management Required
		Idaho	Australia				
Plodia interpunctella (Hübner) [Lepidoptera: Pyralidae]	Indian meal moth	yes	yes	non-quarantine			
Richia albicosta J.B. Smith [Lepidoptera: Noctuidae]	Western bean cutworm	yes	no	quarantine	no		
FUNGI							
Alternaria alternata (Fr.:Fr.) Keissl.	Alternaria leaf blight	yes	yes	non-quarantine			
Cladosporium cladosporioides (Fresen) DeVries	Cladosporium rot	yes	yes	non-quarantine			
Curvularia pallescens Boedijn	Curvularia leaf spot	yes	yes	non-quarantine			
Diplodia maydis (Berk.) Sacc.	Ear rot	yes	yes	non-quarantine			
Fusarium moniliforme Sheld.	Fusarium ear rot	yes	yes	non-quarantine			
Gibberella zeae (Schwei.) Petch	Fusarium stalk rot	yes	yes	non-quarantine			
Nigrospora oryzae (Berk. & Broome) Petch.	Nigrospora ear rot	yes	yes	non-quarantine			
Penicillium oxalicum Currie & Thom	Penicillium rot	yes	yes	non-quarantine			
Pythium ultimum Trow	Root rot	yes	yes	non-quarantine			
Rhizopus arrhizus A. Fischer	Rhizopus ear rot	yes	yes	non-quarantine			
Sporisorium holci-sorghi (Rivolta) Vanky	Head smut	yes	yes	non-quarantine			
Ustilago zeae (Beckm.) Unger	Boil smut	yes	yes[3]	quarantine	yes	medium	yes
VIRUSES							
High Plains *tenuivirus*	High Plains disorder	yes	no[4]	quarantine	yes	high	yes
Maize dwarf mosaic *potyvirus*	Maize dwarf mosaic	yes	no	quarantine	yes	high	yes
Wheat streak mosaic *rymovirus*	Wheat streak mosaic	yes	no[4]	quarantine	yes	high	yes

Pest	Common name	Distribution in		Australian Quarantine Status	Present on Pathway[1] (seed)	Economic Importance	Quarantine Management Required
		Idaho	Australia				
WEEDS							
Amaranthus albus L.	Tumble pigweed	yes	yes	non-quarantine			
Amaranthus hybridus L.	Smooth pigweed	yes	yes	non-quarantine			
Ambrosia artemisiifolia L.	Common ragweed	yes	yes[3]	quarantine	yes[2]	medium	yes
Ambrosia trifida L.	Giant ragweed	yes	no	quarantine	yes[2]	medium	yes
Apocynum cannabinum L.	Hemp dogbane	yes	no	quarantine	yes[2]	medium	yes
Artemisia annua L.	Wormwood	yes	yes	non-quarantine			
Avena fatua L.	Wild oat	yes	yes	non-quarantine			
Barbarea vulgaris R. Br.	Wintercress	yes	yes	non-quarantine			
Bassia scoparia L. Roth [5]	Kochia	yes	yes[3]	quarantine	yes[2]	medium	yes
Berteroa incana (L.) DC.	Hoary Alison	yes	no	quarantine	yes[2]	medium	yes
Brassica kaber (DC.) L.C. Wheeler	Charlock	yes	yes	non-quarantine			
Brassica nigra (L.) Koch.	Black mustard	yes	yes	non-quarantine			
Bromus tectorum L.	Downy brome	yes	yes[3]	quarantine	yes[2]	medium	yes
Calystegia sepium (L.) R.Br.	Hedge bindweed	yes	yes	non-quarantine			
Cenchrus longispinus (Hack.) Fern.	Longspine sandbur	yes	yes[3]	quarantine	yes[2]	high	yes
Chamaesyce maculata [5] (L.) Small	Prostrate spurge	yes	yes[3]	quarantine	yes[2]	high	yes
Chenopodium album L.	Common lambsquaters	yes	yes	non-quarantine			
Cirsium arvense (L.) Scop.	Canada thistle	yes	yes[3]	quarantine	yes[2]	high	yes
Conringia orientalis (L.) Dumort.	Hare's ear	yes	yes[3]	quarantine	yes[2]	medium	yes
Convolvulus arvensis L.	Field bindweed	yes	yes[3]	quarantine	yes[2]	high	yes
Conyza canadensis (L.) Cronq.	Horseweed	yes	yes	non-quarantine			

Pest	**Common name**	**Distribution in**		**Australian Quarantine Status**	**Present on Pathway[1] (seed)**	**Economic Importance**	**Quarantine Management Required**
		Idaho	**Australia**				
Cyanchum laeve [5] (Michx) Pers.	Honeyvine milkweed	yes	no	quarantine	yes[2]	medium	yes
Cynodon dactylon (L.C. Rich) Pers.	Bermuda grass	yes	yes	non-quarantine			
Datura inoxia Miller	Downy thornapple	yes	yes[3]	quarantine	yes[2]	high	yes
Datura stramonium L.	Jimsonweed	yes	yes[3]	quarantine	yes[2]	high	yes
Daucus carota L.	Wild carrot	yes	yes	non-quarantine			
Digitaria ischaemum (Schreb.) Schreb.	Smooth summer grass	yes	yes	non-quarantine			
Digitaria sanquinalis (L.) Scop.	Crabgrass	yes	yes	non-quarantine			
Echinochloa crus-galli (L.) Beauv.	Barnyard grass	yes	yes	non-quarantine			
Elytrigia repens (L.) Nevski [5]	Quackgrass	yes	yes	non-quarantine			
Equisetum arvense L.	Common horsetail	yes	yes[3]	quarantine	yes[2]	medium	yes
Eragrostis cilianensis (All.) Link ex Lutati	Stink lovegrass	yes	yes	non-quarantine			
Hibiscus trionum L.	Bladder hibiscus	yes	yes	non-quarantine			
Lamium amplexicaule L.	Henbit	yes	yes	non-quarantine			
Lolium multiflorum Lam. (imidazolinone resistant)	Italian ryegrass	yes	no	quarantine	yes[2]	high	yes
Lychnis alba Mill.	White cockle	yes	yes	non-quarantine			
Malva neglecta Wallr.	Common mallow	yes	yes	non-quarantine			
Mollugo verticillata Roxb.	Carpetweed	yes	yes	non-quarantine			
Panicum dichotomiflorum Michx.	Fall panicgrass	yes	no	quarantine	yes[2]	high	yes
Panicum miliaceum L.	Wild proso millet	yes	yes	non-quarantine			
Poa pratensis L.	Kentucky bluerass	yes	yes	non-quarantine			
Polygonum convolvulus L.	Knotweed	yes	yes	non-quarantine			
Polygonum lapathifolium L.	Knotweed	yes	yes[3]	quarantine	yes[2]	high	yes

Pest	Common name	Distribution in		Australian Quarantine Status	Present on Pathway[1] (seed)	Economic Importance	Quarantine Management Required
		Idaho	Australia				
Portulaca oleracea L.	Pigweed	yes	yes	non-quarantine			
Rottboellia cochinchinensis (Lour.) Clayton. [5]	Itchgrass	yes	yes	non-quarantine			
Rumex crispus L.	Curled dock	yes	yes	non-quarantine			
Salsola kali L. [5]	Prickly Russian thistle	yes	no	quarantine	yes[2]	medium	yes
Senecio vulgaris L.	Common groundsel	yes	yes	non-quarantine			
Setaria glauca (L.) Beauv.	Yellow foxtail	yes	yes	non-quarantine			
Setaria verticillata (L.) Beauv.	Foxtail	yes	yes[3]	quarantine	yes[2]	high	yes
Setaria viridis L.	Foxtail	yes	yes	non-quarantine			
Solanum sarachoides Sendt.	Nightshade	yes	yes	non-quarantine			
Sorghum halepense (L.) Pers.	Johnson grass	yes	yes[3]	quarantine	yes[2]	high	yes
Stellaria media (L.) Cyr.	Common chickweed	yes	yes	non-quarantine			
Taraxacum officinale Wiggers	Dandelion	yes	yes	non-quarantine			
Xanthium spinosum L.	Common cockleburr	yes	yes[3]	quarantine	yes[2]	medium	yes
Xanthium strumarium L. (imidazolinone resistant)	Noogoora burr	yes	no	quarantine	yes[2]	medium	yes
Xanthium strumarium L.	Noogoora burr	yes	yes[3]	quarantine	yes[2]	medium	yes

1 Any means that allows the entry or spread of a pest. In this case the pathway is Idaho-grown sweetcorn seed (FAO, 1999).

2 Seed production, processing and storage methods in Idaho will ensure that export seed is free from this pest, and APHIS would certify freedom from arthropod pests and weed seeds.

3 Under official control in Australia.

4 Unconfirmed records exist of this pest in Australia.

5 The names of these species have been changed from the synonyms listed in the draft IRA, to reflect the correct taxonomy

Idaho-grown sweetcorn seed presents a particularly low risk because of the low prevalence of pests and diseases in Idaho compared with the major, maize grain production areas of the USA. The risk assessment has clearly shown that imports of high-health status Idaho-grown sweetcorn seed present a far lower risk than imports of bulk maize grain from the USA.

6. QUARANTINE PESTS OF CONCERN TO AUSTRALIA

Based on a biological risk assessment of potential quarantine pests (section 5), Biosecurity Australia has identified nine arthropods, one fungus, three viruses, and 23 weed species of quarantine concern to Australia with imports of sweetcorn seed from Idaho (Table 4).

Table 4: Quarantine pests associated with Idaho-grown sweetcorn seed

Quarantine Pest	Common Names
ARTHROPODS	
Cryptolestes turcicus (Grouvelle) [Coleoptera: Laemophloeidae]	Flat grain beetle
Cynaeus angustus **(**LeConte) [Coleoptera: Tenebrionidae]	Large black flour beetle
Glischrochilus quadrisignatus (Say) [Coleoptera: Nitidulidae]	Four-spotted sap beetle
Tribolium audax Halstead [Coleoptera: Tenebrionidae]	American black flour beetle
Tribolium brevicornis (LeConte) [Coleoptera: Tenebrionidae]	Flour beetle
Trogoderma glabrum (Herbst) [Coleoptera: Dermestidae]	Glabrous cabinet beetle
Trogoderma inclusum LeConte [Coleoptera: Dermestidae]	Large cabinet beetle.
Trogoderma ornatum (Say) [Coleoptera: Dermestidae]	Ornate cabinet beetle
Trogoderma variabile Ballion [Coleoptera: Dermestidae]	Warehouse beetle
FUNGUS	
Ustilago zeae (Beckm.) Unger	Boil smut
VIRUSES	
High Plains *tenuivirus*	High Plains disorder
Maize dwarf mosaic *potyvirus*	Maize dwarf mosaic
Wheat streak mosaic *rymovirus*	Wheat streak mosaic
WEEDS	
Ambrosia artemisiifolia L.	Common ragweed
Ambrosia trifida L.	Giant ragweed
Apocynum cannabinum L.	Hemp dogbane
Bassia scoparia L. Roth [5]	Kochia
Berteroa incana (L.) DC.	Hoary Alison
Bromus tectorum L.	Downy brome
Cenchrus longispinus (Hack.) Fern.	Longspine sandbur
Chamaesyce maculata (L.) Small	Prostrate spurge

Quarantine Pest	**Common Names**
Cirsium arvense (L.) Scop.	Canada thistle
Conringia orientalis (L.) Dumort.	Hare's ear
Convolvulus arvensis L.	Field bindweed
Cyanchum laeve (Michx) Pers.	Honeyvine milkweed
Datura inoxia Miller	Downy thornapple
Datura stramonium L.	Jimsonweed
Equisetum arvense L.	Common horsetail
Lolium multiflorum Lam. (imidazolinone resistant)	Italian ryegrass
Panicum dichotomiflorum Michx.	Fall panicgrass
Polygonum lapathifolium L.	Knotweed
Salsola kali L.	Prickly Russian thistle
Setaria verticillata (L.) Beauv.	Foxtail
Sorghum halepense (L.) Pers.	Johnson grass
Xanthium spinosum L.	Common cockleburr
Xanthium strumarium L. (imidazolinone resistant)	Noogoora burr

ISDA has advised that inspection, cleaning and hygienic storage methods are used to prevent infestation and contamination of export sweetcorn seed with arthropod pests and weed seeds. These measures are considered to be effective in mitigating the risk of arthropod pests and weeds in export sweetcorn seed. Details of these measures and their relevance in terms of mitigating risk are given in section 8.

Ustilago zeae is present in Idaho, however, its incidence has been reduced through the widespread planting of resistant hybrids and fungicidal treatments. Most commercial seed production fields are now free of *U. zeae*. Yield losses from this disease rarely exceed two percent, however, high levels of infection may be recorded after hail damage. *Ustilago zeae* is present in some parts of New South Wales and Queensland, and the movement of *Z. mays* seed for sowing is under official control in New South Wales, South Australia, Tasmania, Victoria and Western Australia. Interstate restrictions vary, but include acceptance of area freedom and seed treatment with an appropriate fungicide. Further details on *U. zeae* are provided in the data-sheet in Annex 2.

The seed-borne viruses HPV, MDMV and WSMV are present in Idaho, but ISDA has advised that most commercial sweetcorn seed production fields in Idaho are free of these viruses. Further information on the status of HPV, MDMV and WSMV is given in the data-sheets in Annex 2.

7. OTHER ASSESSMENTS

7.1 Weed Risk Assessment

The weed potential of *Z. mays* was assessed by the TWG on weeds as a part of the IRA for the importation of bulk maize grain from the USA (AQIS, 1999). *Zea mays* was found to have no weed potential.

7.2 Environmental Impact Assessment

AQIS has considered the potential environmental impact of imports of *Z. mays* seed from the USA (AQIS, 1999). Biosecurity Australia is satisfied that the importation of sweetcorn seed from Idaho under conditions specified in this paper will present a negligible risk to the environment, and accordingly that the obligations arising from the Administrative Procedures made under the *Environment Protection and Biodiversity Conservation Act 1999* have been met. Biosecurity Australia notes that imports of genetically modified sweetcorn seed may present a potential risk to the Australian environment. To address this risk, AQIS requires importers to declare importations of genetically modified sweetcorn seed. Applications to import genetically modified organisms (GMOs) require assessment by the Interim Office of the Gene Technology Regulator (IOGTR) in consultation with AQIS and other relevant government agencies. AQIS does not issue import permits for GMOs unless the importers obtain IOGTR clearance.

8. PHYTOSANITARY RISK MANAGEMENT OF QUARANTINE PESTS OF SWEETCORN SEED FROM IDAHO

Biosecurity Australia has considered the management options that would be practical and achievable in Idaho and Australia, and that might effectively address the potential risks of introduction of quarantine pests. Based on seed certification information obtained in June 1999 during a visit to Idaho by an AQIS official, it is AQIS's view that Idaho can produce high health, clean sweetcorn seed to address Australia's pest risk concerns, and that the integrity of Idaho-grown sweetcorn seed can be maintained throughout the production and transport chain. Table 5 summarises the risk management options for quarantine pests associated with sweetcorn seed from Idaho.

Table 5: Risk management measures to reduce the probability of entry of quarantine pests of sweetcorn seed from Idaho

Quarantine Pest	Common Names	Section	Risk Management Measures
ARTHROPODS			
Cryptolestes turcicus (Grouvelle)	Flat grain beetle	8.1	Packinghouse pest management measures; pre-export seed inspection and certification; on-arrival inspection and fumigation; re-export or destruction if live insects found
Cynaeus angustus **(**LeConte)	Large black flour beetle		
Glischrochilus quadrisignatus (Say)	Four-spotted sap beetle		
Tribolium audax Halstead	American black flour beetle		
Tribolium brevicornis (LeConte)	Flour beetle		
Trogoderma glabrum (Herbst)	Glabrous cabinet beetle		
Trogoderma inclusum LeConte	Large cabinet beetle.		
Trogoderma ornatum (Say)	Ornate cabinet beetle		
Trogoderma variabile Ballion	Warehouse beetle		
FUNGUS			
Ustilago zeae (Beckm.) Unger	boil smut	8.2	Pest free area; fungicidal seed treatment
VIRUSES			
High Plains *tenuivirus*	High Plains disorder	8.3	Cultural practices; pest free area; field inspection and testing
Maize dwarf mosaic *potyvirus*	Maize dwarf mosaic		
Wheat streak mosaic *rymovirus*	Wheat streak mosaic		
WEEDS			
Ambrosia artemisiifolia L.	Common ragweed	8.4	Pre-export seed cleaning; pre-export inspection and certification; on-arrival inspection and processing; re-export or destruction if quarantine weed seeds found
Ambrosia trifida L.	Giant ragweed		
Apocynum cannabinum L.	Hemp dogbane		
Bassia scoparia L. Roth [5]	Kochia		
Berteroa incana (L.) DC.	Hoary Alison		
Bromus tectorum L.	Downy brome		
Cenchrus longispinus (Hack.) Fern.	Longspine sandbur		
Chamaesyce maculata (L.) Small	Prostrate spurge		
Cirsium arvense (L.) Scop.	Canada thistle		
Conringia orientalis (L.) Dumort.	Hare's ear		
Convolvulus arvensis L.	Field bindweed		
Cyanchum laeve [5] (Michx) Pers.	Honeyvine milkweed		
Datura inoxia Miller	Downy thornapple		

Quarantine Pest	Common Names	Section	Risk Management Measures
Datura stramonium L.	Jimsonweed		
Equisetum arvense L.	Common horsetail		
Lolium multiflorum Lam. (imidazolinone resistant)	Italian ryegrass		
Panicum dichotomiflorum Michx.	Fall panicgrass		
Polygonum lapathifolium L.	Knotweed		
Salsola kali L.	Prickly Russian thistle		
Setaria verticillata (L.) Beauv.	Foxtail		
Sorghum halepense (L.) Pers.	Johnson grass		
Xanthium spinosum L.	Common cockleburr		
Xanthium strumarium L. (imidazolinone resistant)	Noogoora burr		

8.1 Management Options for Arthropod Pests

8.1.1 Pre-export inspection and certification of seed

Freedom from quarantine pests would be verified by pre-export visual inspection. APHIS-approved inspectors would sample seed according to the International Seed Testing Association (ISTA) rules, and inspect and certify seed for freedom from quarantine pests.

8.1.2 On-arrival inspection

On-arrival inspection is an option for verifying the arthropod pest status of imported seed. AQIS inspectors are qualified in sampling imported seed consignments according to ISTA rules, and inspecting for the presence of quarantine pests.

8.1.3 Fumigation

If live arthropod pests of quarantine concern are detected in sweetcorn seed, fumigation of the consignment with phosphine (section 8.1.3.1) or methyl bromide (section 8.1.3.2), both of which are approved treatments, would be an effective risk management option.

8.1.3.1 Phosphine

Arthropod pest concerns would be addressed by phosphine fumigation at 1.0 to 1.5g/m^3 for 10 days at temperatures between 15°C to 25°C, or, 1.0 to 1.5g/m^3 for seven days at temperatures above 25°C. At the completion of the fumigation, the phosphine concentration needs to be at least 0.1g/m^3; phosphine will not be used at 15°C, or below.

8.1.3.1 Methyl bromide

Arthropod pest concerns would be addressed by methyl bromide fumigation at 32g/m^3 for 24 hours at 21°C (core temperature) with a minimum concentration of 24g/m^3 at normal atmospheric pressure. If the temperature during fumigation is expected to fall below 21°C, add 8g/m^3 for each 5°C below 21°C. If the temperature during fumigation is expected to increase above 21°C, subtract 8g/m^3 for each 5°C above 21°C. The minimum temperature during fumigation is to be used for calculating the dose. Methyl bromide fumigation will not be applied at 10°C or below.

8.1.4 Preferred options

Biosecurity Australia considers that the seed production, harvesting and storage methods in place in Idaho would be effective in managing the quarantine arthropod pests listed in Table 4 for export sweetcorn seed. APHIS would undertake pre-export inspection and certify the export sweetcorn to be free from arthropod pests. This would be verified by on-arrival seed inspection by AQIS. Phosphine fumigation is the preferred option if live stages of any quarantine arthropod pest were found during on-arrival inspection, or the infested lot(s) would be re-exported or destroyed.

8.2 Management Options for *Ustilago zeae*

8.2.1 Pest-free area status

Pest-free area status would be an option for managing the risks of introduction of *U. zeae*. According to ISDA, most commercial sweetcorn seed production fields in Idaho remain free from boil smut (*U. zeae*). However, the boil-smut-free status of export fields may be compromised by hail damage, which would predispose plants to infection.

8.2.2 Seed treatment

Seed treatment with an effective fungicide(s) would be a satisfactory option to address the risk of introducing *U. zeae* to new areas as a contaminant of sweetcorn seed. APHIS would need to ensure that the export seed is treated with an effective fungicide.

New South Wales, Victoria and Western Australia permit entry of seeds for sowing subject to fungicide seed treatment for *U. zeae*. These states accept seed treatments with Vitavax FF 200® (active ingredients: thiram 200 g/l and carboxin 200 g/l) at 500ml /100 kg seed.

The New Zealand Ministry of Agriculture and Forestry currently accepts treatment of sweetcorn seed with any of the following fungicide combinations as management options for addressing the risk of introduction of *U. zeae* into New Zealand with imports of sweetcorn seed:

- Carboxin at 0.8g active ingredient (a.i.)/kg seed and Thiram at 1g a.i./kg seed
- Carboxin at 0.8g a.i/kg seed and Captan at 0.7g a.i./kg seed
- Imazalil at 0.08g a.i./kg seed and Triadimenol at 0.22g a.i./kg seed or
- Imazalil at 0.08g a.i./kg seed and Flutriafol at 0.08g a.i./kg seed.

8.2.3 Preferred option

Seed treatment is the preferred option because it is the least restrictive method of effectively managing the risk of introducing *U. zeae* to Australia in sweetcorn seed imports. The seed would be treated with a mixture of Carboxin at 1g/kg seed and Thiram at 1g/kg seed. Other seed treatments would only be accepted by AQIS after consultation and agreement with Biosecurity Australia and the state departments of agriculture in Australia.

8.3 Management Options for Viruses

8.3.1 Cultural practices

Producers of export sweetcorn seed could be required to use cultural management practices to control quarantine viruses.

- Resistant sweetcorn hybrids are now widely planted in the USA, and have proved to be effective in minimising the impact of HPV, MDMV and WSMV.
- The potential risk of HPV and WSMV infection by wheat curl mites, which may migrate from senescing, infected wheat hosts to green sweetcorn crops, would be reduced by planting export sweetcorn crops as early as possible in the season.
- The risk of infection by the wheat curl mites would be reduced by a requirement that export fields be separated from adjacent non-export grain fields by at least 30 metres.
- The risk of virus infection of export fields would be decreased if the export fields had not recorded HPV, MDMV or WSMV outbreaks previously. ISDA maintains records of export fields and would be able to certify that export fields were not known to have experienced an outbreak of these viruses during the two years preceding the planting of the export crop.

8.3.2 Pest-free area

In accordance with the International Standards for Phytosanitary Measures No. 2 (FAO, 1996b), pest-free area is an option for managing risks of quarantine pests.

ISDA officers have advised Biosecurity Australia that they would be able to provide pest-free area assurances for the place of production (export field) for HPV, MDMV and WSMV which would be verified by export crop inspections and testing.

Export sweetcorn crops would need to be visually inspected for virus symptoms twice during the growing season by APHIS-approved inspectors to detect the presence of quarantine viruses. The first inspection would be at the four- to five-leaf growth stage, and the second within four weeks after tasselling. Inspection of 10% of each export crop would be achievable in Idaho. Sweetcorn plants exhibiting virus symptoms during visual inspection would be tested using ELISA or another reliable method for the detection of HPV, MDMV and WSMV. The leaf samples may be tested in batches of a maximum of ten samples. Similar testing of leaf samples from 300 plants selected at random from the export field during the second inspection would be conducted. In large export fields, this will give a 95% level of confidence of detecting a crop infection level of 1% or greater (Table 1(b), page 16, Cannon & Roe, 1982). Where export seed is sourced from less than 300 plants, sufficient leaf samples would be taken to detect a 1% infection level.

8.3.3 Preferred options

A combination of cultural practices and pest-free area (place of production) certification would be the preferred option for managing the risks of quarantine viruses.

The potential for cross-infection of export crops with HPV and WSMV from wheat fields by the mite vector would be decreased by planting export crops early in the season in April-May to minimise the likelihood of infection of the crop at the early susceptible stage, and by maintaining isolation of 30 metres from wheat and non-export maize fields. Certification that these viruses were not known to occur in export fields for two years before the planting of the export crop, would also reduce the risk.

The HPV-, MDMV- and WSMV-free status of export fields would need to be verified by export crop inspections and testing. APHIS would need to certify that 10% of each export crop was inspected twice; at the four- to five-leaf growth stage, and within four weeks after tasselling. APHIS would also need to certify that sweetcorn plants exhibiting virus symptoms during the inspections, and 300 plants selected at random from the export field during the second inspection, were tested using ELISA or another reliable method for the detection of HPV, MDMV and WSMV. APHIS would need to retain test results for audit by AQIS and, if required for trace-back purposes.

8.4 Management Options for Weeds

8.4.1 Pre-export seed cleaning

The routine cleaning procedures currently used in packinghouses in Idaho would remove contaminant weed seeds. According to Biosecurity Australia's discussions in Idaho with ISDA, research scientists, seed technologists and seed companies, Idaho-grown sweetcorn seed is extremely unlikely to contain weed seeds.

8.4.2 Pre-export inspection and certification

Pre-export visual inspection of sweetcorn seed would be effective in verifying freedom of export seed from quarantine weed seeds. APHIS could certify that export sweetcorn seed is free of weed seeds.

8.4.3 On-arrival inspection

Sampling and inspection of imported sweetcorn seed by AQIS inspectors according to ISTA rules would further verify freedom from quarantine weed seeds.

8.4.4 Preferred options

Biosecurity Australia considers that seed production, harvesting and packinghouse cleaning methods in place in Idaho would virtually eliminate the weed seeds listed in Table 4 from export sweetcorn seed. The preferred options would include pre-export inspection by APHIS who would certify the export sweetcorn as free of weed seeds. This would be verified by pre-export seed inspection and certification by APHIS and on-arrival seed inspection by AQIS. If weed seeds of quarantine concern are found during on-arrival inspection, the consignment must be cleaned to remove these weed seeds, processed, re-exported or destroyed under quarantine supervision.

9. MANDATORY IMPORT REQUIREMENTS

This section describes the mandatory phytosanitary requirements to be implemented to mitigate quarantine risks associated with the importation of Idaho-grown sweetcorn seed into Australia. Import requirements are summarised as a flow-chart (Figure 1).

9.1 Import Permit Requirement

An AQIS import permit is required for the importation of sweetcorn seed for sowing from Idaho to Australia.

9.2 Export Field Registration

All export sweetcorn seed production fields must be registered by APHIS, and are required to comply with APHIS export field standards. Each field is to be allocated a unique serial number, which may be combined with the grower number to enable trace-back in the case of non-compliance. APHIS must keep maps showing the location and registration number of each export field.

APHIS must ensure that HPV, MDMV or WSMV were not known to occur in the export fields for two years before planting of the export crop. A minimum distance of 30 metres must separate the export field from adjacent non-export sweetcorn, other *Z. mays* and wheat fields.

9.3 Field Sanitation and Pest Control Measures

The hygiene of export crops must be maintained by appropriate pest management options to ensure that inspection for HPV, MDMV and WSMV is not impeded as a result of the presence of other pests masking virus symptoms. To reduce the risk of introduction of quarantine pests to export fields, only Idaho-grown seed is to be used for planting export crops. Export crops must be planted in April-May, to minimise the potential risk of HPV and WSMV infection by wheat curl mites, which may migrate from senescing infected hosts, particularly wheat, to the export crop.

9.4 Export Crop Inspection and Testing

APHIS-approved inspectors must conduct two visual inspections, each of a minimum of 10% of the export crop, for pests of quarantine concern to Australia. The first inspection must be conducted at the four- to five-leaf stage and the second within four weeks after tasselling.

In addition, leaf samples from 300 plants selected at random from the export field during the second inspection must be tested using ELISA or another reliable method for detecting HPV, MDMV and WSMV. Where export seed comes from less than 300 plants, the plants must be sampled to provide a 95% level of confidence of detecting a plant infection level of 1% or greater. The leaf samples may be tested in batches of a maximum of ten samples.

APHIS must ensure that the inspector(s) is familiar with disease symptoms of the quarantine pests of concern to Australia. Plants exhibiting disease symptoms must be submitted to an APHIS-approved plant pathologist for identification, and records of results of all tests must be kept by APHIS for audit checks by AQIS.

Sweetcorn plants exhibiting virus symptoms during visual inspection must be tested using ELISA or another reliable method for detecting HPV, MDMV and WSMV. Seed from export fields in which HPV, WSMV or MDMV is detected must not be exported to Australia.

9.5 Packing house Registration and Procedures

All packinghouses handling export seed must be approved and registered with APHIS, for trace-back purposes. APHIS must keep records of all exports of sweetcorn seed to Australia for two years for trace-back.

APHIS officers must inspect the packinghouse and cleaning equipment before commencement of processing of export seed to Australia, to determine hygiene conditions and product identity.

The manager of the packinghouse must ensure that machinery and storage facilities used for handling export seed are thoroughly cleaned before being used to process export seed. The manager of the packinghouse must ensure that export seed is thoroughly cleaned to remove extraneous matter (e.g. trash, soil, weed seeds, arthropod pests). The manager of the packinghouse must ensure that export seed is segregated from non-export seed at all times.

APHIS must conduct random audit checks on approved packinghouses to monitor the precautions taken to prevent mixing or substitution of export seed with non-export seed, contamination with weed seeds, and infestation with arthropod pests.

APHIS must suspend exports from packinghouses that fail to comply with the requirements set out in this section.

9.6 Pre-export Seed Inspection

APHIS-approved inspectors must inspect export seed sampled from consignments in packinghouses in Idaho, according to ISTA rules, for all visually detectable quarantine pests (arthropods and weeds) specified by Biosecurity Australia (Table 5).

9.7 Notification

APHIS must notify AQIS immediately of any change in the status of quarantine pests recorded in the USA and Idaho. Any change to the status of the quarantine pests may result in immediate suspension of trade until the outcome of a joint AQIS and APHIS investigation is known.

9.8 Pre-export Seed Treatment for *Ustilago zeae*

All sweetcorn seed for export to Australia must be treated with a mixture of Carboxin at 1g/kg seed and Thiram at 1g/kg seed or another AQIS-approved fungicide(s) effective against *U. zeae*.

9.9 Packing, Labelling and Storage

APHIS must inspect packinghouses during the packing and storage of export seed to monitor and verify that the necessary requirements are being met, including a pest control program. During pre-export storage, necessary precautions must be taken to prevent re-infestation with trash, soil, weed seeds and arthropod pests.

Export seed must be packed in clean, new bags, which must be of a woven or gas-permeable material such as hessian, and without plastic liners.

Each bag must be clearly labelled "*FOR EXPORT TO AUSTRALIA*" and bear the serial number of the approved export field and packinghouse. Sweetcorn seed packages must not be opened in transit from Idaho to Australia. A consignment must not be stored, split or have its packaging changed while in transit between Idaho and the port of export or while in another country en route to Australia.

9.10 Phytosanitary Certification

Upon completion of seed sampling and inspection, APHIS must issue a Phytosanitary Certificate for each consignment, containing the following information:

- the appropriate 'serial number', packing house number, number of bags per consignment and date.
- an additional declaration stating that "Seed was produced in accordance with AQIS's requirements, including inspection and testing of export seed crops for High Plains *tenuivirus*, wheat streak mosaic *rymovirus* and maize dwarf mosaic *potyvirus*".
- the details of the AQIS-approved fungicide seed treatment applied for *Ustilago zeae*.

9.11 On-arrival Inspection of Phytosanitary Documents

An AQIS officer must inspect phytosanitary documents relating to imported sweetcorn seed. Any consignment with incomplete documentation, or certification that does not conform to specifications must be refused entry, with the option of re-export or destruction. AQIS would notify APHIS immediately of action taken.

9.12 On-arrival Inspection and Treatment of Seed

AQIS must draw samples according to ISTA rules from all consignments of imported sweetcorn seed. If trash, soil and other extraneous matter are found in the consignment, importers will be offered the option of cleaning the seed, processing, re-export, or destruction. If cleaning is the accepted option, the consignment will be directed to quarantine-approved premises. Removal and incineration of extraneous matter will be carried out under quarantine supervision.

All potential quarantine pests found during on-arrival inspection must be forwarded to an appropriate AQIS Laboratory for full identification before a non-compliant consignment is treated. AQIS will provide the results of pest interceptions to APHIS.

If live stages of a quarantine arthropod pest are intercepted during on-arrival inspection, the affected seed lot(s) must be fumigated with either phosphine or methyl bromide. The importer may use either fumigant. The efficacy of fumigation will be verified by inspection 24 hours after completion of the treatment.

If a quarantine pest for which pest-free area status is specified is detected during on-arrival inspection, AQIS will review the import conditions and may suspend the importation of sweetcorn seed immediately, pending the outcome of a joint AQIS, Biosecurity Australia and APHIS investigation.

9.13 Review of Import Requirements

AQIS, and Biosecurity Australia, in consultation with APHIS, will review the import requirements if circumstances or information warrant such action.

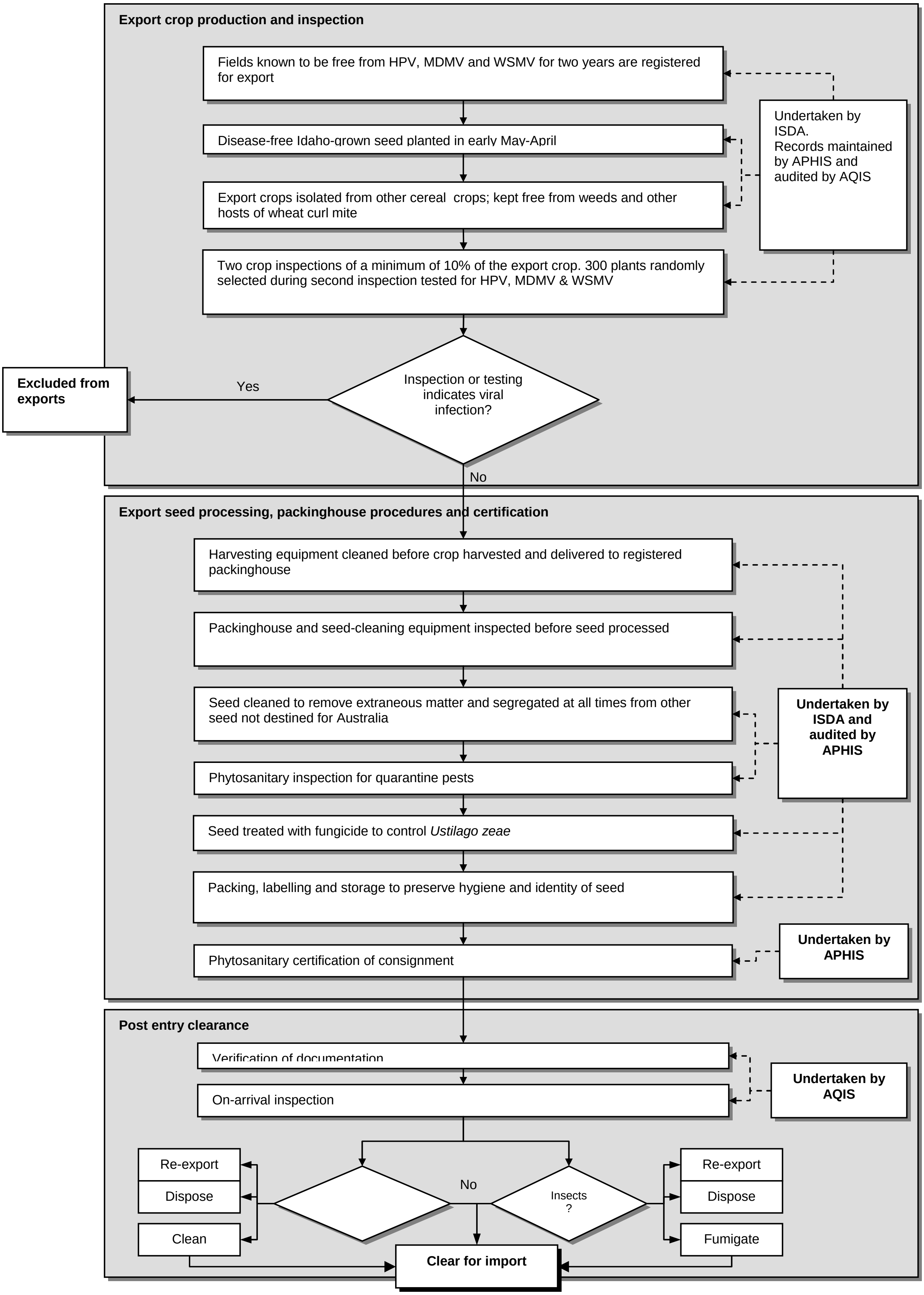

Figure 1: Import requirements for Idaho-grown sweetcorn seeds

10. AUSTRALIA'S APPROPRIATE LEVEL OF PROTECTION

The SPS Agreement defines 'appropriate level of sanitary or phytosanitary protection as the level of protection deemed appropriate by the member country establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory'.

Based on the findings of the IRA, Biosecurity Australia believes that Australia would achieve its appropriate level of protection by importing sweetcorn seed from Idaho in accordance with the conditions of import described in section 9.

The management of quarantine risks offshore is consistent with AFFA's policy to permit imports of various plants, animals and their products, including APHIS-certified seeds of beans, peas and Lucerne from specific states of the USA.

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ANNEX 1

STAKEHOLDERS COMMENTS ON THE DRAFT IRA PAPER

TABLE OF CONTENTS

1 INTRODUCTION

Biosecurity Australia circulated the draft IRA on 6 January 2000 to 392 stakeholders. Stakeholders were invited to comment on the technical issues raised in the draft IRA by 8 March 2000. Biosecurity Australia received 21 written responses from six seed companies (two separate responses were received from Pacific Seeds Pty. Ltd.), two consultants, four industry associations, three research stations, the Idaho State Department of Agriculture (ISDA) and four from Australian State Departments of Agriculture. ISAD, representatives of the Idaho sweetcorn seed companies and the University of Idaho provided a combined response. This annex tabulates all stakeholder comment and the Biosecurity Australia response.

Stakeholders consulted	392
Responded	21
Supported the draft analysis	12
Opposed the draft analysis	4
Provided comments	3
Acknowledged receipt of the draft IRA but made no comments	2

STAKEHOLDERS RESPONDING TO THE DRAFT IRA

Stakeholder	Overall position taken
New South Wales Agriculture	Supported (some qualifications)
Maize Association of Australia	Supported (some qualifications)
Queensland Department of Primary Industries (QDPI)	Supported (some qualifications)
Department of Natural Resources and Environment (DNRE) – Agriculture Victoria	Supported (some qualifications)
Dr John T Swarbrick - Consultant	Supported (some qualifications)
Dr Peter Rothwell – Consultant	Supported
Simplot Australia	Supported
Pioneer Hi-Bred Australia Pty	Comments provided
Australian Lot Feeders Association (ALFA)	Supported
Idaho State Department of Agriculture (ISDA)	Supported
Novartis - Australia	Supported
Yates	Supported
CSIRO Tropical Agriculture, Queensland	Supported
Pacific Seeds Pty Ltd.	Opposed (support via NZ)
Snowy River	Opposed (support via NZ)
Grains Council of Australia (GCA)	Opposed (support via NZ)
Allan Peake Sweetcorn Breeder, Pacific Seeds Pty Ltd	Opposed (support via NZ)
Seed Industry Association of Australia Ltd. (SIAA)	Comments provided
Dr Rob Forster, Idaho State University	Acknowledged
CIMMYT International, Mexico	Acknowledged
Agriculture Western Australia (AGWEST)	Comments provided

2 COMMENTS MADE BY THE STAKEHOLDERS IN SUPPORT OF THE IRA

- "Queensland DPI supports the IRA and the proposed protocol in general. DPI notes that New Zealand has been operating for many years under a protocol similar to that now proposed by AQIS for Australia, and that Australia has had no restrictions on sweetcorn seed from New Zealand in that time. There have been no quarantine problems with this arrangement" (QDPI).
- "You may be aware that an officer of NSW Agriculture had the opportunity to inspect the Idaho scheme a couple of years ago. His assessment confirms the view expressed in the draft IRA that the Idaho certification scheme can produce high health sweet corn seed and maintain its integrity throughout the production and transport chain" (NSW Agriculture).
- "Overall, the Department of Natural Resources and Environment (DNRE) supports the appropriate treatment protocols for meeting AQIS's appropriate level of protection for the quarantine pests, diseases and weed species…" (DNRE Agriculture Victoria).
- "Had no concerns with the IRA" (Yates).
- "We had previously examined the detailed Import Risk Analysis paper submitted by the Technical Working Group on importation of maize from the USA and agree with the view that the potential quarantine risk associated with sweetcorn seed is lower than for imports of bulk maize grain imports from the USA" (CSIRO Tropical Agriculture).
- "Since we are most concerned about hybrid grain corn, HPV and WSMV are not serious concerns to most of the US seed production areas. The thirty-meter isolation from wheat field does not cause a problem" (Pioneer Hi-Bred Australia Pty.).
- "The management options for arthropods and weed pests are reasonable.' 'Existing seed cleaning techniques will eliminate weed concerns" (Pioneer Hi-Bred Australia Pty.).
- "Field inspections (based on their definition of a Pest Free Area) are a logical method to verify absence of the pest" (Pioneer Hi-Bred Australia Pty.).
- "The Idaho State Department of Agriculture (ISDA) working cooperatively with the Idaho sweetcorn seed companies, the University of Idaho research scientists and the U.S. Department of Agriculture (USDA) would like to assure the Australian Quarantine and Inspection Service (AQIS) and the Australian sweetcorn industry that only sweetcorn seeds in compliance with AQIS import requirements will be certified for export to Australia" (ISDA).
- "We are in total agreement with AQIS's recommendation that in order to reduce the risk of introduction of quarantine pests to export fields, only Idaho-grown seed would be used for planting export crops" (ISDA).
- "For the last thirty-five (35) years ISDA and the Idaho bean seed companies have followed the same management practice. Therefore, we are very familiar with the system and convinced that such a system should be integral to a credible seed production" (ISDA).
- "The import risk analysis paper for the importation of sweetcorn seed from Idaho for the purpose of field sowing in Australia prescribes management options that are

technically sound, reasonable and achievable by our seed companies and enforceable by ISDA" (ISDA).

- "Novartis Seeds Pty. Ltd. through their production people in Idaho have been in contact with the Idaho Dept of Agriculture and have confirmed that they will be able to meet the criteria as set out in the Draft Import Risk Analysis of the Importation of Sweetcorn (*Zea mays*) seeds from Idaho, USA" (Novartis).
- "In my opinion the draft procedures for sweetcorn seed from Idaho seem totally appropriate and practical. The recommendations avoid 'new tariff trade barriers' and embrace cooperation of Australian and USA agencies" (Peter Rothwell).
- "ALFA agrees with the findings of the IRA that the increased pest risk management measures that can be implemented for the small tonnages involved (in conjunction with the importation of the 'high health status' Idaho sweetcorn seed), supports the classification of seed import as of low risk potential" (ALFA).
- "The risk management procedures including fumigation, export field registration, crop inspection, crop testing and seed cleaning are certainly more comprehensive than mechanisms that can be applied to bulk maize imports on an economically sustainable basis" (ALFA).
- "To this end, ALFA supports the AQIS view that Australia would achieve its appropriate level of protection by importing sweetcorn seed from Idaho under the proposed management conditions" (ALFA).
- "As stated in the draft, AQIS collected a great deal of information on Sweet Corn pests when they conducted the IRA of bulk maize grain imports from USA (AQIS, 1999). We are therefore very confident in the accuracy of the information listed in Tables 3 and 4 regarding the quarantine status of pests associated with Idaho produced Sweet Corn" (Pacific Seeds).
- "We agree that modern seed processing, sampling, inspection, fumigation and storage methods should be effective in mitigating the risk of insect pests and weed seeds in Sweet Corn seed" (Pacific Seeds).
- "This letter serves to indicate Simplot Australia's appreciation of the subsequent Routine Import Risk Analysis undertaken by AQIS and strongly supports the proposed actions and co-operative initiatives undertaken with APHIS as outlined in the Draft Analysis Paper" (Simplot Australia Pty Limited).
- "We believe the proposals represent practical and realistic solutions to the management of potential quarantine problems identified and as such, Simplot Australia pledge total co-operative support to ensure the proposed system becomes highly reliable and workable" (Simplot Australia Pty Limited).
- "We believe that faster access to the range of new sweetcorn varieties that are developed overseas, which will result from the proposed new AQIS import guidelines, will significantly enhance the Australian sweetcorn industry's ability to compete more effectively with international suppliers" (Simplot Australia Pty Limited).
- "The draft IRA indicates that the preferred option for managing *Ustilago zeae* is seed treatment with an AQIS approved fungicide, as it is the least restrictive method of effectively managing the risk. The GCA agrees with this recommendation by AQIS" (GCA).

3 ISSUES RAISED BY THE STAKEHOLDERS IN RESPONSE TO THE DRAFT IRA

3.1 General Issues

3.1.1 Potential damage to the Australian grains industry

Issue No 1: 'The importation of sweetcorn seed for sowing from Idaho has the potential to cause significant damage to the $7 billion Australian grains industry.' (GCA).

Issue No 2: 'The cereal industry to which the HPV and WSMV is a real threat should be included in the IRA. The maize and popcorn industry is geographically located within the wheat industries in Australia. Any potential outbreaks could move very quickly into the cereal industry.' (Allan Peake, Pacific Seeds).

Issue No 3: 'The potential damage to the wheat, maize and sweetcorn industries of Australia far outweigh any benefits that may be gained by the sweetcorn industry.' (Allan Peake, Pacific Seeds).

Issue No 4: 'Given that the sweetcorn industry is worth some $50 million and that the cereals, maize and popcorn industries are worth some $5000 million the potential down-side to these industries seems a lot greater than any potential gains from relaxing the import restrictions. 'All *Zea mays* products share the same diseases. However the downstream impact is potentially far greater on industries other than sweetcorn in Australia. There are significant risks to these industries.' (Snowy River Seed).

> **Biosecurity Australia response:** In the IRA, Biosecurity Australia has considered all plants and plant products at potential risk from introduction of quarantine pests that may be associated with Idaho-grown sweetcorn seed. The IRA takes into account the likelihood of establishment of quarantine pest and their economic impacts (details provided in Annex-2 data sheets of quarantine pests).
>
> As a member of the World Trade Organization (WTO), Australia is obliged to practice quarantine risk management consistent with its international obligations and in a scientifically justified manner without imposing unnecessary restrictions to trade. At the same time, Australia has maintained a conservative approach to quarantine in order to safeguard our highly favourable animal and plant health status.

Issue No 5: 'Whilst we acknowledge that implementing quarantine controls that are 100% risk free is not achievable, in this instance the economic impact to not only the Australian maize industry but also the wheat industry should High Plains Virus, Wheat Streak Mosaic Virus or Maize Dwarf Mosaic Virus be introduced is enormous.' (Pacific Seeds).

> **Biosecurity Australia response:** The mandatory import requirements will provide a greater level of protection for the grains industry than some of the current methods of importation. Commercial quantities of *Z. mays* seed from the USA can be imported via New Zealand, subject to one generation growth in New Zealand. No active viral indexing system is in-place to detect viral infection. New import conditions include two inspections of 10% of the export crops and ELISA testing of 300 randomly selected plants to detect viral pathogens. Biosecurity Australia has no intention of relaxing quarantine conditions for sweetcorn seed imports. Biosecurity Australia is

planning to review the policy on sweetcorn seed imports from New Zealand to provide better protection for the Australian grains industry.

3.1.2 The IRA process and procedures

Issue No 6: 'We ask that AQIS to re-submit the IRA using a non-routine system to include protocol for all *Zea mays* products and industries, and to take account of the full potential impact to all concerned industries including cereals.' (Snowy River Seed).

> **Biosecurity Australia response:** Biosecurity Australia consulted stakeholders for their comments on the process to be used for this IRA and the majority of the stakeholders supported a routine IRA. The decision to conduct a routine IRA was based on consideration that this proposal is technically less complex and does not require assessment of significantly greater or different risks than those AFFA has previously examined. The routine process includes technically rigorous risk analysis, and is conducted in full consultation with stakeholders and external scientists. Biosecurity Australia has conducted a non-routine IRA for the importation of bulk maize grain from the USA into Australia, and used the relevant technical information from this IRA for the sweetcorn IRA.

Issue No 7: 'Why this IRA has not been carried out for all *Zea mays* products (maize seed and grain, popcorn seed and grain and sweetcorn seed and food production). Specifically the Maize seed and Popcorn seed industries.' (Snowy River Seed).

> **Biosecurity Australia response:** Most of the import requests were for sweetcorn seeds, therefore, the draft IRA was confined to the assessment and management of risks associated with a specific proposal – sweetcorn seed for sowing produced in Idaho, USA. The systems in place to produce this product were examined in detail and the proposed protocols are in part based on these systems. Applications to import other forms of *Z. mays* from Idaho would be considered by Biosecurity Australia on a case by case basis. AQIS may grant permits to import other forms of *Z. mays* subject to the same or similar conditions outlined in this IRA for the importation of Idaho-grown sweetcorn seed.

Issue No 8: 'It is suggested that the draft IRA should include all pathogens of the crop in question and information presented whether these are present in the exporting state or country and Australia. After consultation with stakeholders, this list could then be revised for pests and diseases of quarantine concern in the final IRA.' (AGWEST).

> **Biosecurity Australia response:** AQIS prepared a world list of pathogens associated with *Z. mays* and this list was utilised in this IRA. This list was circulated to key stakeholders, including AGWEST and amended according to their suggestions.

3.1.3 Consultation with stakeholder

Issue No 9: 'The wheat industry ought to be widely consulted before a decision is taken to import large volumes of sweetcorn seed into Australia. I have contacted relevant people in GRDC, the Leslie Research Centre (formerly the Queensland Wheat Research Institute) and the University of Queensland, and not one of the wheat breeders and pathologists and these organisations were aware of the existence of this draft IRA.' (Allan Peake, Pacific Seeds).

> **Biosecurity Australia response:** AQIS has consulted all peak industry bodies during the course of this IRA. In addition to the GCA, the draft IRA was sent to Professor John Lovett and Mr. Joe Williams (GRDC), and Mr Jason Able (Queensland University). Quarantine pathologists in every State, State Departments of Agriculture, and other State agencies, are also included on Biosecurity Australia's stakeholders' lists. These stakeholders were consulted throughout the draft IRA process.

3.1.4 Australian sweetcorn seed import policy

Issue No 10: We would like AQIS to address what has changed since the AQIS 1990 where open quarantine was suspended due to concerns regarding the potential risk of establishment and spread of Downy Mildew and Stewart's bacterial wilt'. (Snowy River Seed).

> **Biosecurity Australia response:** Open quarantine was suspended in 1990 following concerns regarding the potential risk of establishment and spread of downy mildews (*Peronosclerospora* spp.) and Stewart's wilt (*Pantoea stewartii* subsp. *stewartii*). These diseases are not present in Idaho and therefore pose no risk of introduction on Idaho grown sweetcorn seed. Biosecurity Australia will require APHIS to provide certification to this effect with all imports of sweetcorn seed from Idaho.

Issue No 11: 'We believe our quarantine concerns are legitimate and should not be compromised under the illusion that this is needed for trade to proceed. The essential element of the trade is the germplasm, which can be presently introduced to Australia with minimal risk either via closed quarantine glasshouses or via a single generation in NZ.'(Pacific Seeds).

Issue No 12: 'No alterations should be made to the existing arrangements for the importation of sweetcorn seed for sowing.' (GCA).

Issue No 13: 'Australian importers can currently access seed of new sweetcorn varieties from the USA and other countries through New Zealand. The sweetcorn industry in Australia can currently introduce and have commercial varieties from any source in the world under its current quarantine system. It takes one year to bring in any commercial quantity required by the industry. Given that any reputable commercial producer will introduce a new variety over 2-5 years the current system allows them full access. Currently the main varieties used for export to Asia are available in Australia. Several of the preferred varieties for export are Australian bread materials. These hybrids are used successfully around the world. The claim that the export market is being held back, simply does not stand up. The current system has successfully stopped disease outbreaks so far, why is this not sufficient given the risk associated with a change in the system?' (Snowy River Seed).

> **Biosecurity Australia response:** Biosecurity Australia is obliged to consider proposals to import from any source without discrimination and, where feasible, develop protocols to manage any phytosanitary concerns that are identified. Biosecurity Australia has no intention of relaxing quarantine conditions for sweetcorn seed imports. The mandatory import requirements for Idaho-grown sweetcorn seed provide better protection than the current methods of importation of sweetcorn seed

from New Zealand. The proposed import conditions are rigorous and sound when compared to current import conditions. Under current policy, seeds of sweetcorn can be imported into Australia from New Zealand or grown under PEQ and then released. However, no active viral indexing system is in-place to detect viral infection. The proposed import conditions for Idaho-grown sweetcorn seed include two inspections of 10% of the export crops and any suspected plant having virus symptoms would be sent for diagnosis. In addition 300 randomly selected plants will be tested for the presence of viral pathogens. Each step in the process will reduce the risk of introduction of quarantine pests into Australia.

Biosecurity Australia is planning to review the policy on sweetcorn seed imports from New Zealand on completion of the sweetcorn IRA to ensure that the level of quarantine protection for the Australian grains industry and the environment is appropriate.

3.1.5 The sweetcorn seed production industry in Idaho

Issue No 14: ‘It is important to note that Idaho has no formal method of restricting entry of seed, even though it is collection point and major production area for most of the worlds Sweet Corn breeding companies.’ (Pacific Seeds).

Biosecurity Australia response: Idaho does not maintain a formal quarantine policy against the entry of Z. mays seed from other states in the USA. Because it is a major exporter of seed, all segments of the industry are keenly aware of the consequences of accidental introduction of pathogens of Z. mays of concern to other countries. According to ISDA, no seed is purchased from sources that could be contaminated with pests of concern.

Issue No 15: ‘All major USA sweetcorn seed producers are present in the Treasure Valley of Idaho. Their breeding programs are situated there and also their production and processing facilities. They also all use other sites for disease testing, cultivar testing and alternate season production. The key areas that they move material to and from are Hawaii, Argentina, Chile, Wisconsin and Florida. What systems are in place to insure there is no contamination from these locations either in the field or in the processing plants.’ (Snowy River Seed).

Biosecurity Australia response: The mandatory measures specified in this IRA require that only Idaho-grown seed must be used for the planting of export crops (sec. 9.3). APHIS must conduct random audits on approved packinghouses to monitor measures in place to prevent mixing or substitution of export seed with non-export seed, contamination with weed seeds, and infestation with arthropod pests, including a pest control program (sec. 9.5).

Issue No 16: ‘In point 3.4 para 1, it should be noted that of the 10, 577 tonnes exported from Idaho some 80% of this is used in the USA and not exported out of the country. In fact at least 20% of the seed used outside the USA is Australian produced seed.’ (Snowy River Seed).

Biosecurity Australia response: Idaho produces about 90% of the United States domestic supply of sweetcorn seed and exports about 4.5 million pounds annually (Forster *et* al., 2001). According to ISDA statistics, greater than 80% of the sweetcorn seed produced in Idaho is exported to international markets. This equates to an average of 2000 tonnes exported annually from 1988 to 1998. In data provided to Biosecurity Australia by SIAA, 50 tonnes of sweetcorn seed are exported from Australia annually which is a small proportion of that exported from Idaho.

Issue No 17: In point 3.4. Para 3, You state that; 'Cobs are picked well above ground level'. This is simply not correct in many cases, crops are very low to the ground or have actually fallen over onto the ground. One of the main characteristics of the "special harvesters" you mention is their ability to pick crops up off the ground. In some cases rocks, soil and certainly weeds are harvested and transported into the processing plant. Please view attached photo showing a crop in Idaho with cobs clearly on the ground (Attached photo).' (Snowy River Seed).

Biosecurity Australia response: Cobs are generally picked well above ground level with special harvesters that minimise contamination. The cobs are transported to packinghouses, sorted to remove poor grade cobs, and threshed. The resultant seed is dried, cleaned, and sorted to remove poor quality seed and extraneous matter. The harvesting, sorting, threshing, and cleaning procedures ensure that the risk of contamination of sweetcorn seed with weed seeds, soil and trash is negligible.

3.2 Arthropod Pest Issues

3.2.1 Arthropod pest risk analysis

Issue No 18: 'In reviewing the document two potential quarantine pests have been found that are not listed on Table 3. *Helicoverpa zeae* (Boddie) [Lepidoptera: Noctuidae] (Corn earworm), a serious pest of sweetcorn and rated second most important economic pest species in North America (CABI, 1999). *H. zeae* is widespread in North America and present in Idaho (Scott, 1987). *Sitobion avenae* (Fabricius) [Hemiptera: Aphididae] (English grain aphid), a serious pest of wheat and a pest of other grains including corn. Widespread in the USA (CABI, 1999) including Idaho (Feng *et al.*, 1993).' (AGWEST).

Biosecurity Australia response: *Helicoverpa zeae* feeds on green material and not on dried seeds. *Sitobion avenae* feeds on plant fluids and therefore not on dried stored grains, as these do not contain fluids. As only sweetcorn seeds will be imported, these two field pests are not in the importation pathway. These pests have been added to Table 3 of the final IRA document.

3.2.2 Pre-export inspection and seed certification

Issue No 19: 'The proposed inspection procedures by APHIS for arthropods may not be rigorous enough, or of sufficient sample size, to adequately protect the Australian grains industry.' (GCA).

Biosecurity Australia response: APHIS has successfully complied with a number of import conditions developed by AQIS to import seeds of various commodities such as pea (*Pisum sativum*), bean (*Phaseolus* spp.) and lucerne (*Medicago sativa*) from the USA for sowing in Australia. Some of these conditions have been operating effectively for over a decade.

Pre-export inspection will be undertaken by APHIS approved inspectors. The sampling regime and sample size inspected will be in accordance with the International Seed Testing Association (ISTA) guidelines (sec. 9.6). On-arrival inspection of seed would be undertaken by AQIS, also in accordance with ISTA guidelines.

Issue No 20: 'The draft IRA does not state where the pre-export inspections will take place. Pre-export inspections at Idaho pack houses would need follow-on bio-security, this appears not to have been considered in the draft. If pre-export inspections are to be conducted at shipping ports beyond Idaho, the likelihood of contamination or infestation with pests outside of the State does not appear to have considered.' (AGWEST).

Biosecurity Australia response: The pre-export seed inspection would be done in packinghouses within Idaho, thereby, maintaining grain integrity in the export process. To further ensure grain security, Biosecurity Australia will require that APHIS inspect packinghouses during the packing and storage of export seed to monitor and verify that they meet the necessary requirements, including a pest control program. During pre-export storage, necessary precautions must be taken to prevent re-infestation with trash, soil, weed seeds and arthropod pests. Export seed must be packed in new bags and sealed. Each bag must be clearly labelled "FOR EXPORT TO AUSTRALIA" and bear the serial number of the approved export field and packinghouse. Sweetcorn seed packages must not be opened in transit. A consignment must not be stored, split or have its packaging changed while in transit between Idaho and the port of export or another country en route to Australia (sec. 9.9).

3.2.3 Fumigation

Issue No 21: 'If the mandatory import requirements, outlined in the draft IRA, are consistently applied, then the risk of introducing any of the quarantine pests recorded in Idaho is small. However, as the intention is to import relatively large quantities of seed and there are a number of *Trogoderma* spp. present in Idaho, a reasonable precaution would be to require pre-shipment fumigation of consignments with phosphine. (NSW Agriculture).

Issue No 22: 'The GCA considers that fumigation may be an inappropriate mechanism, as it is not convinced about the practicality of using either phosphine or methyl bromide for that purpose. This would mean that re-export or destruction would be the only appropriate responses. If, however, fumigation is considered to be an appropriate mechanism then the GCA would consider that all shipments should be fumigated due to the inability of sample inspections to find every arthropod.' (GCA).

Biosecurity Australia response: The proposed import conditions for sweetcorn seed production, handling, and storage will manage the risk of introduction of quarantine arthropod pests (sec. 9.5, 9.9) and mandatory fumigation would not be justifiable. Pre-export visual inspection by APHIS and on-arrival inspection by AQIS following an internationally accepted inspection regime provides further assurance that the consignment is free of *Trogoderma* spp. (sec. 9.6, 9.12). This is consistent with established policy on seed imports. Biosecurity Australia currently accepts certification provided by APHIS for the import of lucerne, bean and pea seed for sowing from the USA. Biosecurity Australia stipulates that seeds in the consignment have been inspected and found apparently free from all species of the genus *Trogoderma*. APHIS would be providing an assurance that the consignment is free from quarantine pests (Table 5). Biosecurity Australia will review the need for pre-export treatment for arthropod pests if ongoing problems with interception of arthropod pests are encountered.

Issue No 23: Modern seed processing, sampling, inspection, fumigation and storage methods should be effective in mitigating the risk of insect pests and weed seeds in sweetcorn seed. However, given the serious impact that insects of *Trogoderma* species could have if introduced to Australia, the relatively minute cost of treatment with a residual insecticide or fumigation would seem to be very cheap insurance.' (Pacific Seeds).

Biosecurity Australia response: Fumigation is a standard treatment for seed consignments that are infested with arthropod pests. Mandatory fumigation with a residual insecticide can only be justified if there is a significant risk of infestation by quarantine pests. *Trogoderma granarium* in grain is of serious quarantine concern to AQIS. This pest has not been recorded in Idaho. *Trogoderma glabrum, T. inclusum, T. ornatum* and *T. variabile* are known to occur in Idaho. *Trogoderma variabile* is present in Australia and under official control in Western Australia. Freedom from identified pests would be verified by on-arrival seed inspection by AQIS. If live stages of any quarantine arthropod pest were found during on-arrival inspection, infested lot(s) must be fumigated.

Issue 24: 'The management options for arthropod pests are reasonable. One concern would be that any fumigation of seed not include methyl bromide which can reduce seed germination. Phosphine is the preferred methodology. Adequate pre-shipment inspection of seed should reduce the need for fumigation in any case.' (Pioneer).

Issue No 25: 'It is a well accepted fact that fumigation with Methyl Bromide adversely affects seed viability or vigour. As the draft is specifically seed for sowing inclusion of Methyl Bromide is not an acceptable option. The alternative listed (phostoxin) would be acceptable.' (Pacific Seeds).

Biosecurity Australia response: Phosphine fumigation is the preferred option if live insects of quarantine concern are detected during on-arrival inspection (sec. 8.1.3). The importer will also have the choice of fumigation with Methyl Bromide on the understanding that the treatment may impair seed germination.

3.3 Fungal Pathogen Issues

3.3.1 Fungal pathogen risk assessment

Issue No 26: 'According to Shurtleff (1994), there are 12 bacterial, 74 fungal and 38 virus or virus-like pathogens associated with *Zea mays* L. Of these, all the bacterial, 48 fungal and 18 virus or virus-like pathogens are present in the USA. It is acknowledged that not all of these are seed-borne. It is not clear from the draft IRA, how many of these are present in Idaho. (AGWEST).

Biosecurity Australia response: In the IRA on bulk maize grain from the USA undertaken by Biosecurity Australia, 14 bacteria, 310 fungi, 40 nematodes and 38 viruses were found associated with maize worldwide. This list was appended to the Pathogen Technical Working Group report to the Risk Analysis Panel for bulk maize imports from the USA and is available on request from Biosecurity Australia. A detailed analysis was undertaken to determine which of these may be associated with Idaho grown sweetcorn seed, following FAO guidelines (FAO 1996), and using information provided by ISDA, other technical experts, available databases, and published scientific literature. Only those pests known to occur in Idaho were considered in further detail. Annexes 2 and 3 of the final IRA contain data-sheets on these pests. Biosecurity Australia considered host range, distribution, biology, life history, entry potential, establishment potential, spread potential and economic damage potential during analysis of pests present in Idaho. Pests were categorised as quarantine or non-quarantine pests as defined in the FAO glossary of phytosanitary terms (FAO, 1999).

Issue No 27: 'Fungal pathogens such as *Fusarium poliferatum* (T. Matushima) Nirenberg, *Rhizoctonia solani* AG – 2 type 2 III B, intraspecific group 2B, *Cochliobolus carbonum* R.R. Nelson, *Colletotrichum graminicola* (Ces.) G.W. Wils., *Botryosphaeria zeae* (G.L. Stout) Arx & Mullero, and *Botryodiplodia theobromae* Pat. are known to be seed-borne (White, 1999). If present in Idaho then these should be listed in Table 3 of the draft IRA. (AGWEST).

Biosecurity Australia response: *Fusarium proliferatum* (T. Matushima) Nirenberg; *Cochliobolus carbonum* R.R. Nelson, *Colletotrichum graminicola* (Ces.) G.W. Wils., *Botryosphaeria zeae* (G.L. Stout) Arx & Muller, *Rhizoctonia solani* AG – 2 type III B, intraspecific group 2B, and *Botryodiplodia theobromae* Pat. are not recorded on *Z. mays* in Idaho, and therefore, are not in the pathway. Furthermore, these pathogens have been recorded in Australia (Elmer *et al.*, 1999; CABI/EPPO, 1998; Ramsey, 1990; CMI, 1985).

Issue No 28: 'Some of these diseases of concern include … and Sorghum downy Mildew**.'** (Pacific Seeds).

Biosecurity Australia response: *Peronosclerospora sorghi* (sorghum downy mildew) is a quarantine pathogen for Australia. However, surveys conducted by ISDA in the last 30 years have shown that sorghum downy mildew is not present in Idaho and is therefore not in the pathway. ISDA must provide area freedom certification with all sweetcorn seed exports to Australia.

3.3.2 Management options for *Ustilago zeae*

Issue No 29: 'The freedom from common smut in Idaho is questionable. Even in relatively resistant hybrid grain production fields, and in the absence of mechanical or hail damage, common smut can occur.' (Pioneer).

Biosecurity Australia response: *Ustilago zeae* (boil smut) is present in Idaho and is under official control in Australia. Seed treatment will be mandatory for Idaho-grown sweetcorn seed (sec. 9.8).

Issue No 30: 'The seed treatments listed will be effective, and if anything should be mandatory, not listed as an option! Common smut could easily be overlooked, and treatment represents good, inexpensive insurance.' (Pioneer).

Issue No 31: 'We are in agreement with the proposal to treat seed with a mixture of carboxin (1g/kg) and thiram (1g/kg) given that is the prescribed seed treatment to allow for interstate movement of maize in Australia. We suggest that "another AQIS approved fungicide(s) effective against *Ustilago zeae"* only be prescribed after consultation and agreement with all State Government Departments of Agriculture in Australia. If this is not done then we could have the farcical situation where Sweet Corn seed could be imported into Australia and then not be moved interstate until retreated with another fungicide(s) approved by the states.' (Pacific Seeds).

> **Biosecurity Australia response:** The Australian State Departments of Agriculture permit entry of seeds for sowing that have been treated with Vitavax FF 200. Other seed treatments (sec. 8.2.2) would only be accepted by AQIS after consultation and agreement with Biosecurity Australia and the State Departments of Agriculture.

3.4 Bacterial Pathogen Issues

Issue No 32: 'The draft has not indicated what measures are in place to minimise the introduction of important diseases like *Clavibacter michiganensis* subsp. *nebraskensis* and *Pantoea stewartii* subsp. *stewartii* etc. into Idaho from neighbouring States'. (AGWEST).

> **Biosecurity Australia response:** There are no formal inter-state regulations on the movement of sweetcorn seed in the USA, however, ISDA has a reliable and ongoing system for pest surveillance of sweetcorn crops. In addition, farmers, the University of Idaho, and the seed industries are constantly in communication with the ISDA through the extension service. If a pest of concern is detected, eradication management procedures begin immediately. Biosecurity Australia has provided a list of quarantine pests associated with Idaho-grown sweetcorn seeds and the ISDA will be inspecting export fields for these pests. ISDA and APHIS are required to advise AQIS immediately of any change in disease status in Idaho, at which time trade would be suspended until the change in risk status was assessed and appropriate measures to manage the risk developed and implemented. *Clavibacter michiganensis* subsp. *nebraskensis* is confined to a few States in the USA (Bradbury, 1991). ISDA surveys have shown that this bacterium has not been recorded in Idaho during regular crop inspections since their export certification program began in the 1960s. *Pantoea stewartii* subsp. *stewartii* was detected once in Idaho on glasshouse plants grown from imported seed in 1967 and its introduction to production fields was prevented (Pepper, 1967). ISDA has advised AQIS that there have been no reports of this bacterium in sweetcorn crops in Idaho since that time (ISDA, 1999). *Pantoea stewartii* subsp. *stewartii* is unlikely to persist in Idaho due to dry climatic conditions and the absence of its vector, the corn flee beetle, *Chaetocnema pulicaria* (Pepper, 1967).

Issue No 33: 'Is there an active monitoring program in place for detection of these diseases in Idaho or is it simply that the relatively "unfavourable" climatic conditions are not conducive to these diseases developing to a level to cause economic loss, thus being brought to the attention of APHIS authorities. Some of these diseases of concern include *Erwinia stewartii*, and *Pseudomonas avenae*' (Pacific Seeds).

> **Biosecurity Australia response:** There are no formal inter-state regulations on the movement of sweetcorn seed in the USA, however, pest surveillance system and the drier climatic conditions in Idaho are not favourable for bacterial pathogens to establish. In addition, the seed industry in Idaho sows relatively pest and disease free seed to prevent introduction of new pests and diseases into Idaho. ISDA has advised AQIS that there have been no reports of *Pantoea stewartii* subsp. *stewartii* (synonym: *Erwinia stewartii*) in sweetcorn crops in Idaho since that time (ISDA, 1999). *Acidovorax avenae* subsp. *avena* (synonym: *Pseudomonas avenae*) is already present in Australia and does not meet the definition of a quarantine pest as defined by the FAO. In addition, this bacterium has not been recorded on *Z. mays* in Idaho.

Issue No 34: 'AQIS's emphasis on field inspection could prove to be a problem in regards to Stewart's wilt and sets a bad precedent. Even when Stewart's wilt is found in a production field, APHIS permits the use of a seed test to determine whether the seed is infected. With Stewart's and other diseases, we focus on seed tests and/or grow-outs to determine whether the seed is truly infected and not whether the seed producing plant was infected. If a two-year field freedom was applied to Stewart's Wilt, very little seed would make it to Australia.' (Pioneer).

> **Biosecurity Australia response:** The two-year freedom requirement applies only to the quarantine viruses specified in this IRA. Should Stewart's wilt be recorded in Idaho, AQIS would at that time suspend trade and consider appropriate management options. However, Biosecurity Australia is satisfied that field inspections for Stewart's wilt will be effective. If the disease incidence in export crops is below the detection limit, the disease would be extremely unlikely to be transmitted through seed as the transmission rate in seed from heavily infected plants is very low (Block *et al.*, 1994).

3.5 Viral Pathogen Issues

3.5.1 Virus risk analysis

Issue No 35: HPV and WSMV are largely unknown quantities and could do great damage to the Australian grains industry if allowed to enter Australia. (GCA).

Issue No 36: Of major concern to SIAA is the identification of the three viruses in Idaho, those being: High Plains *tenuivirus*; Maize dwarf mosaic *potyvirus*; Wheat streak mosaic *rymovirus*. (SIAA).

Issue No 37: 'There have been concerns expressed about the impacts of HPV and WSMV in the maize and wheat industries in Queensland, should these disease agents be introduced on imported sweetcorn seed. It would be desirable to note these concerns in your overall assessment of the risk.' (QDPI).

Issue No 38: 'High Plains Virus and Wheat Streak Mosaic Virus present a potentially substantial risk to the sweetcorn, maize and wheat industries in Australia. There is not a lot of information available on the potential effect of these two viruses to the sweetcorn, maize or wheat industries of Australia, but I understand they have caused severe crop losses in each of these species in the USA.' (Allan Peake, Pacific Seeds).

Issue No 39: 'The general knowledge in the world on both (HPV and WSMV) seem limited and pathologists in the USA reinforce the unknown nature and untested control measures for both. I am most concerned about the lack of scientific knowledge in relation to the identification, control, and potential economic impact of HPV. This [HPV] is a very recently identified disease do we know enough about it. First identified in 1993.' (Snowy River Seed).

Issue No 40: 'There has been extremely limited research into its potential spread and possible economic damage. HPV poses a very serious threat to the *Zea mays* industry and the cereals industry. Can AQIS warrant that HPV and WSMV will not have a significant impact on the Australian Cereal, and *Zea mays* industries?' (Snowy River Seed).

> **Biosecurity Australia response:** HPV was first recorded in 1993 on wheat and maize crops in Texas and Idaho and is probably distributed worldwide (Jensen, 1998). However, with the development of new diagnostic tools it is now possible to detect and identify HPV. The seed-borne nature of HPV and extremely low levels of seed to seedling transmission rates have been demonstrated recently (Forster *et al*., 1997; 1998; 2001). WSMV was described on wheat in 1937 in the USA, and first recorded on *Z. mays* in 1957 in Idaho (Finley, 1957). WSMV is only seed-borne in maize (certain cultivars), and seed to seedling transmission depends on the combination of virus and a specific host variety (Hill *et al*., 1974). Seed to seedling transmission (0.1%) has only been reported from plants of line #779 showing symptoms of WSMV (Hill *et al*., 1974). Since then, no research has been conducted on the seed transmission of this virus in maize. HPV and WSMV are vectored by wheat curl mite (WCM), which plays an important role in dissemination of these viruses from infected wheat crops to maize. WSMV is not seed transmissible in wheat. None of the 500 seedlings arising from seeds harvested from infected plants showed virus-like symptoms. Fifteen days after seedling emergence, two of the seedlings showed a certain degree of chlorosis and dwarfing; however, these plants were tested negative in ELISA against WSMV (Sanchez- Sanchez *et al*., 2001). In some cases, the literature mentions that corn is a susceptible host (How, 1963) and in others that it is immune (Lane & Skopp, 1983). Marcon *et al*. (1997a) showed genetic variability in corn regarding resistance to WSMV. The isolate found in Mexico is not mechanically transmitted to maize varieties (Ranchero and Hybrid H-522) tested (Sanchez- Sanchez *et al*., 2001).
>
> HPV intensity and severity fluctuates annually depending upon migrating infected WCM. There is little information on economic losses caused by this virus. However, up to 75% yield losses have been reported on three dent corn hybrids after artificial inoculation in the USA (Jensen & Lane, 1994). Systemic spread of HPV is important in the severity of the disease and potential yield loss in maize (Marcon *et al*., 1997b). WSMV is a minor pathogen of corn, with annual losses of up to 2% in the Great Plains region of the USA (Christian & Willis, 1993). However, local losses of up to

100% in wheat have been reported (McNeil *et al*., 1996). Biosecurity Australia has taken a conservative approach and highlighted the worst-case scenarios (eg. after artificial inoculation, susceptible hosts, and ideal disease development conditions), which may not arise naturally.

Issue No 41: 'We believe these quarantine pests (viral pathogens) present the greatest potential risk to importing Sweet Corn seed from Idaho. High Plains Virus, Maize Dwarf Mosaic Virus and Wheat Streak Mosaic Virus are all present in Idaho and there is no efficient seed treatment or fumigant. The declaration that a shipment is free of any one of these diseases rests solely with absence on field inspections and a 300 plant ELISA test. We suggest that the potential impact of HPV and WSMV on the Australian wheat industry needs to be considered to a much greater extent than has been presented here. What yield losses would be likely and what regions would be potentially affected? We believe this information must be presented and considered before a more informed judgement on whether the risk outweighs the benefit can be made.' (Pacific Seeds).

Biosecurity Australia response: Biosecurity Australia does not dispute that HPV, MDMV and WSMV are present in Idaho. MDMV has been confirmed only from south central Idaho. No MDMV was detected in the sweetcorn seed production area of southwestern Idaho during 1977, 1978 and 1979 in spite of close observation by personnel of the University of Idaho and sweetcorn seed and processing companies (Forster *et al*., 1980). According to ISDA, in the last 15 years MDMV has not been detected in commercial crops in Idaho. Surveys conducted in commercial sweetcorn seed crops by ISDA since 1994 have consistently recorded zero incidence of MDMV. MDMV is seed-borne, transmits at a low level, with only one seed transmission in 22, 1895 seedlings in one study (Mikel *et al*., 1984), one seed transmission in 11, 448 seedlings in another study (Hill *et al*., 1974), and two transmissions in 29, 735 seedlings in a third study (Williams *et al*., 1968). Transmission rates depend on the combination of virus and specific host variety (Hill *et al*., 1974). Seed to seedling transmission has only been reported from plants of line #779 showing symptoms of MDMV (Hill *et al*., 1974). Seed transmission of MDMV is economically unimportant (Williams *et al*., 1968), however, the aphid *Schizaphis graminum* contributes to its incidence and yield reductions (Forster *et al*., 1980). MDMV is important in the USA, where crop loss studies, particularly with artificial inoculation, have reported yield reductions (Gregory & Ayers, 1982). Yield losses of up to 75% or more in severely affected fields have been recorded, especially after late sowing (Forster *et al*., 1980). ELISA testing is an additional safeguard to detect low levels of viral infections in export crops. The regions that could be potentially affected by these quarantine viruses are all cereal production areas in Australia where the vector is present and susceptible cultivars are grown.

Issue No 42: 'Current research and status of seed borne issues; the ability to control this (HPV and WSMV) on the seed is as I understand unknown' or 'limited'. What research has been conducted to either separate out or kill off the seed borne HPV? Are there any registered chemicals known to specifically control HPV on seed? None that I am aware of.' 'To open up Australia to this threat with such limited research seems very risky. There has been no work carried out as to whether it is controllable on the seed.' (Snowy River Seed).

Issue No 43: 'All three are present in Idaho and to our knowledge there is no "fullproof" seed treatment or fumigant.' (SIAA).

> **Biosecurity Australia response:** Seed-borne nature of HPV and WSMV in *Z. mays* has been reported (Forster *et al*., 1997; 1998; 2001; Hill *et al*., 1974). However, WSMV is only seed-borne in maize (certain cultivars), and seed to seedling transmission depends on the combination of virus and specific host variety (Hill *et al*., 1974). WSMV was not detected in Idaho in sweetcorn plant samples tested in 1977 from south central Idaho (Forster *et al*., 1980). Seed treatments or fumigation generally do not control viruses. The plant health status and sweetcorn cultural practices in Idaho, in conjunction with the proposed import conditions, ensure that the seed for export is not infected with these viruses (sec. 8). In Idaho, WSMV is common on wheat and barley but rarely found on sweetcorn, probably because the sweetcorn cultivars being used for seed production are selected for virus resistance (Hill *et al*., 1974). Surveys conducted in commercial sweetcorn seed crops by ISDA since 1995 have recorded low levels (0.007 to 1.6%) of HPV. Recent studies conducted in the USA using hand-harvested ears from plants tested positive in ELISA for HPV demonstrates low level of seed transmissions (Forster *et* al., 2001). Out of 38, 473 seedlings ELISA testing tested three positive. Biosecurity Australia has no intention to relax quarantine conditions but has proposed more stringent quarantine measures, which would provide better protection than some of the current methods of importation of sweetcorn seed.

Issue No 44: 'By the end of 1995, HPV was confirmed in samples of maize and wheat tissues received from over 100 counties in an area extending from the Texas panhandle to eastern Nebraska, to central South Dakota, to western Idaho and back through Colorado to eastern New Mexico and Texas (Jensen *et al*., 1996). The susceptibility depended on the cultivars and in some fields all plants were affected and dent corn yields have been reduced by 25 to 75%. Disease levels ranging from trace to 80% have been quoted. The reappearance of the disease in 1993, 1994, 1995 in some of the same areas confirms that the pathogen is established, widespread and endemic in those areas. Forster (1996) reported that in Idaho, 750 acres of sweetcorn were affected with yield losses exceeding 50% in several fields.'

'The above seems quite different to the statement in the data sheet for High Plains Virus (HPV) is rarely seen in Idaho sweetcorn seed crops. In surveys conducted by ISDA since 1995, the incidence of HPV ranged from 0.007 to 1.6%.' (AGWEST).

> **Biosecurity Australia response:** Biosecurity Australia does not dispute that HPV is present in Idaho, and in one report, caused significant yield losses in some fields. Nevertheless, the ISDA annual surveys of commercial sweetcorn crops covered a much larger area (see data sheet) and indicated a very low incidence of HPV. The incidence of HPV in screening nurseries could be high, as breeders test resistance in their breeding lines against this virus.
>
> Sweetcorn seed for export to Australia will be sourced from fields free of HPV for at least two years, based on field surveillance and ELISA testing (sec, 8.2).

Issue No 45: 'My main concerns are in regard to the new and unknown nature of HPV and WSMV and their potential interaction. In communication with Dr Stanley Jensen, Research

Plant pathologist, University of Nebraska [arguably the most knowledgeable scientist in the world on HPV and author of several of the papers that the IRA quotes from] Dr Jensen states that "…mix in the question of the interaction of HPV and WSMV in the plant and in the vector and the story becomes very complicated. It is still a major concern for wheat growers in the High Plains because there is no identifiable resistance in wheat and well documented losses of whole fields have occurred. The potential for damage to *Zea mays* crops is significant". Jensen goes on to state that "…a corn producer who plants susceptible genotypes of corn downwind of wheat is just asking for trouble. Demonstration plots of susceptible corn have been wiped out to the last plant." This relates to corn planted while winter wheat is maturing, the vector mites migrate from the maturing wheat and onto the corn seedling. This is the pattern of planting all over the MIA, Darling Downs and the Liverpool Plains. As well as many of the key sweetcorn growing areas of the central NSW.'(Snowy River Seed).

> **Biosecurity Australia response:** The interaction between HPV, WSMV and the vector, WCM, is not fully understood, although Mahmood *et al*., (1998) have investigated the impact of mixed infections of these viruses on wheat under field conditions. In the field, it is extremely difficult to visually differentiate between plants infected with WSMV and those with HPV. The degree of loss in the field is mainly dependent on the migratory WCM carrying HPV. Mixed infections of WSMV and HPV are commonly detected in corn and produce symptoms virtually identical to those of corn infected with only HPV (Foster *et al.*, 2001). High disease incidences of HPV were noted in sweetcorn fields adjacent to wheat fields. Disease incidence declined as distance from the wheat increased, which is consistent with observations concerning spread of HPV by WCM from volunteer wheat (Seifers *et al*., 1997). Studies on the epidemiology of this virus in the USA correlate maximum disease occurrence with wheat heading dates (Fritts *et al*., 1999). Corn planted 10 to 20 days before wheat heading escapes severe HPV incidence; therefore, it seems that older corn is either such a poor host of WCM that HPV transmission is negligible or it becomes negligible (Fritts *et al*., 1999). The HPV incidence recorded on early-planted corn may be due to HPV transmission by early-dispersing WCM, or to a percentage of the corn plants in a population being susceptible at any stage (Fritts *et al*., 1999). Corn planted 10 to 30 days after wheat heading probably emerges during the height of WCM dispersal in a given area. This young corn is either a better WCM host or is more susceptible to HPV infection. Late-planted corn probably escapes the main WCM dispersal and, therefore, even though it may be at a susceptible stage, there are probably fewer WCM to transmit the pathogen (Fritts *et al*., 1999).

Issue No 46: 'Does the vector insect required to transfer this disease [WSMV] occur in Australia. There seems to be ambiguity to whether it does or not. We would like AQIS to address the current research that shows the WSMV vector does or doesn't occur in Australia.' (Snowy River Seed).

> **Biosecurity Australia response:** WSMV is vectored by *Aceria tulipae* (Slykhuis, 1955) and *Aceria tosichella* (Seifers *et al*., 1997). Until 1996 *A. tulipae* was reported to be a vector of WSMV, however, later on *A. tosichella* was identified as a vector of WSMV (Seifers *et al*., 1997; Sanchez-Sanchez *et al*., 2001). *Aceria tosichella* is known to occur in Australia (Baker *et al*., 1996; Persley, 1998). *Aceria tulipae* does

not naturally infest wheat and does not transmit WSMV. Although experimentally this species has colonised wheat and transmitted WSMV at low frequency, it does not tend to reproduce abundantly on wheat unlike *A. tosichella,* which is an efficient vector of WSMV and severely infests wheat (Frost & Ridland, 1996). For these reasons, Amrine & Stasny, (1994) proposed to refer to *A. tulipae* when the mite is found on Liliaceae and to *A. tosichella* as the main species on cereals. It is assumed in this IRA that the potential for spread of this virus in Australia is not limited by the absence of a suitable vector.

Issue No 47: 'In point 3.2 para 2: What has changed to indicate that HPV can be identified and contained. Since risk analysis by AQIS in 1993. At which point AQIS did not pursue the issue due to uncertainty over the potential risk of HPV. To my knowledge if anything research has shown that HPV is seed borne, is difficult to identify in the field, is difficult to culture in laboratories and with what is now known poses a significantly higher risk than first thought due mainly to its seed borne nature.' (Snowy River Seed).

Biosecurity Australia response: In 1993, AQIS stopped the IRA, because the seed-borne nature of HPV was unclear. Since then Scientists have published several papers on its seed-borne nature (Forster *et al*., 1998; Brown & Skoglund, 1999); seed to seedling transmission (Forster *et al*., 1997; 1998; 2001); symptoms (Jardine *et al*., 1994; Jensen & Hall, 1995; Jensen *et al*., 1996; Marcon *et al*., 1997; Forster, 1998; Mahmood *et al*., 1998; Forster *et al*., 2001); diagnostic tools for detection and identification (Jardine *et al*., 1994; Jensen & Lane, 1994; Jensen & Hall, 1995; Brown & Skoglund, 1999); and resistance (Marcon *et al*., 1997a,b; Marcon *et al*., 1999). Recent research has shown that HPV is seed-borne and seed-to-seedling transmission rates are very low (Forster *et al*., 1997; 1998; Brown & Skoglund, 1999; Forster *et al*., 2001). Reliable diagnostic tests have been developed, and surveys conducted in commercial sweetcorn seed crops by ISDA since 1995 have consistently recorded a very low incidence of HPV (0.007 – 1.6%). Seed transmission can be a serious problem with some plant viruses e.g. barley stripe mosaic virus where seed transmission is the major mechanism of spread of the virus (Timian, 1974). With other viruses, seed transmission may be rare and a means for the introduction of viruses into new areas where they may further spread and become established if suitable vectors and hosts are available. This mode of virus spread is of great concern in modern agriculture, where it is common for large amounts of seed stock to be moved between regions or continents to take advantage of different growing seasons. Recent studies have described the seed transmission rates of 0.10% and 0.11% (Forster *et al*., 2001). The vector of HPV, WCM is present in Australia (Baker *et al*., 1996; Persley, 1998). Several grain crops, including wheat, barley, oats, rye, and corn, and weeds including yellow foxtail, green foxtail and down brome are hosts of HPV (Seifers *et* al, 1998). Some of these hosts are present in Australia. The protocols contained within the IRA, based on current technology, ensure that sweetcorn seed produced in Idaho for export to Australia is free of this virus.

Issue No 48: 'The disease that worries us most is HPV. It is our understanding that this disease is present in Idaho, but it is not normally a problem in wheat in Idaho because it kills the plant and hence the spread is limited and the Idaho climate is unsuitable for its spread.' (Maize Association of Australia).

> **Biosecurity Australia response:** HPV is present in Idaho. Diseased seedlings are stunted, and die after emergence, indicating that seed to seedling transmission is extremely low and probably unimportant (Forster *et al*., 1997; 1998; 2001). Surveys conducted in commercial sweetcorn seed crops in Idaho by ISDA since 1995 have consistently recorded HPV at incidence levels of 0.007 – 1.6%. Recent studies have described the seed transmission rates of 0.10% and 0.11% (Forster *et al*., 2001).

Issue No 49: 'It is also our understanding that the virus (HPV) is spread by insect vectors, which travel long distances downwind. It would therefore be possible for a sweetcorn plant to become infected fairly late in its growth cycle and the disease may not show up. It seems that the risk, though minimal is unacceptable, because once in production areas the disease could not be controlled. It is our understanding that the disease, once established would be quite devastating to all *Zea mays* crops.' (Maize Association of Australia).

> **Biosecurity Australia response:** Biosecurity Australia agrees that WCM can travel long distances depending on the wind direction and wind velocity. HPV transmission in mature plants, while possible, is negligible because older plants are a poor host of WCM and are generally more resistant to viral infection (Fritts *et al*., 1999). Long distance movement of HPV, is not likely to be accomplished by mite dispersal (Forster *et al*., 2001). Biosecurity Australia has no data to indicate that the climatic conditions in Idaho suppress the expression of symptoms produced by this virus. Management protocols include early planting of sweetcorn crops and buffer strips between wheat and corn crops to minimise vector transmission. The mandatory second inspection and testing will detect any late infection in the crop that could be systemically transferred by seed.

Issue No 50: 'How will HPV & WSMV react in the spread of geographic and climatic ranges of Australia?'(Snowy River Seed).

> **Biosecurity Australia response:** Biosecurity Australia has assumed that the Australian climate is suited to the establishment and spread of HPV and WSMV wherever *Z. mays* is grown and the vector is present.

Issue No 51: 'Whilst SIAA acknowledges that the arid conditions of Idaho may act as a barrier to the introduction of many of the quarantinable pests in Idaho, what is the probability of these pests manifesting in Australia when the seed is grown in our sub-tropical climates eg. Queensland?' (SIAA).

Issue No 52: ' 'As stated on page 6 of the draft, "Idaho is ideal for high health Sweet Corn seed production as the arid conditions prevent the development of many of the Sweet Corn pests found in other parts of USA." 'Is it therefore not possible for diseases to be present at 'sub-clinical' levels, only to manifest themselves when the subsequent seed is sown in tropical north Qld.' (Pacific Seeds).

> **Biosecurity Australia response:** Arid environmental conditions in Idaho do not favour bacterial and fungal diseases. Migratory WCM mainly transmit HPV and symptom expression is not suppressed by environmental conditions. ISDA surveys

has consistently recorded low incidence of HPV in commercial sweetcorn crops since 1995. Introductions of HPV via seed depend upon its seed to seedling transmission rates, which are extremely low. The diseased seedlings are stunted, and died after emergence, indicating that seed to seedling transmission is probably unimportant (Forster *et al*., 1998).

Issue No 53: 'AQIS has quoted Stanley G. Jensen of University of Nebraska in respect to unconfirmed reports of HPV and WSMV in Australia. Was this information balanced against the opinion of his local Australian counterparts (Darren Graetz, SARDI, Adelaide and Professor John Randles of Waite Campus of University of Adelaide)?' (AGWEST).

Biosecurity Australia response: As the records of HPV and WSMV are unconfirmed, Biosecurity Australia has conservatively taken the position that the viruses are not present in Australia and therefore are quarantine pests. Additionally, Biosecurity Australia has consulted Australian experts and they agree with this position.

3.5.2 Virus management options

3.5.2.1 General

Issue No 54: 'We would like AQIS to address research that indicates that the recommended protocols are scientifically sound.' (Snowy River Seed).

Biosecurity Australia response: Biosecurity Australia considers the proposed protocols to be sufficient. The detailed comment in sections 3.5.2.2 to 3.5.2.5 addresses the technical basis for this. It is well documented that HPV is vectored by WCM (Oldfield, 1994; Seifers & Harvey, 1995; Seifers *et al*., 1997) and can be seed-borne (Foster *et al*., 1998; Brown & Skoglund, 1999). Resistant cultivars and resistant genes (resistance is located on two genes) have been identified (Marcon *et al*., 1997a,b; Marcon *et al*., 1999). Integrated management of this virus is, therefore, possible using host plant resistance, volunteer elimination, isolation from small grains (source of virus and vector) and planting date modification (Brown & Skoglund, 1999).

Issue No 55: 'The proposed protocols are insufficient to prevent the rapid introduction of these diseases. On the information presented in the draft IRA, I do not believe that the proposed protocols would adequately ensure that HPV and WSMV would not enter this country. I believe that the importation of live seeds has an extremely high risk of importing these two diseases into Australia, regardless of any inspection procedures prior to export.' (Allan Peake, Pacific Seeds).

Biosecurity Australia response: Biosecurity Australia intends to continue Australia's conservative approach to quarantine in order to safeguard our highly favourable animal and plant health status. As a member of the WTO we are obliged to practice quarantine risk management consistently and in a scientifically justified manner without imposing unnecessary restrictions to trade. Biosecurity Australia cannot adopt a nil risk policy.

3.5.2.2 Cultural practices

Area Freedom

Issue No 56: 'The GCA believes that there can be no guarantee of area freedom from viruses for Idaho produced sweetcorn seed for sowing.' (GCA).

> **Biosecurity Australia response:** The ISDA will certify that the export fields are free of quarantine viruses based on cultural practices, inspection and testing (sec. 8.3).

Issue No 57: 'The crop freedom protocols for HPV, MDMV and WSMV should include the control or removal of volunteer hosts of these viruses within the crop and the 30 metre buffer zone to further reduce the risk of infection.' (DNRE).

> **Biosecurity Australia response:** The assurance that quarantine viruses have not been present in a field for two years prior to planting an export crop is primarily based on inspection and testing of the maize crop. Management of volunteer hosts is an issue the crop manager must consider as a means of reducing the risk of failing inspection/testing.

Issue No 58: 'The final requirement in 8.2 "that APHIS ensure fields were free of viral disease for two years prior" is also untenable. This would delay exports for at least two years, and with fields being rotated constantly would be difficult for APHIS to manage. In addition, given the nature of these diseases, two years does not make sense. These viruses are predominantly vector-borne, hence it doesn't matter whether the field was free of the disease, the vector can fly in from elsewhere.' (Pioneer).

> **Biosecurity Australia response:** ISDA have advised that this arrangement can be complied with. Ongoing surveillance arrangements mean that fields that meet the requirements would be available within a year. This will ensure the diseases are not present within the registered fields. Cultural practices that include early planting and buffers between fields will minimise the chance of introduction via vectors from adjacent fields. Inspection and testing will verify that the measures were effective.

Issue No 59: 'With respect to the preferred option approach. ie. a combination of cultural practices and pest free areas, SIAA would suggest that paddock history should play an important role in determining the status. Is two years paddock history sufficient?' (SIAA).

> **Biosecurity Australia response:** Two years without evidence of the presence of quarantine viruses in an export field is sufficient to establish pest freedom. In addition, inspection and testing of the export crop for the presence of these viruses will reveal the presence of viruses introduced during the season.

Buffer zone

Issue No 60: The GCA does not believe that the recommendation for maintaining isolation of thirty metres from wheat fields is sufficient to protect the Australian grains industry from viruses present in the United States. 'The GCA believes that the potential distance over which viruses could carry is significantly greater than 30 metres.' (GCA).

> **Biosecurity Australia response:** A buffer zone of 30 metres segregates export crops from other *Z. mays* and wheat fields and helps to prevent migration of WCM from maturing wheat crops. The buffer is just one component of several measures to prevent the introduction of the viral diseases into export fields.

Issue No 61: 'With respect to Section 7.3.1, Cultural Practices, AQIS has used terms such as "would be reduced", and "would also be decreased" if the management options for viruses were employed ie. use of resistant sweetcorn hybrids and isolation distances. SIAA contends that this terminology is too subjective and therefore the SIAA would request that the risk be "quantified" in more objective terms.' (SIAA).

> **Biosecurity Australia response:** Biosecurity Australia has no doubt that the measures will significantly and substantially reduce the likelihood of disease establishment in export fields. Quantifying the cumulative effect of these measures is difficult without specific experimental data. Inspection and testing will provide the assurance that the measures are effective.

Resistance issues

Issue No 62: 'As a plant breeder, I am fully aware of the amount of work that is involved in breeding resistance to new disease. It could literally take ten years to breed resistance to the diseases into hybrids, causing unknown levels of crop losses in the sweetcorn industry for a long period of time.' (Allan Peake, Pacific Seeds).

> **Biosecurity Australia response:** The IRA addressed the risk of introduction of HPV and WSMV. The IRA in no way lessens the rigour of measures to prevent the introduction of pests on the basis of a presumed potential for resistant cultivars to reduce the economic impact. Biosecurity Australia does not dispute that conventional breeding procedures take years to develop resistant cultivars. However, modern techniques (transformation etc) have reduced time required to develop resistant lines. As resistance-controlling genes have been identified (Marcon *et* al., 1997a,b; Marcon *et* al., 1999), transformation of these genes into cultivars with desired characteristics could be achieved in a timely manner.

Issue No 63: 'I understand that resistance to these diseases (ie. HPV and WSMV) is available for use in sweetcorn and maize, I also understand that there are no known sources of resistance to these diseases in wheat, making it impossible to develop a genetic resistance to the diseases in wheat varieties.' (Allan Peake, Pacific Seeds).

> **Biosecurity Australia response:** Wheat cultivars with low trichome hair densities harbour fewer WCM and show less WSMV than cultivars with higher trichome densities (Harvey *et al*., 1990). High levels of resistance to WSMV have been identified in *Agropyron elongatum* and *A. intermedium*, and several *Triticum*/*Agropyron* crosses. In field tests, both naturally infected and mechanically inoculated lines carrying the 4Ai2-S translocation were WSMV symptom-free, and grain yields, test weights, and plant height were not reduced by WSMV (Seifers *et al*., 1995). However, for HPV there is no information available on potential resistance in wheat.

Issue No 64: 'In Annexure 1 pp25 It states that varieties used for export are resistant to WSMV. This is simply not correct. Many of the hybrids are either not tested or show susceptibility to WSMV. Refer to Pataky disease screening trials 1998 University of Illinios.' (Snowy River Seed).

> **Biosecurity Australia response:** WSMV is rarely seen in commercial sweetcorn crops and this is considered to be due to the use of resistant cultivars and other cultural measures (ISDA, pers. comm., 1999). The publication referred to by the stakeholder is not relevant to WSMV. The group working at Illinios University only tested sweetcorn lines under field conditions against other diseases of interest including Stewart's wilt, common rust, and Northern and Southern leaf blight. Pataky *et al.* (1998) have not tested these lines against WSMV.

Issue No 65: 'Will all sweetcorn varieties entering Australia under the new system be resistant to WSMV as you indicate and will they have at least 3 years of testing to prove that resistance? Also will the female seed parent be specifically resistant?' (Snowy River Seed).

> **Biosecurity Australia response:** Testing for resistance in all crops, including sweetcorn has standard procedures that are followed by breeders and seed companies. It is not necessary for Biosecurity Australia to ask ISDA for details of breeding procedures or results of breeding programs. It is the importer's decision as to whether resistant or susceptible cultivars are imported. Biosecurity Australia has proposed import conditions, which are sound and more rigorous than the existing ones. Sweetcorn seed, whether resistant or susceptible to WSMV, produced according to these protocols and found free of identified quarantine pests can be imported.

Cross contamination

Issue No 66: 'Possible cross contamination (HPV and WSMV) through detassling [removal of male flower parts] crews moving from crop to crop. Machinery especially harvesting equipment moving from crop to crop. How will this be stopped?' 'Cross contamination (HPV and WSMV) in the grading facility. Currently there is no sanitation of field or processing equipment.' 'Idaho has a very high bird population that in particular feed in corn crops and on the insects in those crops. The main bird pest (similar to Starlings and also include pheasants) eat into the maturing cob to extract kernels and insects. What measures will be taken to stop this potential cross contamination (HPV and WSMV)?' (Snowy River Seed).

> **Biosecurity Australia response:** HPV and WSMV are not transmissible by contact between plants or plant residues, or by birds (Seifers *et al*., 1997). Therefore, there is no chance of cross contamination via crews moving from crop to crop, or harvesting or processing equipment. Export crops found free of these viruses during two visual inspections and ELISA testing will be harvested for export to Australia. These viruses are predominantly vector-borne and vector transmitted. WCM cannot survive more than a day without living host material (Hein, 1998). During processing and grading of sweetcorn seed the likelihood of green host plant material being present would be extremely low, and there is no evidence that WCM can transmit HPV and WSMV to seeds.

Issue No 67: 'SIAA is concerned that possible cross contamination through harvesting equipment, birds, wind, and detassling of male flower parts. How are these concerns being addressed?' (SIAA).

Issue No 68: 'What is the risk of contamination of sweetcorn seed destined for export with one of the viral pathogens from residues or dust from say a previous cereal crop? Could the risk be reduced if the seed cleaning plant was require to process non-cereal crop immediately prior to the export Sweet Corn.' (Pacific Seeds).

> **Biosecurity Australia response:** Export seed must be clean and free of dust and residues. Furthermore, there is no mechanism by which the mite vector, which depends on living green tissue for survival (Hein, 1998), could absorb and transfer viable virus particles from dust or residues. APHIS will inspect packing houses and cleaning equipment prior to commencement of processing seed for export, to determine hygiene conditions and measures for ensuring product identity. HPV and WSMV are only seed-borne in maize (WSMV only in certain cultivars) and not in other cereals. Therefore, risk of contamination from previous cereal crops is extremely low.

Issue No 69: 'The Treasure Valley has a high concentration of seed producers. Without thorough inspection of all crops in the valley how can we be sure that people, machinery or animals have not spread the disease? Although as previously outlined crop inspection seems unlikely to adequately detect the disease.' (Snowy River Seed).

> **Biosecurity Australia response:** There is no evidence that field crew, machinery or animals are involved in dissemination of HPV and WSMV. These viruses are disseminated by WCM, which requires living green tissues for its survival (Hein, 1998). Therefore, the risk of dissemination of these viruses through field crew, machinery or animals is extremely low. The only disease, which could be spread during harvest, is boil smut (*Ustilago zeae*). Seed treatment is mandatory to prevent the introduction of this pathogen (sec. 9.8).

Planting date

Issue No 70: 'AQIS has suggested that the chances of "cross-infection" of export crops with HPV and WSMV "would be decreased" by planting export crops early in the season". SIAA cannot accept this approach as a condition of export as its implementation by farmers is not guaranteed under a voluntary system. How will it be policed?' (SIAA).

Issue No 71: 'In section 8.3 of the Proposed Mandatory Import Requirements there is the statement: 'Export crops should preferably be planted in April/May in order….'. We interpret this as merely an advice or request rather than a mandatory requirement. If AQIS wish to prescribe the planting time to further reduce the risk of viral infection via for example wheat curl mites from an adjacent cereal crop then this should be included as such and not a "preferable" option.' (Pacific Seeds).

> **Biosecurity Australia response:** The early planting of export crops is to further reduce the risk of viral infection from adjacent cereal crops. Biosecurity Australia has consulted experts in the USA and the ISDA on this matter and they have advised that

this general practice is used by the seed-companies in Idaho. Farmers produce seeds under contract for seed companies in Idaho and the early planting condition will be a contractual condition. ISDA will ensure that this requirement has been met. In ‘Field Sanitation and Pest Control Measures’ (sec. 9.3) the phrase ‘Export crops should preferably be planted in April/May…’, has been amended to ‘…must be planted in April/May’.

3.5.2.3 Pre-export inspection

Detection of symptoms in the field

Issue No 72: ‘The concerns are as follows: Idaho is a high dry desert climate, potentially the disease (HPV and WSMV) will be significantly masked in that climate and could be rampant under certain Australian conditions. (Snowy River Seed).

Biosecurity Australia response: Biosecurity Australia has determined that conditions in Idaho are favourable for the expression of symptoms produced by WSMV and HPV (Finley, 1957; Forster *et al*., 1998). Surveys conducted by ISDA since 1995 have consistently reported HPV at an extremely low level in sweetcorn crops. Similarly, WSMV is rarely seen in sweetcorn crops.

Issue No 73: Masking effects due to environment. As already noted the virus (HPV) is often not symptomatic and thus impossible to visually detect. Masking effects due to environment and subsequent ability to identify the problem (WSMV) in the field. (Snowy River Seed).

Biosecurity Australia response: The typical symptom of HPV is inter-veinal chlorotic lesions, which are often more severe on the lower leaves and leaf tips. Symptoms of the disease are very severe in susceptible genotypes, with maize plants being killed within two weeks following infection, depending upon the time of infection and environmental conditions. Rapid systemic spread of the virus results in plant stunting and death (Marcon *et al*., 1997b).

Issue No 74: Single plants can test positive for HPV whilst showing no symptoms (Mahmood *et al*., 1998). We do not believe that physical field crop inspection will be adequate in identifying symptoms (HPV and WSMV). I understand that single plants can show symptoms in the field (WSMV). (Snowy River Seed).

Biosecurity Australia response: Mahmood *et al*., (1998) researched mixed infections of winter wheat with HPV and WSMV, and have presented percentages of wheat plants infected by these viruses individually and in mixed infections. This research highlights the symptomless infection of wheat plants. No research was conducted on mixed infections on *Z. mays*. WSMV is common in wheat crops in Idaho but this virus is very rarely found in commercial sweetcorn crops. Proposed phytosanitary measures do not rely on visual crop inspection but include ELISA testing of randomly selected plants from export crops to detect trace levels of HPV and WSMV.

Issue No 75: We would like AQIS to address the current research that proves HPV can be readily identified by field inspection that HPV is not masked under certain production systems and thus could escape field inspection. (Snowy River Seed).

Issue No 76: 'Seed crops are harvested late in maturity where there is significant leaf tissue necrosis, a late infection (HPV and WSMV) will be very difficult to identify.' (Snowy River Seed).

> **Biosecurity Australia response:** Biosecurity Australia's assessment shows that symptoms produced by HPV on maize and wheat are now well defined (Jensen *et al.*, 1996; Jensen & Hall, 1995; Marcon *et al.*, 1997a,b; Forster, 1998; Mahmood *et al.*, 1998; Marcon *et al.*, 1999) and are not masked by environmental conditions or production systems. Surveys of commercial crops conducted by ISDA since 1995 have continuously detected low level of HPV. Biosecurity Australia will require that export crops are inspected by APHIS-approved inspectors, who are familiar with disease symptoms of the quarantine pests of concern to Australia (sec. 9.4). ELISA testing will reliably reveal the presence of low levels of these viruses.

Issue No 77: 'These concerns are masking effects due to genetic resistance and subsequent ability to identify the problem in the field' (WSMV). Masking effects due to genetic resistance is also quite possible' (HPV). (Snowy River Seed).

> **Biosecurity Australia response:** Biosecurity Australia acknowledges that visual inspection may not detect symptomless infection in plants of resistant cultivars. However, ELISA testing, which is a mandatory requirement, will detect these viruses in resistant cultivars.

Issue No 78: 'Resistant wheat cultivars may be infected by HPV without noticeable damage (Mahmood *et al.*, 1998; Salomon 1998 in AQIS 2000).' (AGWEST).

> **Biosecurity Australia response:** There is no evidence that HPV or WSMV are seed-borne in wheat. Infected WCM transmit these viruses in wheat crops (Mahmood *et al.*, 1998). Symptomless infections in wheat have been reported (Mahmood *et al.*, 1998). However, ELISA testing will detect HPV and WSMV in export sweetcorn crops.

Inspection and sampling

Issue No 79: 'Field inspections (based on their definition of a Pest Free Area) are a logical method to verify absence of the pest. But their proposal for two-field inspections will likely cause logistical problems and sets a bad precedent for grain corn seed. At present, neither APHIS nor the states regularly perform two field inspections. One field inspection occurs approximately two weeks post-flowering. The large acreages involved typically prevent two inspections, even though from a purely scientific standpoint, two inspections are better. (In fact for some pests, a third inspection for ear moulds and stalk rot should be done just prior to harvest.)' (Pioneer).

> **Biosecurity Australia response:** Biosecurity Australia considers that two inspections are essential to detect early and late infections caused by pathogens of quarantine concern to Australia. ISDA has advised Biosecurity Australia that two inspections would be feasible under the climatic conditions in Idaho and sweetcorn export crops are inspected twice under existing systems.

Issue No 80: 'While it may be feasible to inspect 10% of the Idaho sweetcorn seed crop for export this would be unworkable for grain corn seed. We would need to inspect everything twice and that is not possible under the present system since many inbreds and research material would be a candidate for export to Australia.' (Pioneer).

> **Biosecurity Australia response:** The inspection and sampling rates are as large as is practical for the Idaho production systems. ELISA testing is a vital part of the new import conditions to detect viral pathogens of quarantine concern in symptomless plants. The mandatory second inspection will pick up any late infection by pests of quarantine concern and is at a sufficiently late growth stage to eliminate the chance of infection arising after the inspection.

Issue No 81: The sampling protocol may be scientifically/statistically correct, but from a practical standpoint, 300 leaf samples are a lot, especially for a diagnostician to conduct tests on. While it may work for a limited number of fields for sweetcorn seed export, it is too much to expect for export of research, parent or commercial maize seed.' (Pioneer).

> **Biosecurity Australia response:** Based on practicalities and confidence levels, Biosecurity has proposed two visual inspections as well as testing. ISDA has agreed to test lots of 300 leaf samples. This sample size will give a level of confidence of 95% of detecting a crop infection level of 1% or greater.

Issue No 82: 'Inspections at 10% of the export crop and 300 plants at random sample may be considered too small particularly where paddocks are in close proximity to wheat crops. How were these figures arrived at and should they be increased?' (SIAA).

> **Biosecurity Australia response:** Sweetcorn crops must be isolated from other *Z. mays* crops and cereal crops and must have a buffer zone to reduce the risk of migrating WCM. Based on confidence levels, inspection of 10% crops will detect an infection level of 0.001%. Biosecurity Australia considers this is an appropriate inspection regime as sweetcorn crops grown under Idaho climatic conditions and production system express symptoms caused by these viruses. ELISA testing of 300 randomly selected plants is an extra safeguard to detect symptomless infection. This sample size will give a level of confidence of 95% of detecting a crop infection level of 1% or greater.

Issue No 83: 'The draft IRA also outlines recommended requirements for export crop inspection and testing. This includes provision for the conduct of two visual inspections, each of a minimum of ten percent of the export crop, for pests of quarantine concern to Australia. This means that as much as ninety percent of the crop may not be inspected and the GCA considers that this could hold considerable dangers for the Australian grains industry. 'The inspection procedures proposed would allow for a five percent chance of not detecting infected plants. The GCA's view is that this is a way too high level of risk.' (GCA).

> **Biosecurity Australia response:** The proposed inspection regime is consistent with Australia's national and international protocols for seed imports. Current proposals for many other seeds (bean, lucerne, pea) require inspection of 10% of crops. Confidence level limits of 300 plants sample size will give 95% confidence of detecting an infection level of 1% or greater (Canon & Roe, 1982). The ELISA

testing is to detect symptomless infections if they occur and is in addition to visual inspections. Australia does not practice nil tolerance (risk).

Issue No 84: 'Where export seed is sourced from less than 300 plants, the plants would be sampled to provide 95 percent level of confidence of detecting one percent infected. The GCA considers that this is not a sufficient level of confidence, considering the potential damage to the Australian grains industry that could be done by the release in Australia of any of these viruses.' (GCA).

Issue No 85: 'On you're proposed protocol of field inspection in Idaho. How will this overcome the fact that many infected plants do not show symptoms and that by taking 300 random plants for ELISA testing is a very "hit and miss" approach. In an average seed production field in Idaho of say 7 hectares there will be approximately 3 million plants of which you intend to sample 300. This seems very unlikely to provide any surety of discovery at all.' (Snowy River Seed).

Issue No 86: 'Are 300 plants at random sufficient? We would suggest that a much higher sampling intensity would be warranted especially in the boundary rows adjacent to wheat or other host crops of the wheat curl mites. We would also suggest that random audit sampling & ELISA test by AQIS prior to release in Australia is not unreasonable.'(Pacific Seeds).

Issue No 87: 'The suggested random sampling of production fields has a low probability of identifying small number of infected plants, and no chance of identifying plants mildly infected with the two viruses (HPV and WSMV)' (Allan Peake, Pacific Seeds).

Biosecurity Australia response: The sampling protocol of 300 leaves from randomly selected plants from a large export field, if tested free of viral infection, gives 95% confidence that the level of infection in the crop is less than 1% (Canon & Roe, 1982). This is one of the additional measures, such as a two-year history of freedom from the viruses and visual inspections of export crops, that substantially increases the confidence that the export crops are not infected.

Proposed import conditions provide extra safeguards as compared to current import conditions for sweetcorn seed from New Zealand. After seeds have been imported into Australia, random audit sampling and ELISA testing may be undertaken by State Departments in Australia.

Post entry crop field inspection in Australia

Issue No 88: 'If the importation of sweetcorn seed proceeds, it is suggested that at least a selection of sweetcorn crops grown from Idaho seed in Australia are inspected during the growing season to ensure the seed has met all quarantine requirements.' (DNRE).

Biosecurity Australia response: Biosecurity Australia is confident that the mandatory requirements will ensure that imported seed will be virus free and that there is no technical justification for audit inspections of sweetcorn crops grown in Australia from Idaho seed.

Additional/Alternative tests

Issue No 89: 'Based on the information provided in the draft IRA including data sheets, it appears that the IRA proposes measures to minimise the chance of introduction of HPV, MDMV, and WSMV into Australia. However, as these can be seed-borne, there is some chance that infested seeds may be brought in without detection. To increase security consideration should be given to randomly testing imported seeds for viruses using appropriate methods rather than to rely solely on visual inspections.' (AGWEST).

> **Biosecurity Australia response:** The very low level of field infection that could escape detection by the proposed inspection and sampling protocols, together with the low rate of infected seed from infected plants, would result in an exceedingly low proportion of infected seeds. Tests on random samples of imported seeds would be of little value, as the number of seed that would require testing to detect these low levels of infection would be impractical, and because of the very low seed to seedling transmission of HPV (Forster *et al*., 1998) and WSMV (Hill *et al*., 1974).

Issue No 90: 'A better solution would be seed tests for two reasons. Field inspections are not infallible, especially 5 weeks post pollination. Secondly, seed tests do exist for WSMV and MDMV as well as Stewart's Wilt which is our most problematic pest for grain corn seed exports.' (Pioneer).

> **Biosecurity Australia response:** Biosecurity Australia does not dispute the existence of seed tests developed to detect these viruses. However, seed infection levels are extremely low and seed testing would be time consuming, laborious and require large numbers of seed because of the very low seed to seedling transmission of HPV and WSMV. Information on Stewart's wilt caused by *Pantoea stewartii* subsp. *stewartii* (synonym: *Erwinia stewartii*) is included in section 4 of this Annex.

Export field registration

Issue No 91: 'In section 8.2 they expect APHIS will register fields, keep maps etc. Their description of this process would be a duplication of a system, which already exists for OECD certification. I would not expect that APHIS would agree to create a separate system since the existing system provides for seed identification and trace back. In addition, neither APHIS nor individual states have a program for auditing companies to prevent seed mixing or substitution.' (Pioneer).

> **Biosecurity Australia response:** ISDA has assured Biosecurity Australia that seed production fields will be registered by APHIS, that they will keep maps, conduct random audit checks, ensure quarantine viruses are not known to occur in export fields, and that fields are sufficiently isolated with a buffer zone (sec. 9.2).

3.5.2.4 Auditing and compliance

Issue No 92: 'Only Idaho is to be allowed to export into Australia and yet Idaho every year has seed grown across the valley from all over the world from their winter nursery sites that is used for both breeders seed and for commercial production. The likelihood of adequate identification is slim at best. How will the proposed protocols counter this risk?'(Snowy River Seed).

Biosecurity Australia response: Biosecurity Australia is aware that a number of seed companies multiply and screen their germplasm in Idaho. However, APHIS must provide a declaration that seed was produced in accordance with Biosecurity Australia's requirements. Under the mandatory import requirements only Idaho-grown seed can be sown for Australian export crops. In addition, only seed derived from crops that have been inspected and tested and found to be disease-free will be exported to Australia.

Issue No 93: 'We understand winter nurseries and contra season produced parent seed is imported to Idaho from Hawaii, Chile and possibly Argentina. Diseases not well adapted to Idaho may well remain at a low incidence, escape detection and be imported to Australia. Hybrid seed containing one of these diseases would be distributed widely throughout the Sweet Corn growing areas, making containment or eradication of any outbreak impossible.' (Pacific Seeds).

Biosecurity Australia response: *Zea mays* is a regulated seed in the USA, and downy mildews are on the regulated pest list of APHIS. The list is derived from pests identified in Title 7, Code of Federal Regulations, Parts 300-399. The importation of *Z. mays* seed from other countries for propagation in the USA is allowed only after pest risk assessment. Additionally, the Idaho sweetcorn seed industry is aware of the danger of entry of new pests into Idaho. As a major exporter of seed, all segments of the Idaho sweetcorn industry are keenly aware of the consequences of accidental pest introduction. ISDA regularly surveys for sweetcorn pests. WSMV has not been recorded on *Z. mays* in Chile or Argentina (Brunt *et al*., 1996), while only HPV is reported from Chile ((Jensen *et al*., 1998) and MDMV from Argentina (Yossen *et al*., 1983). HPV has been continuously reported by the ISDA since 1995 and the incidence of HPV in commercial sweetcorn crops is very low. The survey results indicate that environmental conditions do not suppress symptom expression for HPV and WSMV. The proposed ELISA testing will detect low levels of infection, which are not visual during crop inspection.

Issue No 94: 'The SIAA is currently unaware of any program in the US, which prevents companies from mixing seed. In addition, we are not aware of any auditing system, which can be used to measure compliance. As such SIAA poses serious questions regarding the validity of this management option to mitigate the risks associated with the importation of Idaho grown sweetcorn seed into Australia.' (SIAA).

Biosecurity Australia response: The integrity of export seed will be assured by the registration and certification of management practices required for production of this seed. It will always be in the best interest of seed companies to adopt the proposed import conditions in order to maintain export markets.

The following assurance has been provided by ISDA:

'The Idaho State Department of Agriculture (ISDA) working cooperatively with the Idaho sweet corn seed companies, the University of Idaho research scientists and the U.S. Department of Agriculture (USDA) would like to assure the Australian Quarantine and Inspection Service (AQIS) and the Australian sweet corn industry that only sweetcorn seeds in compliance with AQIS import requirements will be certified for export to Australia.' (ISDA, pers. comm., 2000).

3.5.2.5 Packing house registration and procedures

Issue No 95: 'The GCA considers that any proposal for random APHIS audits needs to be clarified in greater detail. APHIS would be required to conduct random audit checks but questions how frequently these would occur and whether this would prove to be a satisfactory enforcement mechanism. (GCA).

Biosecurity Australia response: Biosecurity Australia is confident that the random audits undertaken by APHIS will be effective. Biosecurity Australia has stipulated similar conditions for other commodities imported into Australia.

Issue No 96: 'Seed production, harvesting and storage methods in place in Idaho may be effective in eliminating the quarantine pests listed in Table 4. However, it appears that consideration has not been given to transport and storage requirements en-route to shipping ports outside of Idaho predisposing consignments to infestation prior to shipping.' (AGWEST).

Biosecurity Australia response: APHIS will inspect packinghouses during storage. In addition, during transit sweetcorn seed packages must not be opened. A consignment must not be stored, split or have it's packaging changed while in transit between Idaho and the port of export or while in another country *en route* to Australia (sec. 9.9).

Issue No 97: 'It is important that all export sweetcorn seed for Australia is clearly identified and segregated at all stages during harvesting, handling and packing. It is also suggested that APHIS officers inspect the packing shed and cleaning equipment prior to commencement to determine hygiene conditions and product identity. This would be followed by random audits during the export season.' (DNRE).

Biosecurity Australia response: Biosecurity Australia has included these requirements in the mandatory import conditions (sec. 9.5). According to mandatory import conditions sweetcorn seed for export to Australia must be segregated from non-export seed at all times. APHIS officers must inspect the packinghouse and cleaning equipment prior to commencement of processing of export seed to Australia, to determine hygiene conditions and product identity. The manager of the packinghouse must ensure that machinery and storage facilities used for handling export seed are thoroughly cleaned prior to use for processing export seed. APHIS must conduct random audit checks on approved packinghouses to monitor the precautions taken to prevent mixing or substitution of export seed with non-export seed, contamination with weed seeds, and infestation with arthropod pests.

3.6 Weed Issues

3.6.1 Weed risk analysis

Issue No 98: 'AQIS states that: "The weed potential of sweetcorn was assessed by TWG on weeds as a part of the IRA for the importation of bulk maize grain from the United States

(AQIS, 1999). Sweetcorn was found to have no weed potential. Was the weed potential of sweetcorn assessed using the 'Weed Risk Assessment' system? Further, is it a requirement to assess the 25 weed species associated with Idaho sweetcorn seed in line with the WRA system?' (SIAA).

> **Biosecurity Australia response:** *Zea mays* was assessed using the weed risk assessment (WRA) system as part of the IRA for imports of bulk maize from the USA, and the weed risk was found to be exceedingly low (AQIS, 1999).
>
> The AQIS WRA system was developed to determine the quarantine weed status of plant species. Of the 25 weed species associated with Idaho-grown sweetcorn seed, 4 had not been recorded in Australia or previously assessed by AQIS. A WRA was conducted on these species (Weed Technical Working Group, 1999). The remaining weeds are already prohibited by AQIS or are under official control in Australia and thus their weed status is established.

Issue No 99: 'Recently, the SIAA approached AQIS to seek a determination on a quarantinable pest known as *Kochia scoparia* which is listed as a pest associated with Idaho sweetcorn. AQIS stated the following in a letter to the SIAA dated 13 November 1998: "The current range of *Kochia scoparia* around the world would indicate that it has a high degree of adaptability to many situations. Added to this is the fact that herbicide resistance in *Kochia scoparia* has recently been discovered, to a range of herbicides, in the United States of America, highlights the high risk posed, and the difficulty in controlling this weed should it become established in Australia." Further the WRA conducted by AQIS concluded: "the dispersal mechanisms, viability and adaptability of *Kochia scoparia* make it a potential high risk of becoming a weed of agricultural and/or environmental significance in Australia". (SIAA).

> **Biosecurity Australia response:** *Bassia scoparia* is the accepted name for the species previously referred to in the IRA as *Kochia scoparia*. Biosecurity Australia has not understated the weed potential of this or other weed species associated with Idaho grown sweetcorn. Proposed management options including cleaning, pre-export inspection and certification (free of identified quarantinable weeds) and verified by on-arrival inspection would virtually eliminate these weeds from sweetcorn seeds.

Issue No 100: 'Given the above, the SIAA is concerned that AQIS may be understating the weed potential of Idaho and accordingly SIAA seeks comment about whether or not the WRA system should be used to assess the weed risk potential of all 25 weeds identified as quarantinable from Idaho.' (SIAA).

> **Biosecurity Australia response:** The protocols required for Idaho sweetcorn seed have, *inter alia,* been developed to provide a high degree of certainty that Idaho-grown sweetcorn seed entering Australia is not contaminated with any of these weeds. This includes a combination of routine cleaning procedures, APHIS certification of freedom from weed seeds based on visual inspection, and zero tolerance for the weeds in samples of sweet corn taken on arrival.

Issue No 101: 'There are a number of plant species listed in Table 3 under the heading of weeds that are categorised as non-quarantine. This may be correct in terms of their weediness but may not reflect their ability to transmit seed borne pathogens. Seeds in this category are often termed restricted and include *Agropyron* spp., *Digitaria* spp., *Avena* spp., and *Panicum* spp. The IRA should reflect the dual status of such seeds.' (AGWEST).

> **Biosecurity Australia response:** A number of plant species have been classified by AQIS as restricted seeds because of the risk of transmitting pathogens. Restricted seeds, which include the species referred to by AGWEST, have specific tolerances as contaminants of any seed for sowing. As these contaminants are dealt with under existing AQIS policy for any imports of seed for sowing, the IRA does not make specific reference to this issue. All quarantine weed seed contaminants are subject to nil tolerance.

Issue No 102: '*Digitaria ischaemum*, *Mollugo verticillata*, *Rottboellia exallata*, *Solanum sarachoides* are under official control in Western Australia and should be considered as quarantine pests in the IRA'. (AGWEST).

> **Biosecurity Australia response:** *Mollugo verticillata* and *Solanum sarrachoides* are currently on the AQIS permitted list. *Digitaria ischaemum* is a restricted species with a specified tolerance of 125 seeds/kg as a contaminant of permitted seeds. *Rottboellia cochinchinensis* (synonym: *Rottboellia exaltata*) is native to parts of Australia (Hoskins, 2000). These species are absent from WA, have been assessed as weeds in that state and are therefore prohibited entry to WA under State legislation. Biosecurity Australia will examine mechanisms with WA to ensure that species prohibited by WA but permitted under Commonwealth legislation are intercepted at WA State barriers and dealt with appropriately.

3.6.2 Weed management options

Issue No 103: 'The GCA is concerned at the consideration of re-exporting as an option as it considers that this could have the potential to do considerable damage to the high reputation of the Australian grains industry in international markets (as overseas grains industry participants may not differentiate between a weed-infected sweetcorn shipment that comes from Australia and a shipment that has been re-exported from Australia).' (GCA).

> **Biosecurity Australia response:** Re-export is a standard AQIS option for commodities that do not comply with quarantine requirements. As the commodity is not of Australian origin and would not be labelled as such, there can be no reflection on the standard of Australian produced seed.

Issue No 104: 'I see no problem with the weeds provided they can be totally screened out at source and there is effective checking that this has been done on arrival and before distribution.' (John Swarbrick).

> **Biosecurity Australia response:** To reduce the risk of introduction of weed seeds as contaminants, AQIS has stipulated that all consignments must be free from weed species that are of quarantine concern to Australia (sec. 6). Seed production, harvesting and packinghouse cleaning methods in place in Idaho would virtually

eliminate the presence of any weed seeds. This would be verified by pre-export and on-arrival seed inspections (sec. 9.6, 9.12).

3.7 Bulk maize grain imports from the USA and Idaho-grown sweetcorn seed imports

Issue No 105: 'I would like clarification in regard to the fact that AQIS have specifically decided that maize grain will not be allowed to be imported into Australia from Idaho and yet will allow sweetcorn seed to be imported.' (Snowy River Seed).

Biosecurity Australia response: The IRA on bulk maize considers the entire USA as a potential source for bulk maize. The draft outcome of this IRA was that bulk maize should be treated to render the maize and associated contaminants non-viable. This was because of the large number of quarantine pests associated with maize grown in the USA, the difficulty and cost of establishing identity preservation arrangements in the USA and the inherent quality concerns with bulk amounts of low value product.

Idaho sweetcorn seed for sowing is produced under the exacting high quality and health standards required of certified seeds in a state with relatively few pests of quarantine concern to Australia. These production practices, coupled with rigorous field inspection, testing and inspection requirements, and the much smaller trade volume of seed for sowing result in a low risk.

Issue No 106: 'AQIS should make it clear in the final version of the IRA that the IRA does not set a precedent for the consideration of arrangements for the importation of bulk maize from the USA.' (GCA).

Biosecurity Australia response: This IRA does not set a precedent for imports of bulk maize from the USA. Applications to import other forms of *Z. mays* from Idaho would be considered by Biosecurity Australia on a case-by-case basis.

Issue No 107: '…the importation of bulk seed from Idaho for direct planting in production fields is another matter. These crops would not normally be regularly inspected and, even if they were, the disease would be much harder to pick up. Under these circumstances we would submit that seed should only be imported in small quantities by reputable seed companies that can demonstrate their ability to provide adequate quarantine.'(Maize Association of Australia).

Biosecurity Australia response: The field inspections of sweetcorn export crops in Idaho are a mandatory requirement, conducted as specified with inspection of a minimum of 10% of the export field. This IRA does not impose any specific volume restrictions but will require strict enforcement of the phytosanitary measures.

Issue No 108: 'AQIS states that: "Idaho grown sweetcorn seed presents a particularly low risk due to the low prevalence of pests and diseases in Idaho as compared with the major maize grain production areas of the United States. The risk assessment has clearly shown that imports of high health status Idaho grown sweetcorn seed present a far lower risk than imports of bulk maize grown from the United States". (SIAA).

SIAA finds it difficult to comprehend how this conclusion can be reached when the IRA has identified nine arthropod pests, three viruses, one fungus and twenty five weed species of quarantine concern to Australia with imports of sweetcorn seed for sowing from Idaho. (SIAA). On this basis SIAA would request further scientific evidence be furnished by AQIS to substantiate the above statement concerning low risk as it is not presented in the Draft IRA Paper.' (SIAA).

Biosecurity Australia response: Biosecurity Australia's assessment shows that Idaho is a low risk State compared to the rest of the USA. A comparison of the risks associated with sweetcorn seed imports and with bulk maize imports from the USA based on findings of the draft IRAs is presented below.

Quarantine pests	Idaho sweetcorn seed	Bulk maize (USA)
Bacteria	0	2
Fungi	1	5
Nematodes	0	5
Viruses	3	4
Weed	23	78
Total	**27**	**94**

This shows that the potential quarantine risk associated with Idaho-grown sweetcorn seed is lower than that for imports of bulk maize grain imports from the USA. More importantly there are practical and effective management options available for Idaho-grown seed, which are not feasible for bulk maize grain imports from the USA:

- Pest free area and fungicidal treatment will alleviate the risk of introduction of the fungal pathogen;
- Cultural practices, pest free area, filed inspection and testing will alleviate the risk of introduction of viral pathogens;
- Packing house procedures, pre-export seed inspection and certification, and on-arrival inspection will alleviate the risk of introduction of arthropod pests; and
- Pre-export seed cleaning, pre-export inspection and certification, and on-arrival inspection and processing will alleviate the risk of introduction of weed seeds.

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