DECISION RESEARCH

Improving Quarantine Risk Communication

Understanding Public Risk Perceptions

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About Decision Research

Founded in 1976, Decision Research is an independent, nonprofit research corporation that specializes in helping individuals, industry, government, and society understand how people make the complex and often risky judgments and decisions of modern life. The organization's research is based on the premise that risk management must be guided by an understanding of how people think about risk and how they value the potential outcomes, good and bad, of their decisions. Led by Dr Paul Slovic (President), a broad range of basic and applied research skills has been used successfully by researchers at Decision Research, bringing widespread recognition that the organization is a world leader in its field.

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Executive Summary

Problem

Maintaining the health and wealth of Australia depends vitally on protecting the nation's environmental and cultural treasures while capitalizing on the opportunities presented by new technologies and products. Achieving a balance between protection and progression, however, is influenced considerably by prevailing perceptions of the risks associated with imported commodities. A persistent community view is that a "no risk" quarantine policy is a viable option. In contrast, import risk analysts view the expectation of a "no risk" policy as untenable, given that Australia is a major agricultural trading nation and has international obligations as a member of the World Trade Organization and a signatory to the Agreement on the Application of Sanitary and Phytosanitary Measures and the Agreement on Technical Barriers to Trade.

Biosecurity Australia, a group within the Commonwealth Department of Agriculture, Fisheries, and Forestry Australia (AFFA), recognizes that public consultation and communication must be an essential part of the import risk analysis process if the community is to share the ownership and responsibility of effective quarantine policies. However, efforts to improve public participation so far have paid little attention to understanding what determines public perceptions of import risks and what methods will effectively engage the public in meaningful dialogue about their expectations and responsibilities.

Approach

A review of research from the fields of risk perception and human judgment and decision making was conducted to highlight important determinants of import risk conflicts and their implications for public communication and consultation. In particular, the nature of risk was examined, focusing on how dread and unknown risk dimensions, affect, and imagery impact people's perceptions and acceptance of risk. The roles of culture, worldviews, and trust were also examined.

Findings

In short, the review suggests that dimensions of risks, features of human judgment and decision processes, and fundamental values reflect in risk perceptions and the levels of risk people are willing to accept. Balancing the risks and benefits of imports for all stakeholders means that Australia's import risk analysis process needs to be sensitive to the socially constructed nature of risk. The main implication for communication and consultation is that efforts need to be tailored to specific target groups and for specific import risks. Communities in rural Australia present unique risk contexts, but the extant knowledge base about the determinants of risk perceptions in

outlying areas is poor. Placing import risks in perspective for stakeholders is difficult, but can be facilitated by considering the cultural and socio-psychological factors that influence the way information is interpreted. Public involvement in risk decision making is a challenging process, yet essential to the relevance and effectiveness of quarantine policies and programs.

Recommendations

The success of Biosecurity Australia's public communication and consultation rests on achieving significant attitudinal and behavioural change, both in the delivery of import risk analyses and in the communities to which that service is provided. It is recommended that Biosecurity Australia take responsibility for initiating and maintaining the required cultural change via the following steps which are designed to improve public participation in import risk analyses:

1. Establish a knowledge base from the extant literature about what makes Citizen Advisory Panels effective.
2. Develop a training package of real-life examples of import risk analyses in Australia.
3. Develop and test pilot Citizen Advisory Panels as a method for ongoing interaction between Biosecurity Australia staff and the public.
4. Develop and test methods for training Biosecurity Australia staff in effective approaches to stakeholder interactions.
5. Close the gaps in basic knowledge of rural Australian reactions to import risks.
6. Develop methods for ongoing links between import risk assessments and social science.
7. Examine the potential for a regional approach to public involvement programs.

In short, tailoring and improving the knowledge and methods already available from the fields of risk perception and decision research will be an invaluable step forward for both Biosecurity Australia and the broader community.

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1 Introduction

1.1 Background

One area of Australian quarantine policy under the spotlight recently has been the import risk analysis process. Biosecurity Australia (formerly part of the Australian Quarantine and Inspection Service - AQIS) recognizes that frequent consultation and communication with stakeholders needs to be an essential part of the process of developing and reviewing effective quarantine policies.

The expectation of a "no risk" quarantine policy needs correcting.

One motivator of the recent emphasis on public participation is the persistent community view that a "no risk" quarantine policy is a viable option (Senate, 1996). The Australian Quarantine Review (hereafter call the "Nairn Review") found that the public, industry, and governments do not agree on the objectives of quarantine, the roles of each stakeholder, and what is realistically achievable by Biosecurity Australia. The review concluded that "the continued perception in some quarters that there ever has been or ever can be a "no risk" quarantine policy for any country - let alone a major agricultural trading nation such as Australia - reflects a fundamental misconception that needs to be corrected in an ongoing awareness campaign" (Nairn, Allen, Inglis, & Tanner, 1996, p. 83).

The Nairn Review argued that the import risk analysis process should provide greater consultation and ownership, while continuing to meet Australia's international obligations as a member of the World Trade Organization (WTO) and a signatory to the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Agreement on Technical Barriers to Trade (TBT Agreement). Emphasis was given to *early consultation* with key stakeholders and a *partnership approach* to import risk analysis involving governments, industry, and the public. These priorities were based on the rationale that the development and the delivery of quarantine policies and programs should reflect a consensus about how best to protect the natural environment in a way that meets the long-term interests and expectations of all Australians.

Improving awareness was a central theme throughout the Nairn Review. A strong quarantine education campaign was recommended, focusing on the general public (especially school children, ethnic groups, and immigrants), industry (especially the trade and travel sectors), government officials (especially quarantine officials), and the international community (especially travelers and exporters to Australia). The review recommended that a professional public relations agency develop the campaign, using the appropriate medium and language, reflecting the appropriate cultural nuances, and reflecting and reinforcing community values towards quarantine.

The Nairn review also recommended that the framework of risk analysis (including risk assessment, risk management, and risk communication) continue to be used and refined for the development of quarantine policies and

Import risk analysis needs improved consultation and communication.

procedures. Suggestions for refinement focused on the duration, timing, and amount of consultation and communication and the provision of an appeal mechanism. A public handbook was recommended (and published by AQIS, 1998) to improve community and stakeholder understanding of the risk analysis process. The review also recommended expanding existing consultative arrangements to improve consultation with major clients and State governments. The role of indigenous people and remote local communities was emphasized but no specific mechanisms for consultation or communication with them were outlined.

1.2 Problem Statement and Approach

In short, the expectation of a "no risk" quarantine policy is viewed as untenable and blamed at least in part on fault lines in the science/policy/public interface. Recommended remedies to date focus on increasing the frequency and reach of consultation and communication with stakeholders when developing and reviewing quarantine policies and programs related to animal and plant importation. However, these remedies are likely to yield disappointing results if there is no advanced effort to better understand what determines public perceptions of import risks and what methods will engage the public in meaningful dialogue about their expectations and responsibilities. Simply amplifying existing outreach efforts will not lead to a sustained change in the quarantine culture in Australia because the fundamental socio-psychological mechanisms underlying the science/policy/public fault lines are not well understood at this stage.

A comprehensive understanding of what the expectation of a "no risk" quarantine policy means is essential before trying to "correct" it. A demand for zero risk may be a demand for action, a way of making the point that the risk is too high, a sincere but ill-informed request, a politically-motivated positioning, or a reflection of genuine distress stemming from outrage, fear, distrust, or profound value differences (Covello, Sandman, & Slovic, 1991).

Ultimately, any efforts to involve diverse stakeholders in developing policy and implementing quarantine programs must be based on a thorough understanding of why people are unwilling to tolerate some risks and unmotivated to prevent other risks associated with importing animals and plants. So far, there has been no systematic search for information about factors underlying public perceptions of import risks. Furthermore, there has been no examination of methods that can be used to reliably and validly assess and incorporate the technical and non-technical dimensions of risk important to the range of stakeholders in quarantine decision making.

What concerns do stakeholders have?

Why do risk perceptions differ across people?

How can we communicate better about risk?

What concerns do stakeholders have about import risks? Why do different people perceive risk differently? How can scientists and stakeholders communicate effectively about import risks? This report addresses these questions by drawing on literature from the fields of risk perception and human

judgment and decision making.[1] Based on the premise that Biosecurity Australia will enhance consultation and communication with stakeholders through a better understanding of how the Australian public forms and holds its perceptions of risk, the present report examines current knowledge on how stakeholders may vary in the way they perceive, explain, and prioritise import risks. Gaps in the knowledge base are identified, particularly as applied to the Australian rural community. And finally, suggestions for further work are outlined.

The literatures on human judgment, decision making, and risk perception are vast in general, but piecemeal with respect to import risks. The approach taken below is to synthesize the main findings in a way that is generally relevant to issues of public participation in developing and implementing import risk policies and programs, in particular highlighting the implications for risk communication in the Australian context. New technologies and activities often present the most complex challenges for import risk analysts and policy makers, so special emphasis is given to the emerging issue of the importation of genetically modified organisms (GMOs) as an illustrative case example.

1.3 Significance

The stakes in the import risk game are high. Australia's multiculturalism and biodiversity are national treasures and their protection is of fundamental importance for the health and wealth of the nation. Yet Australia's economy depends vitally on its viability as an importer and exporter. To provide both protection and involvement in the increasingly global economy, it is important for quarantine policymakers to know what public opinion is, but also on what it is based (cf., U.S. Congress, 1987). Without a framework more responsive to the values and tensions underlying people's attitudes toward import risks, conflict will escalate to the point where the public vote with their feet and environmental activities become increasingly militant (Bruce & Eldridge, 2000) and efforts to improve import risk analysis will be stymied.

Understanding the basis of public risk perceptions will improve communication and consultation.

Effective and responsible consultation and communication can be achieved from a better understanding of the basis of public perceptions of import risk. Systematically assessing public perceptions will help quarantine officials predict community responses to potential imports and communicate about import risks effectively. Identifying the factors underlying differences in risk perceptions will help quarantine officials to identify ways of preventing conflict and facilitating community members sharing the responsibility of quarantine matters. A sense of partnership and trust can be built by identifying dimensions of community values (and methods to assess these values) that need to be discussed and incorporated into import risk analyses. Finally, determining what drives perceptions will suggest how compliance with quarantine procedures can be improved to keep Australia relatively free of many of the debilitating diseases and pests found in other countries.

[1] See Appendix 1 for a summary of the methods used to locate relevant literature.

While increasing education programs, expanding consultation and communication processes, and improving technical analyses are all essential for informed and accountable risk decisions, trying to address risk controversies primarily with more frequent attempts to involve stakeholders or with more science that fails to reflect the context-dependent nature of risk is likely to exacerbate conflict (Slovic & Gregory, 1999). Public reactions to risks are a complex mix of socio-cultural, psychological, economic, and political issues; these factors must be understood thoroughly if any sustainable progress is to be made in changing the quarantine culture in Australia.

2 Foundations for Effective Risk Communication and Consultation

Both hard-learned experience and considerable research suggest that approaching risk analysis without the involvement of the public is a doomed enterprise. First, risk decisions are much more likely to be implemented successfully if they have broad public support (National Research Council, 1996). Second, the wisdom relevant to risk management is not confined to scientific specialists. Moreover, from a normative viewpoint, government should obtain the consent of the governed, who therefore have a right to participate in decision processes (Fiorino, 1990).

If community, industry, and government stakeholders are to agree upon an acceptable level of import risk for specific products or technologies, effective and responsible communication and consultation are essential. One assumption in this report is that discussing risk, when done well, is better than withholding information. However, there are no easy prescriptions for communicating about risk.

Risk communications fail when exactly what drives public risk perceptions is poorly understood.

Despite the existence of several general guidelines for communicating risk information in both the public and private sectors (e.g., Covello & Allen, 1988; Covello, von Winterfeldt, & Slovic, 1987; Hance, Chess, & Sandman, 1988; Krimsky & Plough, 1988) the underlying principles are consistently violated. Typically, the guidelines revolve around the principles shown in Table 1. The reasons they are violated (see Covello et al., 1991) are linked by one common theme: Technical risk analysts and policymakers do not understand exactly what is driving public perceptions of risk.

"Risk communication" should *not* be taken to mean (either in government or industry) "spin-doctoring" designed to calm public fears. Rather, it means taking seriously ongoing public dialogue about the nature and implications of risky products and technologies. The cavalier dismissal of deep-rooted, but perhaps poorly-articulated public concerns about risks or the use of science in policy debate as a trump card that declares something safe and therefore requires no further discussion (Leiss, in press) are methods that fail to produce effective communication and consultation with interested, affected publics in the long run.

Consultation and communication about risk can occur in many forms, including (but not limited to) the use of brochures to distribute information, mail or telephone surveys to collect information, and public meetings to discuss and formulate action plans. Fundamental to *any* risk communication and/or consultation approach is a broad-based understanding of how different client groups perceive, explain, and prioritize import risks. An important task for import risk analysts seeking ongoing public support and a sustained shift in quarantine culture is to thoroughly understand what factors contribute to stakeholders' lingering concerns.

As a first step toward improving Biosecurity Australia's public consultation and communication the remainder of this report examines some of the characteristics of risks and qualities of people that have been identified by researchers as important determinants of perceived risk and levels of risk tolerance.

Table 1. Risk Communication Principles and Reasons They Are Violated

Principle	Reason for violation
Accept and involve the public as a legitimate partner	Policy makers are unclear what factors, other than the probability or magnitude of the risk, affect public perceptions of risk and its acceptability
Plan carefully and evaluate performance	Different groups in the relevant audience have not been identified and so messages cannot be tailored and then evaluated appropriately
Listen to the audience	Communicators assume they know what people know, think, or want done about risks
Be honest, frank, and open	Experts do not appreciate that acknowledging the subjectivity in science is fundamental to building trust
Meet the needs of the media	The political and social context of a risk is deemed a nuisance rather than a central determinant of risk acceptance
Speak clearly and with compassion	Using jargon is an automatic shorthand and creates greater polarization between the technical analyses and the emotions people experience (and rely on) in reaction to risks

3 The Nature of Risk

3.1 Dimensions of Risk

The unknown and dread risk dimensions have been replicated both within and across diverse hazard domains by many researchers in several countries (e.g., Karpowicz-Lazreg & Mullet, 1993; Teigen, Brun, & Slovic, 1988). Thus, the qualitative characteristics of risk can be considered reliable determinants of risk perceptions and risk-related behavior. The reliability of the dimensions permits us to predict the types of products lay people are likely to perceive as the most risky imports.

Traditional approaches to reducing the conflict between experts and lay people have involved frequent calls for better technical analysis and expert oversight via small, centralized groups charged with creating uniformity and rationality in highly technical areas of risk management. Proponents of this approach argue that an expert group is needed to ensure that regulations are based on "sound science" and effectively reduce significant risks at reasonable costs.

The "sound science" approach reflects the traditionally narrow view of risk, which customarily defines risk as "the chance of injury, damage, or loss" (Webster, 1983). From this perspective, the probability of an adverse event and the magnitude of its consequences are assumed to come from physical and natural processes in ways that can be objectively quantified by risk assessment. Often technical risk analysts see risk as synonymous with expected mortality (e.g., Cohen, 1985). Derived from an engineering perspective that has largely been the basis of risk assessment techniques, this approach ignores the role of social processes in the perception of risk.

Risk is a social construct, meaning different things to different people.

Recently social scientists have rejected the notion of "real" or "objective" risk and argued instead that risk is inherently subjective (Krimsky & Golding, 1992; Slovic, 1992). That is, risk cannot be measured "out there," independent of our minds and cultures. Rather, risk is a social construct, meaning different things to different people (Slovic & Gregory, 1999). Several decades of psychometric research (see Slovic, 1987) have shown that public conceptions of risk are qualitative and complex, incorporating considerations such as *dread risk* (the extent of perceived lack of control, feelings of dread, and perceived catastrophic potential) and *unknown risk* (the extent to which a hazard is judged as unobservable, unknown, new, or delayed in producing harmful impacts).

The characterization of hazards on dread and unknown risk dimensions is shown in Figure 1. In the bottom, left portion of the figure are activities and technologies that are known and not dreaded or catastrophic, such as bicycles and alcohol. In contrast, pesticides, DNA technology, and radioactive waste stand out, as both unknown and dreaded (see upper-right quadrant of Figure 1). Handguns are seen almost as dreaded, catastrophic, and potentially fatal as DNA technology, but are viewed as better known, more familiar, and having immediate, rather than delayed effects. In the upper-left quadrant (unknown,

Figure 1. Factors affecting perception of risk *

low dread), there are medical technologies – antibiotics, contraceptives, and x-rays.

High unknown and dread risk dimensions lead to high risk perceptions.

Several insights are gleaned from this picture. For example, the location of an activity in the two-dimensional space can be related to the perception of its risk, attitudes toward regulation, media response, and several other types of social phenomena (Slovic, 1992). For instance, there is a very high correlation (greater than .80) between the dread risk factor and the perception of risk or desire for strict regulation. Going from left to right in the space, the perception of risk increases and the desire for regulation increases.

The unknown and dread risk dimensions have been replicated both within and across diverse hazard domains by many researchers in several countries (e.g., Karpowicz-Lazreg & Mullet, 1993; Teigen, Brun, & Slovic, 1988). Thus, the qualitative characteristics of risk can be considered reliable determinants of risk perceptions and risk-related behavior. The reliability of the dimensions

permits us to predict the types of products lay people are likely to perceive as the most risky imports.

3.1.1 Example Import Risks

Consistent with Australians' long-standing concern about exotic animal diseases (Granot, 1999) *any* imported livestock or agricultural products perceived to bring diseases that could spread to wild and domestic flora and fauna or to humans are likely to be considered highly risky and unacceptable. Given what we know from the psychometric research described above, however, we can be somewhat more discriminating than that.

Genetically modified organisms. The use of GMOs in agriculture presents several distinct benefits, including enhanced farming productivity, reduced pesticide use and run-off, tailored micronutrient enrichment of food, and reduced food costs for consumers. However, GMOs also present *unknown risk.* To some, GM foods seem very risky because they are based on relatively new science (so scientists do not have enough knowledge to estimate the risks accurately); the inadvertent introduction of harmful changes in DNA structure may not be immediately obvious (the effects may be delayed); and consumers do not necessarily know when they are exposed because they are not well-informed about which products contain GM ingredients and genetic engineering is not obvious to the casual observer. In contrast, GM medicines are seen as less risky because they are targeted at a very specific audience who is likely to be well informed (by someone considered trustworthy, such as a primary-care doctor) (Marris, 2000).

GM foods are high in unknown and dread risk.

GM foods also have features of *dread risk:* Many people are exposed to them (signaling global catastrophic potential); it is the food growers who decide whether to use GM seeds or other products (such as recombinant Bovine Growth Hormone, rBGH) so consumers do not necessarily have a choice and inconsistent labeling laws mean than available choices are not always clear (involuntary exposure); the risks and benefits are not fairly distributed (currently the benefits are greatest for farmers and GMO manufacturers rather than consumers); and children are heavy consumers of some products (e.g., milk), making parents especially sensitive to potential harm to future generations. Furthermore, GM foods are morally disgusting to some people: moving genes from one species to another is "not natural" and likened to "playing god" (Shepherd, Manaras, & Sparks, 2000). Consumers of GM medicines, on the other hand, are usually given the choice of whether or not to accept the treatment and will potentially benefit from their exposure.

Beef. Also likely to be perceived as highly risky are imported animals and animal products, despite the fact that humans have domesticated and eaten animals for a long time. Innovations in the feeding of animals facilitated the spread of BSE (Bovine Spongiform Encephalopathy) in the United Kingdom, demonstrating how new threats may not just come from the laboratory but also from familiar places such as the farm. In addition, the effects of a

disease such as BSE in cows or variant Creutzfeld-Jacob Disease (vCJD) in humans are latent and not easily observed at first (Granot, 1999). Thus, animal imports (whether it be beef from Britain or livestock and their products from other countries) have elements of high *unknown risk* for consumers, agriculturalists, and livestock growers, leading to high risk perceptions.

British beef also has *dread risk* qualities through its association with "mad cow" disease. Individual consumers cannot easily control the spread of contamination and symptoms of BSE and vCJD are horrific and potentially fatal. Like BSE, other diseases or pests, such as rabies, foot-and-mouth disease, and fruit flies may not be new or unnatural in comparison with GMOs, but they are seen as having elements of dread risk to the extent that they are uncontrollable. Their capacity to spread once an incursion occurs is daunting. They pose potentially fatal and catastrophic risk (not to mention involuntary risk) to Australian agricultural and livestock industries as well as the natural environment.

3.2 Imagery and Affect

In addition to unknown and dread risk dimensions, researchers have recently begun exploring the importance of imagery and affect (feelings) in risk perceptions. How imagery and affect influence risk judgments and decisions (consciously or unconsciously) is described below. Then the inherent affective component of quarantine is examined, particularly with respect to the potential for the stigmatization of imported products.

Images and feelings are integral to judgment and decision making.

The affect (feelings) people experience in reaction to hazardous activities and technologies is an important component of perceived risk. People respond to risky situations at a gut or emotional level and use this affect to determine the risk posed (Finucane, Alhakami, Slovic, & Johnson, 2000; Loewenstein, Weber, Hsee, & Welch, 1999). Although affect can sometimes lead us astray, it is central to rational thought because it plays a direct role in motivating behavior: Affect guides us toward generally sensible adaptive actions (Epstein, 1994; Mowrer, 1960a). Damasio (1994) argues that people represent objects and events in their minds with images and a lifetime of learning leads to these images being "marked" by positive and negative feelings. When a negative marker is linked to an image it sounds an alarm; when a positive marker is associated with an image, it becomes a beacon of incentive.

The centrality of affect and imagery to risk perception is suggested already by the research described above showing that dread risk is the element most strongly related to high risk perceptions and desire for regulation. Dread essentially reflects a feeling of fear, which motivates fight or flight responses at the most primitive level in the human brain (Damasio, 1994).

In addition, the influence of affect is evident in research showing that although risk and benefit may be distinct (or positively correlated) in the environment, they tend to be negatively related in lay people's minds. That is, for many activities and technologies (e.g., eating beef, food preservatives,

pesticides) people associate greater perceived risk with lower perceived benefit, and vice versa (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; McDaniels, Axelrod, Cavanagh, & Slovic, 1997; Slovic, Kraus, Lappe, & Major, 1991). For instance, the nature of the benefits gained from GM crops (e.g., micronutrient-rich food sources) may be qualitatively different from the nature of the risks (e.g., developing herbicide-resistant "superweeds"), but many people tend to see GM crops as high in risk and relatively low in benefit (cf., Gaskell, Bauer, Durant, & Allum, 1999; Raufaste, Finucane, & Slovic, 2000).

Affect is an efficient, fairly accurate tool for processing information.

Because affect can be accessed automatically and effortlessly, it provides a very efficient tool for processing information. We can quickly form a fairly accurate sense of how good or bad something is without a thorough deliberation or conscious appraisal of the situation. This shortcut approach is essential given the myriad of judgments and decisions we must make each day (from what food to eat and which medications to take to whether to drive and what insurance to purchase). As information becomes more complex or more contradictory, as it does in situations such as import risk analysis, reliance on affect naturally increases because the human brain is limited in the amount of analytic information it can process without external help. Research has shown that affect even influences expert risk analysts' judgments (Slovic, 1997).

To the extent that experts recognize their cognitive limitations and the need for deliberation and logical analysis in their judgments of the risks of imports, however, their job is to rely on formal procedures such as risk assessment to deliberate over information. As information becomes more complicated, experts tend to place more emphasis on increased scientific scrutiny of risks in evermore scientifically exacting tiers of assessment (National Research Council, 1996). The consequence of this emphasis is a polarizing of expert and lay opinion.

Increasing focus on risk assessment methods fails to address the public's broader, socio-cultural concerns, resulting in more (negative) affect: fear that the authorities overseeing the risk analyses and regulatory policies are neglecting important non-technical dimensions that underlie the acceptability of risks. Moreover, a narrow focus on just the technical components of import risk assessments ignores the long-standing negative affect inherent in the concept of quarantine.

3.2.1 Quarantine Imagery and Affect

The origin of the word "quarantine" lies in the Italian word for "forty days," the period during which ships from locales known to harbor contagious diseases such as plague were held at a distance from a port (Gerlitt, 1940). But the concept of quarantine is far broader than this - it is a boundary to ward off a feared biological contaminant lest it penetrate a healthy population. It separates the contaminating from the uncontaminated. To consider quarantine as related to only infectious diseases with short periods of ill-

ness would be to overlook the deeper emotional and broader aggressive character of quarantine (Musto, 1986) and people's elemental fear of contagion (Rozin, Haidt, & McCauley, 1993; Rozin, Markwith, & Nemeroff, 1992).

From literature we can see that the images naturally associated with "quarantine" tend to be related to "plague control" (Jones, 1993). In this negative connotation, quarantine operates to ostracize, categorize, assign blame, and ultimately deliver punishment. It is associated with images of fear, distress, and death, and implies a sense of involuntariness on the part of the victim. Images of the plagues visited upon ancient Egypt come to mind. Thus, we are conditioned at least to some extent to feel that anything that needs to be quarantined is something bad and to be feared.

"Island" stands for "immunity."

The quarantine line is viewed as the literal boundary between clean and dirty spaces and subjects: Purity on one side and disease on the other. Part of the effect of the historical approach to quarantine policy, since the Quarantine Act of 1908, has been the imaging of Australia as an island-nation, where "island" stands for "immunity" (Bashford, 1998). Historically, the message has been driven home that our geographical immunity made us the only continent free from endemic forms of disease. Drawing a boundary creates an internal and an external, a self and other, which permits us to establish an identity (through difference from others) as a worthy nation. In the Australian context, establishing the quarantine line was part of drawing the thresholds of the new nation (Bashford, 1998).

But boundaries function counter-intuitively—they create a feeling of certainty (or security) out of the need for it, that is, to cover for uncertainty. Boundaries are often created exactly when the integrity of the self or the nation seems insecure or threatened (Petersen & Lupton, 1996). The linking of opposites is inherent in this imagery—as something becomes more pure it necessarily becomes less diseased and as security increases, threat decreases. Again, risk and benefit are inversely related.

The above descriptions of quarantine highlight the inherent imagery and affect likely to influence perceptions of import risks. Quarantine is not a dry, detached issue; its richness comes from a long-standing appreciation of its function and serves important social and psychological functions. While affect may facilitate the processing of complex information about import risks, though, it can also lead to inappropriate judgments and decisions when analysts want to consider only technical features or distinguish between risks and benefits. Furthermore, the close scrutiny of quarantine activities pre- and post-border, such as occurred in the Nairn Review, only serves to intensify the boundary imagery and its associated affect. Quarantine lines identify areas that have to be kept separate; it is a technology that inadvertently catches people (sometimes a few, sometimes many) within its circumscribed net (Armstrong, 1993). Thus, focus on border activities can only lead to a greater expectation of the "no risk" policy from those living inside the boundary.

3.2.2 Potential for Stigma

Stigma is a powerful aspect of public opposition to risk.

An important consequence of the negative affect associated with risky situations is stigma. Stigma means a visible sign, infamy, or disgrace posing a risk to society. It is demonstrated by "principled refusal to engage in an act that would otherwise be acceptable" (Fischhoff, in press, p. 361). Historically, stigma tended to be used only in reference to people and places. For instance, in the early 19th century the major public health strategy was one of quarantine through the use of a conspicuous mark, "SICK", placed in front of a house (Armstrong, 1993), thus classifying a person and their place as risky. These days, however, stigma can be attached also to products and technologies that are perceived to pose unusually high levels of risk (Gregory, Flynn, & Slovic, 1995). Stigma is a powerful aspect of the public's opposition to many proposed new technologies and consumables and can occur even without risks imposing any actual physical impacts. Dramatic examples of product stigmatization in North America and Europe include the crises involving Tylenol, Alar, tainted blood, and British beef.

More recently, GMOs have illustrated how public opinion can shift rapidly, with the controversy over genetically modified (GM) foods exploding in 1999, first in Europe and then in the United States, which had initially introduced GM crops without much angst. About half of the corn, cotton, and soy fields were planted with transgenic crops when U.S. farmers discovered that their export markets were drying up and domestic consumers were voicing concerns that the crops might be hazardous to human health or the environment. One precipitating factor was the appearance of a few critical studies published in 1999 suggesting fatal outcomes from GM organisms (dread risk). For instance, a lab study showed that monarch butterfly caterpillars died when fed transgenic pollen that contained a bacterial insecticide (Losey, Rayor, & Carter, 1999). But such work was preliminary and controversial, raising argument amongst scientists about the conclusions that should be drawn. Lack of good data frightens the public because the experts appear not to be experts - their scientific uncertainty means they cannot make a definitive statement on the risk of GM crops (unknown risk). As a result, GMOs became rapidly stigmatized and avoided around the world.

Stigma can have widespread social, economic, and political ramifications.

The potential for stigmatization of GMOs suggests that public opinion about what is safe to import into Australia may change dramatically with domestic or overseas events that heighten the elements of dread and unknown risk and negative affective responses. This can have important and widespread social, economic, and political ramifications. Vehement public opposition through Europe has led the European Union to suspend the introduction of new GM crops pending legislation that may take several years to be finalized. Likewise, the BSE crisis resulted in devastating social, economic, and political impacts on the beef industry and the citizens of the United Kingdom (Burton & Young, 1997; Lanchester, 1996), while contamination of blood supplies with HIV has led to people saying they would refuse a blood trans-

fusion despite facing serious health problems or even death if the transfusion were not administered (Finucane, Slovic, & Mertz, 2000).

More generally, studying stigma through an imagery technique has shown that the content of images or word associations evoked by a stimulus (such as the name of a city or a state) predicts economically relevant preferences (e.g., whether the person who produced the image would vacation or start a new business in that city or state). Stigmatization of environments appears to be a phenomenon that generalizes across population groups and has economic impacts mediated by the perception of risk (Flynn, Peters, Mertz, & Slovic, 1998; Slovic, Layman et al., 1991).

4 Understanding People

In addition to characteristics of hazards, characteristics of people and their cultural contexts are important determinants of risk perceptions and risk acceptability. Different people care about different things: for instance, caring about investment risks does not necessarily mean that you care about cancer risks. What is it that determines what we value and care about? The roles of culture, worldviews, and trust in determining perceived risk are examined in this section.

4.1 Culture and Worldviews

Culture and cultural differences are complex constructs that are difficult to define and measure. Commonly, cultural differences are viewed as attitudinal or behavioral divergences associated with differences in stable social structures, processes, and/or values. That is, cultural differences relate to the shaping of individual and collective behavior by a set of common characteristics, including geography, climate, history, economics, politics, and psychology (Tse, Lee, Vertinsky, & Wehrung, 1988; Weber & Hsee, 1999). Cultural differences often follow national boundaries although, of course, this is not always the case (McDaniels & Gregory, 1991).

Groups maintain a particular way of life by attending to some risks and ignoring others.

The importance of culture in determining the values salient to individuals judging risk and its acceptability has been considered at length by Douglas and Wildavsky (1982). According to these authors, perceived risk is a collective phenomenon: every cultural group chooses to attend to some risks and ignore others in order to maintain a particular way of life. Extending this argument, Dake (1991) identified distinct cultural worldviews (beliefs about how the world and its social structure should be organized) that are associated with particular trends in risk perceptions. For instance, groups endorsing a hierarchical worldview (supporting superior/subordinate social relations and detesting civil disobedience) tend to focus on the opportunities offered by industrial and technological risks. In contrast, groups endorsing an egalitarian worldview (supporting broad distribution of power and wealth

and detesting ranked role differentiation) tend to focus on the threats presented to their social structure[2].

To examine the relationship between worldviews and risk perceptions of environmental and health hazards, we conducted two large national surveys of American samples (Finucane, Slovic, Mertz, Flynn, & Satterfield, 2000; Flynn, Slovic, & Mertz, 1994). Responses showed that white males tend to see the world as much less risky than do others. For a wide range of hazards, from cigarette smoking to climate change, white males' risk perception ratings were consistently much lower than the ratings by white females, nonwhite males, and nonwhite females. Furthermore, the range of differences in risk perceptions across subgroups varied across hazards. One of the items with the most highly varied ratings was genetically engineered bacteria (see Figure 2).

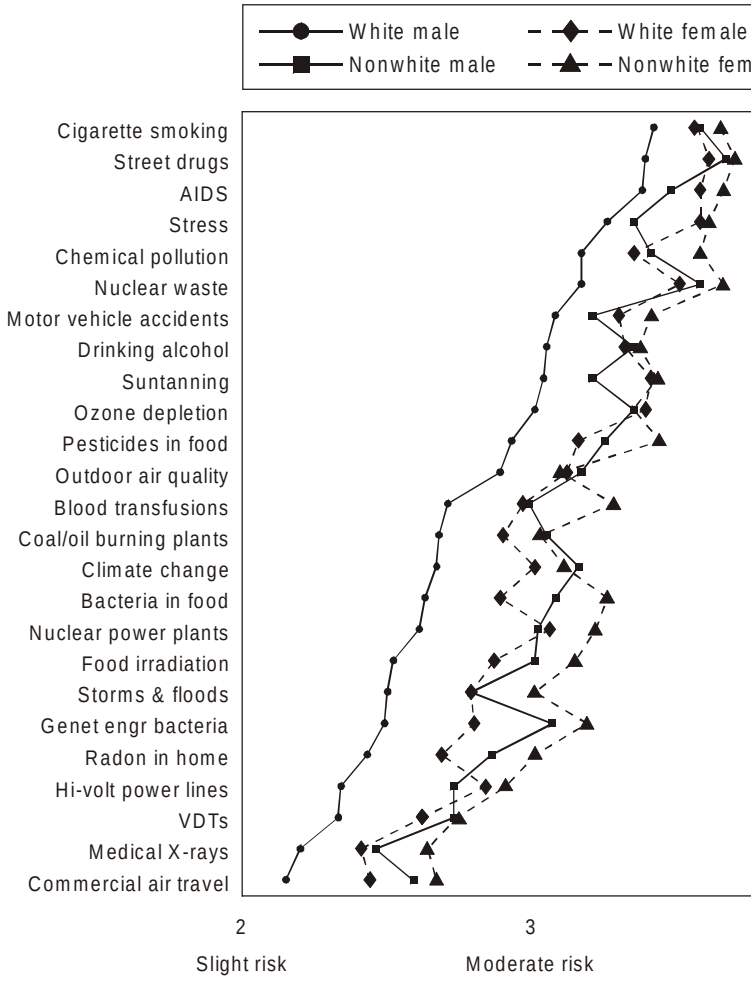

Figure 2. Mean risk-perception ratings by race and ge

[2] Many other ideological frameworks have been proposed. For instance, some have focused on political perspectives, while others have theorized about environmental ideologies (e.g., Dunlap, 1978). Central to the latter beliefs are views of nature – whether it is fragile or resilient, or whether its resources are bountiful or scarce. These views of nature are thought to predispose individuals to be risk seeking or risk averse, however it is hard to separate independent and dependent variables, thus making it difficult to make causal inferences with this framework.

Consistent with cultural theory's suggestions that general dispositions orient or motivate individuals (Weber & Hsee, 2000), we found that compared with others, white males are more likely to agree with statements reflecting hierarchical views (e.g., "when a risk is very small, it is OK for society to impose that risk on individuals without their consent") and to disagree with anti-individualistic statements (e.g., to disagree that "the government should make rules about personal risk-taking activities"). In short, the data suggest that risk perceptions reflect deep-seated values about technology and its impacts on society (cf., Barke, Jenkins-Smith, & Slovic, 1997).

Some claim that scientists are immune from ideological bias and that risk assessments merely reflect a dispassionate distillation of current scientific knowledge (Rothman, 1994; Rothman & Lichter, 1987). However, the long-standing consensus is that both scientific elites and issue publics (e.g., journalists) show greater evidence of ideological thinking than samples of the mass public (e.g., Converse, 1964; Feldman, 1989; McAllister, 1991). Recent empirical evidence from Plutzer, Maney, and O'Connor (1998) showed that conservative scientists regarded an array of technologies as safer than did liberal scientists. Furthermore, they found that the variation within groups far exceeded the variation between groups (e.g., journalists and scientists). Other research has shown that worldview affiliation influence scientists' risks judgments (Kraus, Malmfors, & Slovic, 1992; Slovic et al., 1995).

4.1.1 Implications for Import Risks

Different worldviews imply different levels of support for different safety approaches.

Different worldviews matter because they have implications for which approach to safety standards will be supported. For example, a study by Sheehy and colleagues (1996) suggested that hierarchists feel that the complexity of biotechnology and genetic information undermines their ability to make informed personal decisions. They would prefer mechanisms that draw on the experience of experts to make decisions, rather than rely on their own incomplete knowledge to make these types of decisions. On the other hand, individualists and egalitarians have a strong desire to have information provided to them on which they can base their own personal choices in the marketplace. For these people, products that offer individual and societal benefits are more likely to be well received than those that pose risks. These people also want to be able to make a risk assessment based on their individual beliefs and preferences. They are more likely to embrace labeling of products for three main reasons: to protect consumer choice, to provide information on what a product is made of for health reasons (e.g., allergies), and to encourage companies to provide safer products by having disclosure requirements.

Although most focus group participants in Sheehy et al.'s (1996) study indicated that they would like to be involved in the decision-making process, some suggested that they would be willing to trust the judgment of others. For many consumers, the judgments they are willing to trust refer mostly to safety standards; for others this trust could be extended to include judg-

ments about ethical, environmental, and/or economic considerations of whether a product should be made available on the market.

4.2 Trust

In addition to culture and worldviews, an important dimension of agency/public interaction is public trust in regulatory and management officials. Social trust—the willingness to rely on the policies and decision of agencies and their employees—has been found to be important to the perception of environmental risks and to the acceptance of emerging technologies and environmental management practices (Earle & Cvetkovich, 1995). A lack of trust has been cited in numerous studies as a critical factor in the gap between expert and lay assessments of risk (Slovic, 1997). Trust has also been found to be strongly linked to risk perceptions (Grobe & Douthitt, 1995). These findings suggest a direct relationship between distrust in regulatory agencies and risk perceptions.

Shared values are the foundation of trust.

Earle and Cvetkovich (1995) have argued that shared values constitute the foundations of trust. If people's or institutions' behavior reflects shared values the characteristics of trustworthiness will be attributed to them; the future behavior of trusted persons is expected to be guided by the shared values.

Possibly, perceptions of risk would be decreased if agencies were viewed as more trustworthy. Grobe, Douthitt, and Zepeda (1999) found that greater trust in the U.S. Food and Drug Administration as a food-related information source was related to less concern about the adverse health effects from rBGH use. In addition, Siegrist (1999; 2000) suggests (through structural equation modeling procedures) that trust in companies and scientists performing gene manipulations has a strong effect on the benefits and risks perceived. When trust was controlled for, the inverse relationship between perceived risk and benefit vanished. Furthermore, worldviews, perceived benefit, and perceived risk each were found to contribute independently to the prediction of acceptance of gene technology.

4.2.1 Trust and GMOs

Despite codevelopment of technologies used in modern crop improvement in the U.S. and Europe, the response of the public to GM products on the two continents has been very different. One explanation offered for the difference relates to trust.

In 1992 the FDA issued a key ruling that brought foods containing GM ingredients to market quickly in the US, and without labels. U.S. farmers enthusiastically embraced GM crops and the potential benefits they brought. The initial U.S. field tests in 1986 and 1987 followed open discussions among scientists, regulators, farmers, and environmentalists. Questions and data were shared, experiments were conducted to address concerns, and appropriate decisions were made. However, the public response to field tests in Europe during the early 1990s failed to draw governmental agencies into

the discussion (Beachy, 1999). There was no real central regulator to green light the technology and allay public fears in Europe, and for small farmers, biotechnology represented a threat not an opportunity. Labeling of GM foods may have been a big part of Americans' greater trust - not mandatory labeling, which industry opposes and activists demand, but voluntary labeling. Clearly, however, the U.S. system of review and approval failed to convince the public in Europe (Beachy, 1999).

Distrust makes risk perceptions skyrocket.

Public trust in food safety regulators probably also played a crucial role. In Europe, factors such as concern over mad cow disease, dioxin contamination in animal feeds, lack of effective and transparent regulatory oversight, and the mistrust of government and large organizations appeared to promote the current furor. In Great Britain, for instance, the government's attempt to play down the mad cow disease crisis in the early '90s, led to trust plummeting and risk perceptions skyrocketing, paving the way for more generalized fear of food safety. Britain's 1996 bout with mad-cow disease, though unrelated, weakened European confidence in regulators and industrial-strength agriculture. A string of bad-news food headlines have occurred since then: dioxin-contaminated chicken in Belgium, tainted Coke in Belgium and France, and a punitive U.S. tariff on imports of foie gras and other products imposed in July 1999 because Europe refuses to accept American hormone-fed beef.

The role of trust is evident in less industrialized countries also. Trust is a strong determinant of attitudes in developing countries. Counter-intuitively, the use of instrumental arguments even in developing countries where basic needs are threatened in everyday life do not have much sway. Research by Aerni (1999) on public opposition to GM rice in the Philippines suggested that transgenic crops are valued less in the Philippines than in the U.S. partly because of a lack of confidence in the regulatory institutions that promote GMOs.

4.3 Australia - A Unique Land and People

Caution is needed in generalizing findings from one region to another.

It is crucial to highlight that research on risk perception was born in and continues to come largely from the U.S. and Europe. Many lessons learned from overseas research are highly applicable to the Australian context. However, environmental and cultural differences may limit the generalizability of the findings in important ways.

First, differences in exposure may be one reason why Australians can be expected to rank risks differently from people of other nationalities (Finucane & Maybery, 1996). Australia has a unique climate and environment, potentially heightening or attenuating danger and reflecting in perceived risk. In addition, compared with people from other nations, Australians can be expected to rank hazards differently because of differences in prevailing publicity or heightened industrialization and regulatory conscientiousness. Rohrmann (1994) found that, compared with Germans, Australians gave lower risk ratings for "conventional" technologies such as airports (which

are more likely to seem essential to Australians given their relative isolation from other countries) and coal power plants (also essential because of Australia's less advanced industrialization). However, Australians gave higher risk ratings than Germans to environmental pollution and large-scale technology such as nuclear power (domains in which Europeans are more likely already to have experienced accidents with wide-ranging consequences because of their greater industrialization and dense populations).

Given that there are no nuclear power stations in Australia, the high relative risk rating of nuclear power is noteworthy. The high rating is consistent with findings in Canada where many respondents live far from nuclear reactors and their wastes (Krewski, Slovic, Bartlett, Flynn, & Mertz, 1995). Extreme fears of nuclear power clearly transcend geographical location. Rather, perceptions of nuclear power reflect fears of the unknown, affect associated with nuclear catastrophes, and prevailing worldviews. Thus, even though risks may be ranked differently in different countries, similarities in the underlying elements driving risk perceptions can be found across cultures.

Optimal risk analysis will result only from a thorough understanding of specific regions and their people.

As diverse cultures become increasingly represented in Australia, the dynamic nature of risk perceptions needs to be recognized. Snapshots of perceived risk in the 1990s will not reflect perceptions in subsequent decades as the multicultural population of Australia expands and changes. (Naturally risk perceptions also change as new technologies emerge, sometimes reducing and at other times increasing perceived risk.) Furthermore, public opinion about environmental health issues will undoubtedly vary as a function of geographic, political, and historical differences as one moves from the tropical north of Australia, to the dry inland and rural areas, to the better-watered coastal areas of the south-west, south-east, and eastern coasts of Australia. The risks faced in these areas depend not only on their unique environments, but also on the characteristics of the populaces, particularly as remoteness increases. Little is known about intra-national variation in Australia, but one thing is certain: Optimal risk analysis will result only from thorough consideration of the characteristics of specific regions and their people.

4.3.1 Rural Australia and GMOs

Rural Australian communities present unique risk contexts. For instance, the isolation inherent in rural Australia may foster a sense of independence, as found by McGee (1998) in a study of the Broken Hill community's response to lead contamination. Broken Hill is a city geographically isolated from the bigger cities on the coast and politically isolated due to the dominance of union influence. The isolation has meant that, historically at least, welfare and protection needs have been met largely by the mines and unions, local charities and service clubs, and community networks of family and friends. The role of government officials in this context is not straightforward.

Rural Australia presents a unique risk context, but reactions to import risks have received little study.

The geographical and political isolation of rural Australian communities like Broken Hill clearly shapes the views of local residents, but the effects on their acceptance of specific import risks is unclear. In some cases, the greater independence created by isolation may lead to greater risk tolerance; in other cases a feeling of vulnerability may result from the isolation, heightening risk concerns. Unfortunately, little research on rural Australians' perceptions of risks exists to help us signpost where and when specific import risks will be considered threatening or acceptable.

In the complex world of public policy making, minority groups from rural Australia sometimes make an impact, but sometimes their concerns and needs are overlooked. Two groups (farmers and indigenous individuals) and their perceptions of GMOs are given special attention below.[3] The use of GMOs in agriculture and its associated risks and benefits for remote areas needs comprehensive debate as that is where the new technology's impacts are likely to be greatest. One group discussed below (farmers) has received some attention already from researchers. The other group (indigenous individuals) has received almost no consideration to date.

4.3.2 Farmers

In the early 1990s, farmers' perceptions of GMOs were associated with great uncertainty. A 1992 survey of Australian farmer organizations (Lawrence, McKenzie, & Vanclay, 1993) found that only 24% of responding organizations had developed a policy statement relating to biotechnological applications in farming. When asked if they were concerned about any aspects of the new biotechnological developments in agriculture, there was a high level of "not sure" responses (up to 30%), suggesting that a substantial group of respondents remained ambivalent about the likely effects of those applications. Similarly, many respondents (33%) were unsure whether the benefits of genetic engineering outweighed the possible risks.

Of note is that the findings of research on attitudes in the early 1990s may not hold at the present time, given the socially constructed nature of risk perceptions. Attitudes need to be monitored continually to provide the most reliable and valid assessments of how risk is perceived at any given time.

Different things are important to different farmers.

Nonetheless, the extant studies of farmers suggest that, not surprisingly, different things are important to different people. The main factors important to farmers that have been reported by Australian and overseas researchers are presented in Table 2.

[3] Of course, grouping people in this way overlooks the important individual differences within the groups that may contribute to variation in risk perceptions within communities. Risk researchers and practitioners need to keep in mind the limitations of profiling communities before generalizing their expectations.

Table 2. Some Attributes of Genetically Modified Organisms Important to Farmers

Attribute	Example
Economic benefits	Improved productivity and international competitiveness
Environmental benefits	Reduction in chemical residues
Human health benefits	Micronutrient rich foods
Economic risks	Loss of niche as “clean” food producer; small farms uncompetitive
Environmental risks	Superweeds; threat to biodiversity
Human health risks	Potential for hormonal changes
Unknown risks	Not enough research done to know the environmental consequences of transgenic crops
Lack of control	Patents by large companies
Lack of trust	Research seen as co-financed by biotechnology companies and therefore not independent
Inequity	Currently benefits go to GM seed manufacturers, whereas the risks are borne by farmers, consumers, and regions used as testing grounds
Ethics	Unethical to tamper with natural order; creating genetic pollution

Economic benefits. The survey by Lawrence et al. (1993) found that the majority of respondents believed that GMOs offer great opportunities for farmers to improve their productivity. Grower organizations (e.g., the National Farmers' Federation) considered the agricultural applications of genetic engineering to be vital to maintaining Australian farming's international competitiveness. As Paarlberg (2000) has pointed out, remote and disadvantaged rural areas bypassed by the Green Revolution (due to unsuitable soil, water, typography, and labor endowments) will benefit from GM crops because they depend less on the hard to get, hard to manage "packages" of purchased chemical inputs. Rather, the genetically engineered traits of the plant itself, fully contained in the seed, manage crop pests or diseases and enhance productivity.

Environmental benefits. Biotechnological products offer farmers alternatives to chemical products, which is particularly important in areas where soil degradation is a serious problem. Also, environmental benefits arise from reduced pesticide use through the spread of herbicide-resistant and

pest-resistant GM varieties because there will be less runoff of pesticides into surface and groundwater and reduced need for tillage. Furthermore, natural rural ecosystems would be under less pressure from low-productivity crop farming (especially shifting cultivation) and livestock grazing.

Human health benefits. Micronutrient rich crops can be engineered (e.g., rice can be enhanced with vitamin A to counter eye damage) and increased farm productivity will boost food production and lower the price of food staples, increasing the consumption of food and nonfood goods among the poor (Levidow, 1999).

Economic risks. Yield and cost are, of course, paramount to farmers' purchasing decisions. Yet from the perspective of organic farmers, productivity gains will be nullified by reduced markets due to the undermining of Australia's claim to produce "clean" food in a "clean" environment. In contrast, conventional farmers argue that biopesticides would enhance the possibility of being the world's "clean producer," thereby catering for the clientele of concerned global citizens (Lawrence et al., 1993). Another concern raised, for instance by small dairy farmers in the U.S. who fear the introduction of rBGH, is that the economic competitiveness of small farms will be impacted negatively, wiping out many family-owned farms (Roush, 1991).

Environmental risks. Remote rural areas may become testing grounds for novel and potentially risky substances that they have neither the technical capacity nor the regulatory frameworks in place to deal with. There is potential for biohazards being created such as insect populations becoming resistant to the toxins in GM crops or plants developing into herbicide-resistant "superweeds." In addition, many rural areas are rich in natural biological endowments, raising concerns about the potential of GMOs to increase the genetic uniformity of crops they grow. (Paarlberg, 2000).

Human health risks. Much of the opposition to GM food centers on potential health effects, for instance, hormonal effects from rBGH. A survey of Western Canadian prairie farmers toward two biotechnological products, ENFIX-L and PB-50, suggested that concern amongst farmers typically related to the storage and handling of the products. Overall, however, personal risks and environmental side effects were the only two attributes of products that were considered *unimportant* in the Canadian farmers' purchasing decisions (Hobbs, Kerr, & Klein, 1990).

Unknown risks. Nearly 80% of respondents in the Lawrence et al. (1993) survey wanted more information about the possible social and economic impacts of genetic engineering in agriculture. Organic farmers were particularly worried that scientists had made mistakes previously and were about to make another one. The Confederation Paysanne (a French farmers' trade-union that campaigns against industrial intensive agriculture) called in 1997 for a moratorium on the cultivation and commercialization of GMOs partly due to concerns that the environmental risks associated with the cultivation

of transgenic crops are unknown and might be irreversible. Furthermore, they claimed that the level of research devoted to the study of these risks has been pitiful, especially when compared with the resources devoted to developing these technologies (Marris, 2000).

Lack of control. An important concern of farmers is that patents by large companies would make seed and plant material unavailable to growers. Australian organic farmers were particularly concerned that large corporations would have too much control over the environment (Lawrence et al., 1993). Similarly, the Confederation Paysanne has voiced concerns about farmers becoming technologically and economically dependant on "agro-businessmen" (Marris, 2000).

Lack of trust. Farmers not warned of the dangers of planting a crop with tenuous consumer acceptance are likely to feel misled by multinational seed and chemical companies. Furthermore, public research is seen as increasingly influenced by industrial interests, due to co-financing from biotechnology companies. Organizations such as the Confederation Paysanne believe that public research should remain independent and be directed towards developing more sustainable modes of agriculture (Marris, 2000).

Inequity. Currently, from the perspective of many consumers, the benefits of GMOs are reaped largely by the developers and manufacturers of the products, while the potential risks are borne by the farmers who use the products and consumers who ingest them. Consumers are unlikely to choose a product for which there appears to be no immediate benefit but some additional risk. For farmers, however, current or potential benefits may be traded-off against the risks. On a more global scale, some argue that agricultural biotechnology will not benefit developing regions (despite claims made by multinational companies) but will reinforce the unequal distribution of wealth between developed and developing areas. Patents held by large companies are seen as representing a "pillaging" of genetic resources of the vulnerable communities. Others argue that it is developing regions that are most likely to realize sizeable environmental and health improvements over their current circumstances (Paarlberg, 2000).

Ethics. Lawrence et al. (1993) found that compared with conventional farmers, organic farmers more strongly agreed that it is unethical for scientists to genetically engineer plants, animals, and microbes. Organic agriculturalists assert that genetic modification has no place in the production of safe and healthy food because, compared with selective breeding, making individual genetic changes at a molecular level represents such a deep and unusual intervention in nature that it must carry many uncertainties and risks. This reflects a value assumption that it is inevitably more risky to do what is perceived as unnatural or equated with genetic pollution (by virtue of its state not its effects).

Sociodemographics. In general, the role of sociodemographics in risk perceptions is unclear. Some risk perception research has shown that correlates of high risk perceptions tend to include having children at home, low socioeconomic status, older age, and being female (Florkowski, Halbrendt, Huang, & Sterling, 1994; Flynn et al., 1994; McClelland, Schulze, & Hurd, 1990; Savage, 1993; Tognacci, Weigel, Wideen, & Vernon, 1972). However, other research suggests that no substantial relationship exists between risk perception and demographic characteristics (Crisp et al., 1993). Several researchers have suggested that personal characteristics have minimal influence on perceived risk compared to the influence of qualitative characteristics of the hazards themselves (Gardner & Gould, 1989; Harding & Eiser, 1984).

In their research with farmers, Hobbs et al. (1990) found considerable consensus across farmers of different educational levels regarding the importance of the risk of soil depletion, yet there were differences regarding beliefs about whether biotechnologies would actually lead to increased depletion. Farmers with more education tended to be more skeptical, possibly suggesting a greater awareness of soil depletion dangers. Farm sale size was also found to be influential. Concerns over soil depletion and environmental side effects appeared to be strongest amongst farmers from lower sales groups (less than $100,000 Canadian dollars of gross farm sales in 1988), possibly reflecting a greater dependence on a limited resource base, generating longer-term concerns over the effects on the soil. Only farmers with sales over $250,000 felt the need to e cautious when handling the biotechnological products.

In sum, research suggests a high level of uncertainty among farmers about whether the risks outweigh the benefits of GMOs. The concerns reported reflect the unknown and dread risk dimensions that have been found important in determining the perceived risk of other technologies. The role of cultural and individual values in farmers' perceptions of the risks of GMOs has not been researched.

4.3.3 Indigenous Individuals

There is a dearth of research on indigenous risk perceptions.

In contrast to the interest in farmer perspectives on GMOs, indigenous views have failed to receive much attention. As a result, how Aboriginal Australians perceive and react to GMOs or other import risks is largely unknown. This lack of understanding belies the fundamental importance of indigenous views in import risk analysis. The white majority's progress-oriented approach that currently defines risk analysis procedures and attempts to incorporate marginalized groups into mainstream identity is likely to result in conflict (Mackey, 1999). Apart from challenging non-white people's conceptual boundaries of self and other and thus their sense of security, the progress-oriented approach ignores the broader dimensions of risk and the cultural and socio-psychological factors that are important determinants of risk acceptability in the wider community.

Just as debates about technological risk reflect deep-seated conflicts about the kinds of normative values that the nation should hold, debates about other risk issues reflect profound value differences. Despite the lack of research on Aboriginal Australians' technological risk perceptions, value conflicts are evident in the contemporary discourse about native title in Australia. The native title debate has been laden with images of risk, danger, fear, and threat. Images of risk and danger to the nation, to national culture, and to national progress contribute to the discourse. Some stress that "justice, truth, history, morality, indigenous culture, human rights, and Australia's international reputation are at risk if native title is *not* recognized" (Mackey, 1999, p. 109). Others stress that native title threatens mining and farming interests and thus the nation as a whole. Furthermore, multiculturalism and indigenous rights may be seen by some as a risk to "mainstream" national identity. Clearly, different people value different things. The perception of an endangered nation can contribute to racial and cultural intolerance and the inability to progress with context-sensitive policies for specific domains such as import risk analysis.

The native title debate highlights deep-rooted conflicts about the history, present and future of the nation, and the kinds of normative values that the nation should hold. Debates about import risks also seem likely to reflect value conflicts between native and non-native peoples. Such conflict is illustrated by the recent announcement of a moratorium on GMO imports into New Zealand, with questions being raised about unknown risks to Mäori cultures and their relationship with the environment, the involuntary nature of their exposure to new technologies and products, and the inequitable distribution of risks and benefits of imports.

For Mäori people, GMOs raise environmental, cultural, health, and well-being concerns.

Mäori environmental concerns include the continued and improved availability, quantity, and quality of traditional food and natural resources, the purity of land and air and the need to retain and extend their productive and life-sustaining capacity. Concerns related to cultural outcomes are the recognition and protection of Mäori cultural, spiritual, ethical, or socio-economic values; the protection of the mauri (spiritual essence) of people, flora, fauna, land, waterways, and air; and the preservation of traditional Mäori knowledge. Potential issues of significance in relation to health and well-being outcomes include the protection of spirituality, balance with nature, protection of mauri; protection of the responsibility to the collective, the capacity to belong, to care and to share, the protection of mental health and well-being, the capacity to communicate, to think and to feel; the protection of physical growth and development (Environmental Risk Management Authority, 1999).

Mäori believe that to switch genes across species violates an inherent wisdom in the natural order. (The idea that transgenesis is inherently wrong has also been expressed by several religious bodies who express discontent more vaguely in terms of transgenesis upsetting the way things are in nature, see Bruce & Eldridge, 2000). Although Mäori people's strong sense

of family history and place in the world is well known, insufficient research has been done to determine how this should impact GMO risk analyses.

Mäori concerns may reflect some of the issues relevant to indigenous groups around the world, but the exact concerns and issues relevant to Aboriginal Australians can only be determined through sophisticated research with this population. In short, the scientific worldview is clearly not shared by every cultural group and the impact of differing belief systems needs to be addressed. The current level of understanding of Aboriginal Australians' perceptions of import risks is inadequate and can only lead to greater polarization and conflict.

Failing to understand non-scientific perspectives will inevitably lead to a communication breakdown. What is important to Aboriginal Australians and why it is important cannot be known without a systematic examination of their values and views.

5 Implications for Communication and Consultation

Public consultation and communication needs to be tailored to specific groups.

The material outlined above shows how research on risk perception and human judgment and decision making helps us understand some of the psychological, social, and cultural factors important in import risk analysis. The array of factors that influence risk perceptions suggests why many consumers continue to be skeptical about risks after authorities have declare them safe and continue to call for a "no risk" quarantine policy. The complex nature of risk perceptions implies that a single strategy for public consultation and communication will not be effective. Rather, successful communication and consultation requires that a message is tailored to what people already know and what they need to know about specific risks, and then tested and refined until surveys show that the message conveys information in the intended way (Morgan, 1993). Determining how to consult and communicate about import risks depends on a systematic evaluation and integration of the many technical and non-technical dimensions of the issue at hand for specific target groups.

5.1 Informing People

Attempts to inform the public about risk should be based on the long-term goals of the risk communication (e.g., producing an involved, informed, interested, and fair-minded public so that public concerns will be reasonable, thoughtful, and solution oriented) (Covello et al., 1991). While an information campaign may initially elevate awareness and concern to a level that is uncomfortable for people, it will also lead to an informed, more trusting public that is prepared to deal with uncertainties about hazards and their consequences (MacGregor, Slovic, & Morgan, 1994).

5.1.1 General Education

Education is, of course, fundamental to any informed decision making. Some suggest that a massive, long-term awareness campaign should be launched,

to help the public catch up with modern science and participate in a discussion of its implications. Others suggest, however, that many people, when motivated, can already understand factual information presented to them. For instance, Gamble, Muggleston, Hedderley, Parminter, and Richardson-Harman (2000) found that over 50% of the New Zealand consumers they interviewed scored 75% or higher when asked basic questions about food technology and science. Consider also that many people without mathematical training can understand mortgage rates and the odds at racetracks. Creating and maintaining a high level of general scientific literacy in the public is very important; we can also use more tailored programs to help people better place quarantine risk in context with other regulated risks.

5.1.2 GMO Labeling

Well-designed information about specific risks can be helpful in informing people, but exactly how to frame product labels may cause heated debate (Sticky Labels, 1999). In the case of GMOs, some believe that labeling of products (e.g., of milk from herds treated or untreated with rBGH) is false and misleading because any statement regarding the use or lack of GMOs *implies* a health risk where none exists, even though label information may not explicitly state a health risk (Douthitt, 1995).

Unknown and dread risk can be changed because they are socially constructed.

Consider, however, that with more advance information and clear laws requiring labeling, public responses to GMOs in Europe may well have been more like the initial lack of concern shown in the United States (Marris, 2000). Because the unknown and dread risk dimensions are culturally and socially constructed, they are not necessarily universal, inherent, or unchangeable attributes of import risks. The involuntary nature of the risk from GM food may have been less of a concern in some countries if they had been introduced in a different way.

5.1.3 Risk Comparisons

In order for communications about specific risks to be effective, they need to put information into perspective for the public. Typically, however, efforts to help people grasp statistical measures of risk have not been profitable. For instance, tables of mortality rates, loss of life expectance, quality-adjusted life years, one in a million risks, or natural risks, tend not to be helpful —especially in a confrontational environment. As an alternative, some have tried to aid people's intuitions with risk comparisons (e.g., "the annual risk from consuming genetically modified corn is equivalent to the risk of riding an extra 3 miles in a car"). However this sort of comparison fails to recognize that these two activities differ on many qualities that are important to people, such as the hazard's familiarity, controllability, and catastrophic potential. To a consumer, the comparison is at best unhelpful because there appears to be no reason to accept the (small) added risk of consuming a new food just because s/he accepts the (perhaps larger, but voluntary and personally beneficial) risk of driving a car. Worse, however, is that the comparison may be interpreted as minimizing or trivializing the consumer's concerns about the risk and also prejudging its acceptability. As a result, such

statements are likely to produce anger rather than enlightenment and are ineffective communication tools (Somers, 1995).

Yet comparative analyses can be worthwhile if done with an understanding of the factors affecting human risk perception and judgment. To illustrate, we do not have to compare a GM food and driving. Instead, different estimates of the same risk can be compared. First, the risk at time one versus the risk at time two could be compared: By planting x acres with the new GM corn crops, pesticide residue runoff will be cut in half this time next year." Second, engaging in an activity versus not engaging in it could be compared: "If the Beagle Brigade is used, the risk of a fruit fly incursion is *x,* whereas if it is not used, the risk will be *y.*" Third, a given risk could be measured against some standard of comparison: "The exposure of custom officers to disease *x* is well below the level that the Occupational Health and Safety Administration considers safe."

Comparisons that put minimal strain on trust are most effective.

There are many different types of comparisons that can be done, some of which prove to be quite useful in helping people gain perspective on risk. The best comparisons are those that put minimal strain on the trust between an industry or government official and the public and strike the listener as relevant, appropriate, and helpful information. The more a risk comparison disregards factors that people consider important to evaluating risks (catastrophic potential, dread, voluntariness, newness, etc.), the more likely it is to be ineffective. Guidelines for presenting and explaining risk comparisons have been offered by Covello et al. (1991), who developed a system for ranking types of comparisons on their desirability and likely effect. Most importantly, to develop effective risk comparisons, risk communicators must know their audience: What is it that is important to this individual and why? Risk communicators must also test their messages: Does this comparison have the expected/desired effect on this individual?

5.2 Consulting with People

Risk communications cannot pre-empt decisions about risk acceptability. The process of deciding whether a risk assessed as "high" should be reduced or whether a risk assessed as "low" should be ignored needs to be tackled in consultation with all stakeholders. The importance of context in risk perceptions implies that we need to embed risk decisions more strongly in modern techniques for sound social and individual decision making.

5.2.1 Advisory Groups

In recent years the public has come to expect social decisions will be made with the direct involvement of any interested and affected parties. Groups such as Citizen Advisory Panels (CAPs) have been developed to incorporate public views. CAPs—also known as Site-Specific Advisory Boards (SSABs) or Licensee Advisory Boards (LABs)—work via the interaction of small citizen groups with public and/or private organizations. For instance, about 20 members of the community may serve on a panel for a period of 6 –12 months with an option to continue if interest and commitment remains

high. Depending on the circumstances, meetings might be held four to five times per year. Importantly, panel members should reflect a broad cross-section of interests and backgrounds and the panel should act in an advisory rather than a decision making capacity.

The purpose of a CAP is to provide access to the ideas and attitudes of various groups and/or communities regarding a proposal, issues, or set of issues. Unlike other public participation methods, such as public meetings or community surveys, CAPs offer the potential for detailed interaction between interested and affected citizens and government representatives. Creighton (1983, 1993) suggests that in addition to providing a sample of public views and concerns, CAPs (i) give citizens the chance to become informed before coming to conclusions, (ii) promote a deeper understanding of the concerns and interests of others (thereby moderating more extreme views), (iii) serve as a communications link back to the bodies represented by panelists, and (iv) offer a means for build consensus among conflicting groups. A common tension faced by organizations convening a CAP is the extent to which the panel should be a means for educating the public versus a means for soliciting informed citizen advice.

While CAPs may tackle controversial issues and use professional facilitators, they do not generally have the goal of reaching a binding joint agreement. CAPs are distinct from citizen juries (which are usually selected randomly from the population, meet for a short period, and limit their deliberations to one issue) and from task forces (which are usually small groups of people focusing on one discrete issue on an ad hoc basis).

Several guidelines for operating CAPs have been published (e.g., Chemical Manufacturer's Association, 1991; Tennessee Valley Public Power Association, 1991; Praxis, 1988). Most emphasize the need to establish credibility and support through thorough consideration of the most appropriate procedures for selecting members (e.g., selection by a neutral third party, nominations by stakeholder groups, or popular election), providing logistical/administrative support staff and technical experts, and ensuring members maintain contact with the groups they represent. Ultimately, the actual operation of a CAP reflects the intentions of the organization convening the CAP and the extent of independence encouraged.

Citizen Advisory Panels work best when there are clear goals and adequate resources.

A review by Lynn and Busenberg (1995) suggests that the influence of CAPs on policy outcomes is highly variable from case to case. When advisory groups are convened largely to fulfill legal mandates or to serve as persuasive mediums, their impact is minimal. However, when the goals and purposes of involvement are clear, the group is given adequate resources to accomplish those goals, and an outside, neutral facilitator is used, advisory groups can be very effective. Under the right circumstances, citizen involvement can be an effective mechanism for facilitating a cooperative relationship with the public. Most crucial is that a CAP must have a clear sense of its goals and purposes; otherwise its members are left frustrated and doubt-

ful about what their efforts are accomplishing. Without a purpose, members may lose interest and stop participating.

5.2.2 Decision Analysis

Another consultation method that has advanced greatly in recent years - "decision analysis" - can facilitate the structuring of import risk analyses by involving interested and affected stakeholders early in the risk assessment process. Decision analysis is a technique grounded in the social context of decisions and highlights the subjectivity of probabilities and outcome values defined by individual stakeholders (Slovic & Gregory, 1999). The diverse views of non-expert but interested and affected parties are sought and assessed with sensitivity to issues of equity, personal control, catastrophic losses, or other factors deemed important by those involved (von Winterfeldt & Edwards, 1986). Decision analytic techniques are strongest where the decision problem at hand has no clear solution, as may be the case for some quarantine risks.

Decision analysis is strongest where the problem has no clear solution.

Decision analysis decomposes decision processes into several components: (i) option generation (identifying alternative courses of action); (ii) value assessment (evaluating the attractiveness or aversiveness of the consequences that may arise from each course of action); (iii) uncertainty assessment (assessing the probability of each consequence actually happening); and (iv) option choice (integrating all the above considerations via a defensible decision rule to select the best course of action). Understanding how individuals may differ from one another at each stage is important because anticipating exactly where in the decision process differences may occur helps to reduce conflict. Furthermore, for top-down risk communications to be effectively implemented (i.e., for directives from regulatory bodies to be effective in shaping public perception or behaviour), a bottom-up examination of individual judgment and decision making is necessary to elucidate how the messages are being interpreted and used.

6 Recommendations

The success of Biosecurity Australia's public communication and consultation rests on achieving significant attitudinal and behavioural change, both in the delivery of the IRA service and in the communities to which that service is provided. Without this change in attitudes and behaviours, public involvement in communication and consultation efforts will fail. It follows, then, that Biosecurity Australia needs to take responsibility for initiating and maintaining the required cultural change.

The formulation and implementation of communication and consultation strategies by Biosecurity Australia must serve the organization's vision and objectives. The primary goal is the long-term and short-term betterment of public participation in the import risk analysis process while adhering to the international obligations Australia has as a member of the World Trade Organization and a signatory to the SPS and TBT Agreements. Crucial to

achieving this goal is a range of supporting objectives, outlined in the step-by-step recommendations below. The recommendations are summarized in Table 3 and then described in more detail.

Fundamental to following any of the steps recommended below is Biosecurity Australia's commitment to an in-depth, ongoing dialogue with the public and internal cultural change. Developing an approach plan based on the recommendations must be done with an understanding of: What is important to Biosecurity Australia? Exactly what does Biosecurity Australia want to achieve with greater public participation in the immediate future and ten years from now? How will Biosecurity Australia and the public know when these goals and objectives have been met? What is the current and future role of Biosecurity Australia (e.g., regulator, proponent, both) in public communication and consultation aspects of import risk analysis? What processes can Biosecurity Australia commit to in order to achieve its goals? In short, engaging in an ongoing dialogue with the public is very difficult and a clear strategic plan for public communication and consultation is essential for developing and maintaining an effective public participation process.

Table 3. Recommendations for Improving Quarantine Communication and Consultation

Urgent steps recommended

1 Establish a knowledge base from the extant literature about what makes Citizen Advisory Panels effective

2 Develop a training package of real-life examples of import risk analyses in Australia

Short-term steps recommended

3 Develop and test pilot Citizen Advisory Panels as a method for ongonig interaction between Biosecurity Auystralia staff and the public

4 Develop and test methods for training Biosecurity Australia staff in effective approaches to stakeholder interactions

Long-term steps recommended

5 Close the gaps in basic knowledge of rural Australian reactions to import risks

6 Develop methods for ongoing links between import risk assessments and social science

7 Examine the potential for a regional approach to public involvement

6.1 Establish a Knowledge Base from the Extant Literature about What Makes Citizen Advisory Panels Effective

To achieve effective consultation with local communities, the proper development and use of several CAPs is recommended. A critical underpinning of this new approach at Biosecurity Australia should be a knowledge base about what makes CAPs effective. A knowledge base can be established immediately by reviewing the extant literature on successful and unsuccessful examples of CAPs convened previously. The review should pay special attention to:

- How to determine goals and objectives of CAPs.
- Who to include on the panel and how to select them.
- Exactly what the panelists will do - who they will interact with and how (CAPs are most effective when their goals and purposes are clear).
- Special features of CAPs used by government (as opposed to private) organizations.
- Ways of anticipating and preventing problems (e.g., hijacking of the process by special interest groups that represent a minority view).
- What resources are required for effective functioning of CAPs.

6.2 Develop a Training Package of Real-life Examples of Import Risk Analyses in Australia

In addition to a good theoretical understanding of what makes CAPs effective, a package of good quality training material is essential for maximizing the returns from CAPs. The training package could also be used in staff development programs aimed at improving the community-interaction skills of subject matter experts employed by Biosecurity Australia. Developing a training package should be given urgent attention and should involve (i) identifying community members' knowledge deficits and (ii) collating materials that illustrate the IRA process and historical interactions between Biosecurity Australia staff and stakeholders. More specifically, the package development should:

- Identify (through interviews with Biosecurity Australia staff and community focus groups) what scientific and other concepts members of the public need to understand better to be sufficiently informed to make a valuable contribution to solution-oriented quarantine policy development and implementation. (For instance, community knowledge deficits may relate to the basic conceptualization of risk and risk assessment procedures as well as more general facts about international obligations and how resilient the Australian economy is in light of different import standards.)
- Identify educational material that can be used to fill in knowledge deficits and to bring CAP members "up to speed" about why and how an IRA is done.

- ➢ Identify (through mass media database searches) graphic case material that can be used to highlight the communication and consultation problems that have been encountered previously in real-life interactions between Biosecurity Australia staff and stakeholders.
- ➢ Select and refine group teaching tools that best convey the key messages of the material collated.
- ➢ Develop mechanisms for evaluating the effectiveness of the training package so that it can be refined with use.

6.3 Develop and Test Pilot Citizen Advisory Panels as a Method for Ongoing Interaction between Biosecurity Australia Staff and the Public

Once the extant literature on CAPs has been reviewed and a basic training package developed, several "pilot" CAPs should be formulated and implemented. It is recommended that Biosecurity Australia commission research aimed at determining the optimal conditions for effective use of CAPs in the Australian quarantine context. The research methods should:

- ➢ Directly involve Biosecurity Australia staff in the development and implementation of the pilot CAPs.
- ➢ Identify Biosecurity Australia staff's goals and objectives for the CAPs and compare these goals and objectives with what CAPs can actually do. (The *match* between the organizational context and the realistic benefits of CAPs need to be in tune for successful implementation of CAPs.)
- ➢ Identify distinct horticultural regions in which to develop CAPs that can address Biosecurity Australia's goals and objectives. For instance, one CAP in each of the Mildura, Murrumbidgee, Toowoomba areas may be appropriate if Biosecurity Australia wants to ascertain views and concerns about a particular commodity (e.g., fruit(s) grown in those regions) or about a set of issues concerning particular communication strategies.
- ➢ Select panelists according to the method(s) identified through the literature review as most appropriate given Biosecurity Australia's intentions for the CAPs.
- ➢ Launch each CAP with the training package (described above) of educational material and real-life examples of the IRA process and problems encountered.
- ➢ Outline clear guidelines about what each CAP's purpose is and what will be done with the information generated from the CAPs (otherwise panelists will feel used if they do not see evidence that their involvement has made a significant impact on policies or programs).
- ➢ Focus all CAPs on one general goal (e.g., identifying the criteria Biosecurity Australia needs to meet to achieve public support) and one specific goal (e.g., serving as a "test bed" for developing a communication about a current IRA issue).

- ➢ Employ structured interactions that engage panelists in the task of searching for ways to allow diverse stakeholders (motivated and unmotivated) to collaborate in action planning.
- ➢ Evaluate CAPs' performance on key indices of (i) knowledge change (e.g., Did panelists' understanding of the scope of the IRA process improve?), (ii) attitudinal change (e.g., Did panelists' trust in the IRA process or in Biosecurity Australia staff increase?), and (iii) satisfaction (e.g., To what extent did panelists believe that the CAP process was useful?)
- ➢ Assess the sensitivity of CAPs' performance to potentially influential factors such as panel composition (e.g., Did changes in knowledge, attitude, or satisfaction differ according to individual variation in panelists' socio-demographics, prior attitude, or worldviews?).

6.4 Develop and Test Methods for Training Biosecurity Australia Staff in Effective Approaches to Stakeholder Interactions

Cultural change cannot occur in the general community without cultural change among those delivering the IRA process. Ongoing training for Biosecurity Australia staff is therefore needed to facilitate the acceptance and understanding of excellent stakeholder interaction skills. It is recommended that Biosecurity Australia develop and evaluate methods aimed at engaging subject matter experts in a learning process in which they improve their public communication and consultation skills. The training methods should:

- ➢ Draw on in-house and external expertise to determine how scientific analysis is interpreted, trusted, and converted into action in a community.
- ➢ Identify in-house ways to plan for up-coming public communications and consultations on specific IRA topics (the planning techniques should encourage movement from divergent thinking, which allows multiple perspectives to emerge, to convergent thinking, which channels interests into actionable form).
- ➢ Include hands-on practice and peer-review with group process techniques (e.g., videotaped mock public meeting).
- ➢ Identify behavioural observations and attitudinal assessment techniques that can be used to evaluate the communications and consultations during practice sessions and once they have occurred in real-life.

6.5 Close the Gaps in Basic Knowledge of Rural Australian Reactions to Import Risks

Dramatically enhanced understanding of stakeholder perceptions of import risks is fundamental to improving quarantine communication and consultation. One approach (e.g., through CAPs) involves installing and operating sensitive tripwires to facilitate early detection and careful evaluation of pub-

lic opposition to an emerging hazard. Such monitoring has considerable long-term practical significance. Just as crucial, however, is a long-term commitment to systematically investigating stakeholder perceptions of, and reactions to risk, using state-of-the-art psychometric assessment tools. It is recommended that Biosecurity Australia commission basic research addressing three main questions:

6.5.1 How Are Import Risks Characterized in Rural Australian Communities?

The knowledge base of how rural Australians perceive current and potential import risks is poor. Sustained attention must be given to research aimed at understanding the nature of the diversity in rural communities and how this interacts with import risk analyses. The idea behind characterizing risk attitudes is that they are believed to be causally related to behaviour. Sometimes the link between attitudes and behaviour may not appear to be strong, but even small correlations may have large practical importance (Slovic & Peters, 1998). Behaviour is predicted best from a combination of attitudes, subjective norms, and personal characteristics such as perceived control, so survey measures will need to be multidimensional, reflecting at least the factors outlined in the previous sections.

In addition, to determine the potential for risk communication and consultation with different groups, assessments will need to address:

- Who is included in rural communities in different geographical regions?
- What do they know/ not know about import risks (controversial and noncontroversial) relevant to their region?
- What is important to community members in different regions?
- How diverse are their values and attitudes?
- What are their histories of hazardous exposure and how have they reacted?
- What is the relative importance of quarantine risk(s) compared with other types of (imposed and voluntary) regulated risks?

6.5.2 How Do People Learn to Live with Risk?

An important long-term issue for Biosecurity Australia is determining how people learn to live with risk. We have a strong knowledge base of what factors influence people's perceptions of new technologies, but we do not understand well how people learn to live with risk. The best way to address this question is to begin with focus group methods designed to elicit in-depth views on how individuals have learned or failed to learn how to live with risk. The responses to these groups could then be used in more systematic research on interventions designed to facilitate risk acceptance. The research methods should permit the collection of data that can be used to answer questions such as:

- ➢ What is the role of Biosecurity Australia in facilitating people's ability (i) to live with risk and (ii) to live with the increasingly globalized economic environment?
- ➢ Is technological progress simply outstripping people's capacity for change or is it acting more subtly on individuals' psychological responses to change?
- ➢ What value conflicts arise when people are learning to live with risk and technological/environmental/economic change?
- ➢ Do enriched information environments or broader policy and program options help people move through the tasks more effectively?
- ➢ How can the deep investment in the imagining of Australia as an island be used to engender greater levels of risk tolerance?

6.5.3 What Is the Best Way of Communicating Import Risk in Rural Australian Communities?

The success of specific messages and methods for communicating risk in rural communities will depend on systematically testing the effects of critical features of communications and consultations on a case-by-case basis. Research methods should:

- ➢ Examine the relative effectiveness of different ways of framing messages (e.g., different types of risk comparisons).
- ➢ Determine which community values (e.g., treasured way of life) cannot be expressed meaningfully in economic terms and/or cannot be traded-off or compensated for with more of another value (e.g., employment opportunities).
- ➢ Evaluate the effectiveness of alternative communication methods (e.g., narrative or story-telling techniques vs. traditional cost-benefit analysis reports) in improving rural people's comprehension of risk messages and integration of multiple pieces of information in risk judgments.
- ➢ Sample from at least three distinct horticultural regions that will be targeted with the communication(s) and at least one region that will receive no communication (and thus provide a comparison control group).

6.6 Develop Methods for Ongoing Links Between Import Risk Assessments and Social Science

The socially constructed nature of risk means that survey responses are likely to change over time and are likely to be volatile if, for instance, an issue is embedded in an unstable socio-political climate. To this extent, caution must be used in the interpretation of and extrapolation from survey results conducted at an earlier time. One way to supplement the survey approach is to include social scientists in specialist risk assessment working parties. However, a more cost effective way to facilitate the inclusion of socio-psychological factors into quarantine policies and programs may be

to develop a Social Science Advisory Panel. Such a panel might consist of a small group of three to four people who would attach Biosecurity Australia to a line of knowledge outside the organization and translate the implications of social science research to Biosecurity Australia. This would allow access to social science on a continual basis, not a one-shot study basis (and thus would be a less high-risk proposition). The panel could advise on issues such as compliance communication, media reporting, and case-by-case risk characterizations. Similar to the development of CAPs at Biosecurity Australia, it is recommended that a thorough review of extant literature and consideration of the unique Biosecurity Australia context is made before trialing a new panel.

6.7 Examine the Potential for a Regional Approach to Public Involvement

One final recommendation flows naturally from the literature reviewed above. The finding that perceptions of new technologies vary across people because different things are important to different people implies that public participation policies and programs may be most effective if they are tailored to specific regions and peoples. Thus, Biosecurity Australia should pause to consider seriously what regionalization of policies and programs is possible. Biosecurity Australia needs to examine the limits of federal policies and programs and explore the potential for effectively developing and implementing quarantine communication and consultation procedures that vary region by region. Perhaps a generic approach and fundamental standards could be specified at a national level and then the degree and method of public participation could be determined at a regional level for specific imports in specific communities (with the proviso that the national standards are met). Case studies where a regional approach has worked successfully and unsuccessfully should be reviewed to examine the feasibility of the approach for specific import risks and populations. In short, recognizing and reflecting the diversity of cultural values among Australians, especially in rural areas, is essential to planning any action that requires a partnership with the wider community. Specific social, political, and geographical challenges need to be met with innovatively tailored communication and consultation strategies.

7 Conclusion

Import risk analysis can be improved with steps that are sensitive to the socially-constructed nature of risk.

New technologies and products present many opportunities and challenges. How can Australians take part in the opportunities offered by increasing globalism without sacrificing our natural resources, cultures, and ongoing viability as a wealthy and healthy nation? The research reviewed above highlights the socially constructed nature of risk and the need for quarantine policies and programs that are sensitive to features of risks and individuals that determine risk perceptions and risk acceptability. Something as simple as monitoring public risk perceptions and testing risk communication messages in specific regions will improve Biosecurity Australia's ability to navigate the technically and ethically complex issues in import risk analysis. More complex tasks, however, such as understanding how people learn to live with risk and maintaining an ongoing dialogue with the public will be more challenging to accomplish and require critical attention. Taking advantage of the knowledge and methods already available in the fields of risk perception and decision research and tailoring and improving them for the Australian context will be an invaluable step forward for both Biosecurity Australia and the broader community.

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9 Appendix: Literature Search Methods

Initially, articles relevant to this report were identified by searching four social science databases with FirstSearch, including PsychInfo, SocAbstracts, EconLit, and the Public Affairs Information System (PAIS). General and specific search terms were used in the searches, including quarantine, import risk, disease outbreak, disease control, perceived risk, stigma, trust, biotechnology, bioengineering, genetic engineering, genetically modified organisms, mad cow disease, bovine growth hormone, flavor saver tomato, Mediterranean fruit fly, gypsy moth, monarch butterflies, food safety, oil spills, weeds, and marine biosecurity.

Additional useful articles were identified through the reference lists of articles obtained from the above searches and communication with individuals working in fields related to environmental risk perception research in Australia, New Zealand, and elsewhere. A request for information was also sent via e-mail to members of the Society of Judgment and Decision Making.