Chapter 2

Issues: IRA methodology

2.1 This chapter reviews some matters to do with IRA methodology which were raised in evidence:

- what the time horizon for assessment should be;
- how to acknowledge sub-threshold risks on a number of pests;
- use of probability distributions in IRAs; and
- assessment of consequences.

What should the time horizon for assessment be?

2.2 The probability of importing a disease or pest depends on the volume of imports being considered. Since a longer period of time implies a greater volume of imports, the assessed probability will depend on the period of time of interest.[1]

2.3 The draft IRA report chose an assessment period of 12 months, in line with BA's Import Risk Analysis Guidelines. It justified this saying:

> In these Guidelines, a period of 12 months was chosen because it allowed for the estimation of seasonal effects, but did not require long-range predictions regarding trading practices, plant or commodity production factors or pest biology.[2]

2.4 In fact the IRA guidelines contain no clear explanation of this policy. The only references are:

> The *OIE Code* suggests that 1 year be adopted as period of time by which to evaluate the effect of a projected volume of trade….
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> Biosecurity Australia has designated 1 year as to be the standard period for which the effect of trade volume is estimated.[3]

2.5 The referenced OIE Code, at least in its current version, does not appear to make any relevant comment.[4]

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1 If there is a certain probability that an event will occur in any one year, there is greater probability that it will occur at some time in the next 10 years; etc. For example, if there is a 1% probability that an event will occur in any one year, there is about 18% probability that it will occur within 20 years, and about 63% probability that it will occur within 100 years.

2 Revised draft IRA report, p.53.

3 Biosecurity Australia, *Guidelines for Import Risk Analysis*, draft September 2001, p.68 footnote, p.107 footnote.

2.6 Mr Peasley argued that a one year horizon for risk assessment is too short:

> An accepted time frame for planning farm business operations is at least 5 years and I believe the risk should be calculated over this time frame, not one year. This risk would then be 5 times that of one year and include the increased volume of bananas. I don't believe the impact or consequences for the Australian banana industry, and the environment at a local, district, state and national level can be realistically assessed over a 12 month period.[5]

2.7 The ABGC argued that both a one year and a ten year period should be considered, as the ten year period 'provides a clearer indication of the risk of a pest over a reasonable longer term period.'[6]

2.8 The ABGC argued that 'based on the IRA team's own scientific conclusions.. even if the recommended area of low pest prevalence regime is imposed…there is a 99% chance that Moko will enter, establish and spread in Australia within 10 years after the importation of Philippine bananas commencing'.[7]

2.9 Similar concerns arose at a hearing of the Committee's recent inquiry into a pigmeat IRA. BA commented:

> **Ms Harwood**—Essentially, we have to define the appropriate level of protection—ALOP—in a way which allows us to measure against it, and that is that the quarantine risk is reduced to a very low level in a year of imports…
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> **CHAIR**—But if it rises dramatically over a period of years does that say that there is a certain inevitability about us getting this if we keep going?...
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> **Ms Harwood**—It is a statistical fact in that it is a probability multiplied through time. But the fact is that the actual import policies are extremely conservative. They are adjusted through time in the light of emerging information and conditions and developments overseas. It is not a static situation, so it does not make sense to multiply it out into—
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> **CHAIR**—What is your version of the 10-year risk in percentage terms?
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> **Ms Harwood**—As I said, we use a reference point for ALOP of a very low risk of the pest or disease entering Australia within a year or during a year.
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> **CHAIR**—But what is your 10-year prediction?

4 OIE, *Terrestrial Animal Health Code 2003*: see www.oie.int

5 Submission 7, Mr D. Peasley, attachment H2, p.2.

6 Submission 6, ABGC, p.7.

7 Submission 6, ABGC, p.13. The ABGC made similar statements about freckle (97%), mealybugs (97%) and Banana Bract Mosaic Virus (99%).

> **Ms Harwood**—We are not giving a 10-year prediction. The discipline that we are working with is to measure against a declared reference point for ALOP.[8]

2.10 BA commented that it is reviewing the IRA methodology, with implication that this will be one of the matters considered.[9]

Comment

2.11 There seems to be no clear justification for limiting to a one year time horizon in assessing probabilities associated with volume of trade. Reference to 'seasonal effects' justifies a period of *at least* one year. It does not suggest that the period should be limited to *no more than* one year.

2.12 As for the difficulty of 'long-range predictions regarding trading practices, plant or commodity production factors or pest biology' - these predictions may be desirable, but they are not necessary. Amending a one year probability to give a five or ten year probability *based on current information* is a matter of simple mathematics which does not require any further prediction. It only requires acknowledging the possibility of inaccuracy if future probabilities are in fact different from the present ones used for the calculation. In the Committee's view the information is still worth having.

2.13 In the Committee's view limiting assessments to a one year time horizon takes an unduly short term view. Knowing the risk over a 10 or 20 year time frame is obviously a matter of great concern to affected industries.

2.14 This does not involve changing Australia's chosen ALOP. It is simply a matter of giving stakeholders more information. It may happen that 'very low risk over one year' means 'low risk over 10 years' or 'moderate risk over 20 years'. The statements are interchangeable: they would be different ways of describing a single situation.[10]

2.15 **The Committee recommends** that the risk assessment methodology should provide for assessing risk considered over ten years as well as one year.

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8 Ms M. Harwood (Biosecurity Australia), *Committee Hansard* (Import Risk Analysis for Pigmeat), 8 March 2004, p.33.

9 Biosecurity Australia, answers to questions 3 March 2005, enc.2, p.3.

10 For example: a probability of 1/50 is about in the middle of the probability range which the IRA guidelines labels 'very low probability'. A probability of 1/50 over one year is a cumulative probability of about 1/5 over 10 years ('low probability') or about 1/3 over 20 years ('moderate probability'). If the consequences are rated as 'moderate', this would change the assessed risk from 'very low' to 'low' to 'moderate'. See the risk estimation matrix at paragraph 1.12.

Recommendation 1

2.16 The risk assessment methodology should provide for assessing risk considered over ten years as well as one year.

How to acknowledge sub-threshold risks on a number of pests

2.17 Mr Peasley argued that the IRA methodology does not adequately acknowledge a situation where there might be just-below-threshold risk on a large number of pests. Intuitively, this creates a greater overall risk than just-below-threshold risk on one pest; but the methodology cannot reflect this.

> I do not believe the issue of multiple pests risk has been addressed adequately. I realise the risks of each pest are independent events, however, my intuition says that when there are more than one pest just outside Australia's ALOP that the overall risk is greater. The risk estimation matrix allows for a one pest assessment.[11]

2.18 In this Committee's inquiry into an IRA for New Zealand apples, Apple and Pear Australia Ltd pointed out that some countries have risk assessment methodologies that allow for this:

> The USA for example, uses a system of allocating points for each risk point (see Attachment 3). This means that risk factors accumulate from one issue to the next until a final score is achieved. This is an interesting contrast from the BA multiplication model that can allow high risks to be substantially discounted by low risks.[12]

2.19 BA commented that it is reviewing the IRA methodology, with implication that this will be one of the matters considered.[13]

Comment

2.20 It is certainly true that if events are independent (for example, 'entry, establishment and spread of moko'; 'entry, establishment and spread of freckle' etc), the more possible events are in question, the greater is the probability that at least one of them will happen.

2.21 The Committee agrees with Mr Peasley. There is no reason in logic why risk assessments should not allow for this. The event of concern to Australia is not 'entry, establishment and spread of moko…freckle… mealybugs….etc', each considered in isolation. The event of concern is rather 'entry, establishment and spread of at least one of the above.' The probability of that is the sum of the component probabilities.

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11 Submission 7, Mr D. Peasley, attachment H2, p.2

12 Senate RRAT Legislation Committee, inquiry into import risk assessment of New Zealand Apples, submission 1, Apple & Pear Australia Ltd, p.11.

13 Biosecurity Australia, answers to questions 3 March 2005, enc.2, p.3.

2.22 In the Committee's view Australia should be able to reserve the right to say, 'In respect of an import proposal, there are so many pests of concern that the cumulative risk is regarded as unacceptable.'

2.23 **The Committee recommends** that BA should investigate changing the risk assessment methodology to allow for the fact that the total risk is greater, the more pests there are of concern.

Recommendation 2

2.24 BA should investigate changing the risk assessment methodology to allow for the fact that the total risk is greater, the more pests there are of concern.

Use of probability distributions

2.25 There was some discussion in evidence about the use of probability distributions in risk assessment. There was debate over whether risk assessments should 'report the 95th percentile' or the 50th percentile.

General explanation of probability distributions

2.26 An unwanted event (for example, 'the pest enters, establishes and spreads') will often be the result of a number of preceding steps each of which has its own probability ('the pest is in the harvested fruit… the pest survives transport and storage' etc.). The probabilities of the component events are multiplied together to give the probability of the outcome event.

2.27 Making a probability distribution is a way of estimating the probability of the final outcome when the probability of each step is not known exactly, but is thought to lie within a certain range.

2.28 For each step a probability is chosen randomly within whatever range is regarded as reasonable. These numbers are multiplied together to give a notional total probability (probability that all the steps will happen). This is repeated 1000-2000 times, the result being different each time because the input numbers are different each time. The results are spread over a range from the smallest possible total probability (from multiplying the smallest values of the component probabilities) to the largest total probability (from multiplying the largest values of the component probabilities).[14]

2.29 According to the IRA guidelines, 'This distribution should be interpreted by 'fitting' it to the most appropriate semi-quantitative category. The approach to fitting that has been adopted by Biosecurity Australia is to compare the fifth, 50th (or

14 Biosecurity Australia, *Guidelines for Import Risk Analysis*, draft September 2001, p.43-4.

median) and 95th percentiles of the output distribution with the probability intervals [shown in Figure 1 in chapter 1 of this report].'[15]

2.30 The guidelines do not explain very clearly what 'compare' means and how conclusions are to be reached and by what rules. At one point the suggestion seems to be that the probability distribution should be labelled as 'very low…low…' etc according to which label covers the probability where the median value (the 50th percentile) falls, on the basis that more than half the results fall within this range.[16] At another point the instruction is: 'The distribution should be 'fitted' visually and by virtue of the distribution statistics to the most appropriate semi-quantitative interval.'[17]

2.31 The 50th percentile will always show a lower probability than the 95th. This may or may not affect the assessed risk. It depends on the details of whether reporting the 50th instead of the 95th puts the probability in a different probability category, and whether 'combining' this with the consequences according to the risk estimation matrix changes the risk category.

Use of probability distributions in the banana IRA

2.32 The IRA applied the guidelines on use of probability distributions as follows.

2.33 The first draft IRA report (June 2002) said that it 'reported the 95th percentile'. It explained this as:

> Distributions obtained from simulations of this model were fitted retrospectively to the most appropriate probability range. Where the distribution spans more than a single range, a conservative (95th) percentile was used to determine that which should be reported.[18]

2.34 The revised draft (February 2004) used the 50th percentile:

> Distributions obtained from simulations of this model were fitted retrospectively to the most appropriate probability range using the median value (or 50th percentile). The 50th percentile was chosen as it provides the most robust measure of central tendency for skewed (unsymmetrical) distributions.[19]

2.35 The ABGC argued that this change was made without adequate explanation, and is effectively more risk tolerant. The ABGC noted that the 50th percentile was

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15 Biosecurity Australia, *Guidelines for Import Risk Analysis*, draft September 2001, p.44.

16 This assumes that only one boundary between probability categories falls within the range shown by the distribution.

17 Biosecurity Australia, *Guidelines for Import Risk Analysis*, draft September 2001, p.44.

18 Biosecurity Australia, *Importation of Fresh Bananas from the Philippines - Draft IRA Report*, June 2002, p.58.

19 Biosecurity Australia, *Importation of Fresh Bananas from the Philippines - revised Draft IRA Report*, February 2004, p.52.

also used in recent reports on pigmeat and New Zealand apples, and was concerned that this was a systemic change.[20]

2.36 At hearings on pigmeat on 8 March 2004, and the following Budget Estimates hearing on 24 May, BA argued that if the biological assumptions involved are already very conservative, adding an extra level of conservatism by reporting the 95th percentile 'would give an unrealistic projection outside the bounds of biological reality':

> **Dr Banks**—I think that once we started to use these guidelines in a series of actual import risk analyses, we realised that it was more appropriate in each case to use the 50th rather than the 95th….
>
> **Ms Harwood**—In situations where all the inputs to the model are judged on a very conservative basis, if all the steps in the import pathway as you are inserting the judgment of likelihood and the entry into the probabilistic model are already very conservative, as in the case of those IRAs, it is more appropriate to use the 50th percentile as a genuine reflection of risk than to use the 95th, which would give an unrealistic projection outside the bounds of biological reality….
>
> **Senator BOSWELL**—...Who made the decision to go from 95 to 50?
>
> **Ms Harwood**—… it was the panel working together that chose to use the 50th.[21]

2.37 BA later advised that both the June 2002 draft and the February 2004 draft did in fact report the 50th percentile. The reference to the 95th percentile in the June 2002 draft was a mistake which arose from carrying over text from a previous version. BA noted that '…this and other aspects of Biosecurity Australia's methodology are under constant review and evaluation, and minor changes are often necessary to reflect ongoing best-practice in simulation and other aspects of risk analysis.'[22]

Comment

2.38 The Committee notes the concerns of stakeholders that the procedure recommended in the IRA guidelines (to report the 95th percentile) seems to have been changed as a matter of policy without adequate explanation. It is unclear to the Committee whether this is indeed a change of policy, or whether the choice is left to the discretion of individual IRA panels and might depend on the circumstances of the case.

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20 Submission 6, Australian Banana Growers Council, p.7.

21 Senate RRAT Legislation Committee, Budget Estimates, *Committee Hansard* 28 May 2004, p.99-100. Similarly RRAT Legislation Committee, inquiry into IRA for pigmeat, *Committee Hansard* 8 March 2004, p.30.

22 Biosecurity Australia, correspondence 1 February 2005, answers to questions, no. 30.

2.39 **The Committee recommends** that the IRA guidelines should state a clearer policy on use of probability distributions, and should explain it better to allay the concerns of stakeholders.

Recommendation 3

2.40 The IRA guidelines should state a clearer policy on use of probability distributions, and should explain it better to allay the concerns of stakeholders.

Concerns about assessment of consequences

2.41 As described in chapter 1, the risk assessment methodology involves 'combining' an estimate of the probability of an unwanted event with an estimate of the seriousness of the consequences if it occurs. According to the IRA guidelines each type of consequence is estimated at the local, district, regional and national level, on a scale of highly significant/ significant/ minor/ unlikely to be discernible. The results for the various types of consequences are combined using rules in the guidelines to give an overall rating for consequences on a scale of extreme/ high/ moderate/ low/ very low/ negligible.[23]

2.42 The Australian Banana Growers Council had concerns that this procedure is not sufficiently rigorous:

> The calculation of risk requires, first of all, that we know the annual likelihood of outbreak, establishment and spread and, second, that we know the consequences. We have a unit of measure for the likelihood: it is expressed as a probability… The problem with consequence is that it is just a term. We do not have a scale for that. So when we multiply those two together it is not possible to use the same terms or the same scale… The correct way to look at risk is expected loss.[24]

2.43 In a submission to this Committee's inquiry into an IRA on New Zealand apples, Apple and Pear Australia Ltd had similar concerns:

> The ISPM draft Pest Risk Analysis for Quarantine Pests (IPPC, September 1999) recommends that in assessing economic consequences 'wherever appropriate, quantitative data that will provide monetary values should be obtained.' It appears that no attempt has been made by Biosecurity Australia to quantify the economic consequences. Where these are likely to be profound it is inappropriate to use a qualitative scale. The estimation of consequences without an underlying and clearly understood monetary basis to confirm its rigour misleads the overall analysis.[25]

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23 Biosecurity Australia, *Guidelines for Import Risk Analysis*, draft September 2001, p.104ff.

24 Mr D. Pullar (ABGC), *Committee Hansard* 13 April 2004, p.19.

25 Senate RRAT Legislation Committee, inquiry into import risk assessment of New Zealand Apples, submission 1, Apple & Pear Australia Ltd, p.10.

2.44 The Queensland Department of Primary Industries and Fisheries was concerned about the possible effects of import on banana-reliant economies in North Queensland:

> It is likely that these shires would experience considerable difficulties if adjustment as a result of the loss of the banana industry were to occur.

2.45 The Department 'strongly advocates that the Commonwealth Government must address the socio-economic impact of changing import restrictions…'

> While it is acknowledged that it is important not to limit trade, the DPI&F believes that the Commonwealth must ensure that any inequitable burden placed on local communities dependent on the commodity in question is properly addressed.[26]

2.46 BA commented that it is reviewing the IRA methodology, with implication that assessment of consequences will be one of the matters considered.[27]

Comment

2.47 The Committee is sympathetic to the industry's concerns about assessment of consequences. The Committee accepts the point made in the IRA guidelines that some consequences (such as change in social amenity) are harder to measure than others (such as change in commercial production).[28] However it appears that even where consequences should be measurable, the IRA has made no particular effort to do so. For example, the impact of Moko on production is discussed qualitatively in some detail.[29] In the Committee's view it should not be impossible to put some figures on this, taking into account points such as those made by Mr Peasley about the difficulty of controlling Moko in North Queensland's highly mechanised farms (see paragraph 3.20).

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26 Submission 14, Queensland Department of Primary Industries and Fisheries, p.5.

27 Biosecurity Australia, answers to questions 3 March 2005, enc.2, p.3.

28 Biosecurity Australia, *Guidelines for Import Risk Analysis*, draft September 2001, p.105.

29 Biosecurity Australia, *Importation of Fresh Bananas from the Philippines - revised Draft IRA Report*, February 2004, p.152.