

## **Submission**

### **Comments re: Application A1092:**

Irradiation of specific fruits: apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash

**prepared by**

**Food Irradiation Watch  
PO Box 5829,  
West End QLD 4101  
[www.foodirradiationwatch.org](http://www.foodirradiationwatch.org)**

**Supported by  
Gene Ethics  
Friends of the Earth  
MADGE  
GM-Free Australia Alliance**

## Executive Summary

We recommend that FSANZ reject proposal A1092 on the following grounds:

- Irradiation of apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash would adversely affect the nutritional value and safety of significant components of the Australian and New Zealand food supplies.
- Combined with fruits and vegetables already approved for irradiation, this proposal would constitute a major reduction in the nutritional value and safety of the human food supply in both countries, yet A1092 is being assessed in isolation from its total dietary context.
- Irradiated pet food was responsible for the death and injury of a significant number of cats in Australia, leading to its ban. Until the mechanisms of these adverse health impacts are fully explored and understood, and negative impacts on humans and other species are absolutely ruled out, no irradiated foods should be allowed to enter the human food supply.
- The Queensland government has a clear conflict of interest by being both the applicant for A1092 and, as a member of the Legislative and Governance Forum on Food Regulation, being one of the final arbiters of the decision on its own application.
- The nutritional and safety assessment process lacks scientific rigour, relying heavily on unpublished – non-peer-reviewed research submitted by the applicant.
- The Legislative and Governance Forum on Food Regulation (the Forum) has been derelict in its duty to canvass all potential management, chemical and technical replacement options to follow the final phase-out of fruit fly insecticides. These chemicals have been under APVMA review since the mid-1990s because of their known toxicity to humans. A thorough process to review all fruit fly control options should precede any further approvals to irradiate fresh fruits and vegetables.
- FSANZ also ignores the numerous alternatives to irradiation that exist for achieving the stated phytosanitary goals of A1092.
- The Forum and FSANZ have been derelict in their duty to protect the public health and safety, by failing to facilitate the much earlier and more timely phase out of highly toxic dimethoate and fenthion in which fresh fruits and vegetables were dipped to control fruit fly larvae.
- In its cost/benefit statement, FSANZ inflates the claimed benefits of approving A1092 while diminishing the impacts of the known hazards, risks and costs of irradiating apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash - impacts that the whole community will bear.
- Labelling requirements are weak and there is no way to visually distinguish between irradiated and non-irradiated foods. Thus shoppers depend on the integrity and comprehensiveness of irradiation labelling.
- As there is no simple, reliable and affordable test for irradiated foods, it is difficult for state and local authorities to monitor them in the marketplace and to enforce the labelling requirements.
- Despite the assessment's claims that the public has the right to know and decide what foods to buy, the future labelling of all irradiated foods is not assured, as the Forum has commissioned FSANZ to

review (with the intention of terminating) all labelling requirements on irradiated food products. The “review” is expected to commence this year (2014).

- Despite FSANZ' claim, there is no reliable and contemporary evidence that the Australian and New Zealand public are aware of, or will consent to, the widespread irradiation of the fresh fruit and vegetable supply;
- No other countries (or states) expressly require the irradiation of apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash, so approval of A1092 cannot be claimed to be a mechanism for harmonization of trade regulations.

**We call on FSANZ to adopt option 2 and reject A1092 which seeks permission to irradiate apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash. The grounds for our recommendation are:**

- the safety and nutritional integrity of irradiated foods is not established;
- the application and the assessment are flawed in the ways we discussed above;
- the technological need for this irradiation has not been established;
- irradiation is not the only effective option for fruit fly control that exists or is used now;
- the assessment has no cost/benefit analysis of other phytosanitary measures;
- FSANZ must ensure a whole systems approach is used that would guarantee - or at least make accessible – other approaches to quarantine solutions;
- A1092 offers no credible benefits to Australians or New Zealanders;
- if A1092 were approved, the Australian and New Zealand public would be unfairly and unnecessarily exposed to further risks, costs and hazards;
- exporting apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash may expose local growers to greater competition from imported produce, further reducing or wiping out local production;
- if further fresh foods were approved, only full, honest irradiated food labelling would support public confidence in the wholesomeness of Australian foods and the integrity of the food industry itself.

As a matter of urgency, and in the public interest, we call on FSANZ to:

- Decline approval for the irradiation of apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash**
- Refuse any further irradiation approvals *and to***
- Cancel all previous irradiation approvals.**

## Contents

1.	Executive Summary.....	2
2.	Introduction.....	5
3.	Overview of Concerns.....	7
4.	Flawed Assessment & Regulatory Bias.....	8
5.	Detailed Comments re Safety, Dietary Modelling and Consumer Preference	
	a. Dietary Modelling.....	12
	b. Safety Assessment .....	12
	c. International precedents.....	14
	d. Summary of available literature on consumers and food irradiation.....	14
6.	Failure to Benefit Consumers: Critique of Cost Benefit Analysis.....	16
7.	Failure to Demonstrate a Technological Need.....	18
	a. The false choice between irradiation and pesticides.....	18
	b. Irradiation-free trade.....	19
	c. International phytosanitary obligations.....	21
	d. Summary of concerns re Technological Need.....	22
8.	Harmful to Australian Farmers: Market access is only half the story.....	23
	a. Irradiation facilitates imports.....	23
9.	Consumer Awareness and Labelling.....	24
	a. Australia & New Zealand: Failing to meet world standards.....	25
	b. Overview of regulations in CODEX.....	26
	c. Regulation in other countries.....	27
	d. Labelling recommendations.....	27
10.	Conclusion: A1069 Must be Rejected.....	28
11.	APPENDIX A: Other problems with labelling.....	29
12.	APPENDIX B: Consumers' knowledge of and attitudes towards irradiation.....	33
13.	APPENDIX C : Nuclear concerns.....	36
14.	Supporting Organisations.....	37
15.	References.....	39

## 2. Introduction

FSANZ's Food Regulation Review Process has a clear, legislated mandate to protect public health and safety. This mandate is also reflected in the UN *Codex Alimentarius*, where protection of public health and safety is paramount, and issues of free trade and food promotion are also secondary.

FSANZ consideration and approval of Application A1038 to allow the irradiation of persimmons and A1069 for the irradiation of tomatoes and capsicums revealed serious shortcomings in the process of safety assurance. The major areas of our concern we raised in our submissions related to the lack of objective standards for safety and risk assessment, the processes used to determine these, and the quality of dietary modelling used to predict likely consumption patterns. Our legitimate concerns and representations were ignored.

Similar flaws are apparent in FSANZ's assessment of Application A1092, which combined with irradiated tomatoes and capsicums represents quantum leap in risk to public health because of the much large per capita intake of the proposed fruits by the Australian and New Zealand public.

We therefore recommend that Application A1092 be **rejected** on the basis that:

1. Public health and safety has not been adequately demonstrated by the scientific data available and therefore **cannot** be guaranteed
2. The technical data that the nuclear industry and the Queensland Government submitted are an inadequate basis for a robust assessment
3. Claims for commercial and economic benefits from approving A1092 are **erroneous** and **unsubstantiated**
4. Claims for consumer acceptance of irradiated foods are **biased** and **unsubstantiated**.

We also recommend that the appropriate, precautionary public health response to official advocacy for irradiation technology and its sterilized products is to:

- Initiate a **moratorium** on the irradiation of all foods in Australia and New Zealand, and the importation of irradiated food products, until independent and competent experts have fully explored the aetiology of the toxic effects observed in cats that ate irradiated animal feed
- Maintain this **moratorium** until the demonstrated increase in allergenicity associated with irradiation has been specifically and experimentally discounted in apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash and other food approved for irradiation
- Overhaul** FSANZ assessment protocols used to evaluate the safety of irradiated foods, to incorporate these new understandings of potential toxicity in mammalian species (Specifically, leukoencephalomyelopathy and allergenicity)
- Place the onus for addressing these **safety concerns** on the applicant government, and the nuclear and horticultural industries which utilize food irradiation.

Though labelling is not the subject of Application A1092 per se, the promise of labelling is used to suggest that shoppers will have their right to know met and will have the option of avoiding irradiated food if they so choose. The assessment fails, however to inform the public, that the requirement for mandatory labelling for irradiated food is soon to be reviewed – with the clear bias towards its removal.

In correspondence to Senator Nick Xenophon, Health Minister Fiona Nash has stated that the purpose of the review of mandatory labelling is to *“assess whether there are better ways to communicate the safety and benefits of irradiated food to consumers.”*

In correspondence with Food Irradiation Watch, Victorian Minister for Agriculture and Food Safety Peter Walsh stated

*“The review [of mandatory labelling requirements] has been requested to assess whether this is a more effective approach to communicate the safety and benefits of irradiation to consumers. The FoFR noted that improving consumer confidence in irradiation will reduce disincentives for increased uptake and broader application of the technology by industry.” (Dec 18, 2013)*

A plan to increase “uptake” is not an acceptable rationale for the removal labelling in a democracy – particularly one in which the market is meant to be based on informed consent of consumers. Irradiation labelling, in fact, needs to be more stringent and more tightly monitored and controlled. The current labelling regime is inadequate as it leaves a majority of irradiated foods either unlabelled or deceptively labelled. For instance, irradiated apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash will not require individual labelling.

We call on policy-makers to amend Food Standard 1.5.3 to require irradiated is all labelled as such and that non-packaged irradiated foods such as fruit and vegetables are individually labelled. Labelling must include the words **“irradiated”** or **“treated with radiation”** or **“treated with irradiation”**.

Our call for strict labelling is made in the public interest, to satisfy everyone’s right to know that foods were made or processed using technologies specified in Food Standard 1.5. This does not signify our support for food irradiation.

The scientific evidence on irradiated foods is, at best, divided and unresolved in its conclusions on their safety. New research and real-life experience in Australia suggests that irradiation can have serious health impacts, at the very least on domestic animals. The precautionary principle should, therefore, be rigorously applied. No monitoring or long-term studies have been conducted on the human consumption of irradiated foods yet a clear health impact has been demonstrated in cats in Australia.

**The onus is on the irradiation industry to prove food irradiation safe. This Queensland Government application and FSANZ assessment fail this test.**

### 3. Overview of Concerns

On August 28, 2014, Food Standards Australia New Zealand (FSANZ) announced a six week public consultation for Application A1092, an application made by the Queensland government for approval to irradiate apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash.

Herbs, spices, herbal infusions and nine tropical fruits, persimmons, tomatoes and capsicums had been approved for irradiation in Australia and New Zealand. Pet foods, medicinal goods, and seeds and grains for animal consumption may also be irradiated. These are not classified as “food” under Australian law as they fall under different regulations and require no labelling.

We oppose the irradiation of apples, apricots, cherries, honeydew melons, nectarines, peaches, plums, rockmelons, strawberries, table grapes, zucchinis and scallopinis (summer squashes).

- We have unresolved concerns about the wholesomeness of irradiated food as well as the environmental and social impacts of irradiating our food, especially our fresh fruit and vegetable supply.
- We are alarmed at apparent regulatory bias expressed through the lack of scientific rigour applied to FSANZ’s assessment of irradiated food.
- We do not believe that the applicant has proven there is a technical need for the approval of irradiation of these fruits.
- We question the benefit of irradiation as a market access tool for producers and we believe that any perceived benefits for consumers are outweighed by the costs.
- We have further concerns that despite constant re-iteration throughout FSANZ draft approval that irradiated food is labelled, FSANZ’ document fails to mention that it will conduct a “review” of mandatory irradiation labelling this year – with the Ministerial Forum’s explicit intention of removing the mandatory labelling requirements.

While acknowledging in its assessments and fact sheets that irradiation may deplete vitamin and nutritional content, FSANZ has so far justified irradiation approvals on the basis that the approved foods made up a minimal part of the Australian and New Zealand diet.

But that will dramatically change if irradiated apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash are approved as these foods along with tomatoes and capsicums are regularly consumed as a core part of the diet by many members of the Australian and New Zealand public.

At best, scientific opinion around the safety of food irradiation remains divided. There is little data to support any claim that irradiation has been proven safe as no long term studies of the human consumption of irradiated foods have been conducted. FSANZ concedes that irradiation induces both vitamin and nutritional depletion, and changes to chemical make up in treated foods. These invisible impacts occur on top of any changes/depletion due to storage, cooking, and processing of these foods.

Despite FSANZ’s support and proponents’ claims, irradiation has not been proven safe, as no long-term studies of consumption of an irradiated diet have been conducted. Indeed, SD1 states clearly “consumption data are not available.” (SD1 page3)

*“The USA is the second greatest user of food irradiation by volume after China. No consumption data are available, but the amounts sold into the retail trade are known approximately. As the foods*

*have been retailed for several years in a few thousand retail outlets (Eustace & Bruhn 2006), it may be presumed that retailers are actually selling most of the product.” (SD1 page3)*

Safety cannot be “presumed.” With “no consumption data available” a scientific statement as to the safe consumption is –let alone the safe consumption for 30 years – is unprovable – and unacceptable.

The whole approach to scientific substantiation in this proposal is concerning, especially with regard to its over-generalisation of the very meagre 'safety' studies to date and the consequent misrepresentation of the potential impact of this expansion of irradiated foods on nutrition and public health. Some of our concerns elaborated further below are:

- The paucity of published accounts of the effects of irradiation on the integrity of folate. The proposal states that only impacts on vitamin C and beta-carotene are relevant. The applicant should provide DIRECT, PUBLISHED and PEER-REVIEWED evidence that folate integrity is maintained.
- The failure to address the food component category collectively known as flavonoids. These various compounds are found almost exclusively in vegetables and fruits and have been linked to risk reduction/prevention of a range of cancers and coronary heart disease. This application provides NO evidence that flavonoids are not modified when exposed to irradiation.
- The failure to address new research indicating that irradiation has the potential to modify the tertiary structure of proteins, representing the risk of generating allergenic epitopes. FSANZ and the applicant have still not adequately addressed this concern in either the application or the various responses.
- FSANZ has not adequately dealt with the misinterpretation of the results of dietary intake studies.

Finally, and of most concern, is the process by which the application and all the issues it raises are being considered. The applicant is the Queensland Government, which also participates as a member of the Forum in the health and safety assessment of the application. This clear conflict of interest casts substantial doubt on the Forum’s and FSANZ capacity to protect the public health of all Australians and New Zealanders. This uncertainty undermines consumer confidence.

Between 2008 and 2009, approximately 100 Australian cats developed neurological disorders which led to their paralysis and, in some cases, death. The cause was identified as the consumption of irradiated cat food imported from Canada. As a result, irradiated cat food is now banned in Australia. These cases of harm to animals are clear evidence that irradiation may also have negative health impacts on humans. The European Food Safety Authority has stated that an impact on humans cannot be ruled out. As no robust scientific evidence has ruled out this possibility all irradiated foods should be excluded from the human food supply immediately.

FSANZ has suggested that the impact of irradiated food on cats was species-specific, however FSANZ now acknowledges that the US Food and Drug Administration (FDA) is also investigating the possibility that consumption of irradiated food led to the serious consequences for dogs. Species-specificity is an assumption made by FSANZ– not a scientific fact. Research indicating potential neurological impacts on cats, was produced prior to the irradiation of cat food for the Australian market. Despite known risks, regulators allowed irradiation to take place, recommending irradiation as a quarantine measure. It was irresponsible for the regulators to promote irradiation in light of the known risks – a similar situation involving other animals, including humans, cannot be ruled out.

Exposing food to ionizing radiation disrupts its molecular make-up, producing free-radicals and potentially other toxic chemicals such as benzene and formaldehyde.

Ionising radiation also creates new chemicals called “radiolytic products”, some of which do not usually occur naturally in food. The impacts of these have not been adequately studied. One, 2-ACBs, has recently been found “to promote the cancer-development process in rats, cause genetic damage in rats and cause genetic and cellular damage in human and rat cells.”

“Irradiation destroys and disrupts vitamins, proteins, essential fatty acids and other nutrients in food – sometimes significantly. It can destroy up to 80 percent of vitamin A in eggs and 48 percent of beta-carotene in orange juice.”

Irradiation produces free radicals in food and has been linked to health problems such as nutritional deficiencies, immune system disorders, and genetic damage.

Another concern is the risk of irradiation being used to mask poor production practices and breach of standards. Irradiation can kill most bacteria in food, but it does not remove the faeces, urine, pus and vomit that often contaminate meat or the pests, faeces, or other matter that may contaminate herbs, spices, or fruit and vegetables. Re-irradiation is also permitted under revised Standard 1.5.3 to deal with post-irradiation contamination and is inadequately monitored.

Application A1092 suggests that irradiation is necessary to kill fruit fly larvae, in particular Queensland fruit fly, to enable increased trade of apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash grown in areas that are potentially fruit fly infested.

This use of irradiation as a “phytosanitary” measure enables corporations to transport and trade food at the expense of the public health, a cost that we all bear. This is important to note in A1092 as several of the proposed fruits are not grown – or not grown in significant quantities – in Queensland. It can be presumed, therefore, that this Application is to facilitate the importation of irradiated produce from overseas or interstate.

Globally, approval of irradiation for phytosanitary purposes is the exception –not the norm. Irradiation is not a substitute for a holistic fruit fly management plan and promotion of irradiation as an “alternative” to chemical use is disingenuous. Irradiation is a post-harvest “treatment” that it will be used on top conjunction with other chemicals/pesticides in “conventional” agricultural mass production.

Providing shoppers with nutritionally depleted and potentially harmful foods to protect and expand interstate or overseas trade is unacceptable.

Aware that members of the public see irradiation as a “high risk, low benefit” technology, FSANZ repeatedly seeks to legitimise the process by stating that a technological “purpose” for irradiating food has been established. In fact, a technological “need” for irradiating food does not exist. The many other alternatives for fruit fly treatment must be thoroughly explored before resorting to irradiation but this process has not been undertaken.

### **3. Flawed Assessment and Regulatory Bias**

Australians and New Zealanders expect our food regulator to be scrupulous, stringent and non-biased in its assessment of new foods under Standard 1.5. Research shows that the public have faith in the government to look after public interest. FSANZ is also expected to adhere to internationally recognised standards of peer-review for the science it relies upon when making decisions and present relevant science with honesty and integrity.

But in this case FSANZ has let the public down by basing its assessment on evidence tainted with a pro-irradiation bias- relying on research conducted by the applicant for its main assessment of nutritional impacts of irradiation, and concluding that based on previous information presented by the applicant no further dietary assessment should be required.

Earlier this year, FSANZ published a report “Nutritional impact of phytosanitary irradiation of fruits and vegetables (February 2014). This report is primarily a literature review which draws heavily for current validation on unpublished research conducted by the proponent of this application.

FSANZ bases much of its assessment of this Application on the findings of the above report, non-independent – non-peer-reviewed investigations and its previous assessment of Application A1069 for the irradiation of tomatoes and capsicums. That assessment was also based on unpublished research that the applicant submitted. The standards set for scientific rigour are well below what the scientific community would expect from our regulator: at least peer-reviewed by independent experts.

FSANZ is mandated to ensure that new food processing and treatment systems and processes are safe. So we expect FSANZ to reject this application until the scientific basis for the applicant’s claims has survived the rigours of academic and scientific peer scrutiny.

## **Detailed Comments re Safety, Dietary Modelling and Consumer Preference**

The public is asked to assume the risks of irradiation for the benefit of a few minor operators who want to trade freely in fruits and vegetables. This application places the health and safety of millions of citizens below the interests of the Queensland Government and its backers, even though they have many other options for managing fruit fly.

For instance, while treatments may vary according to desired outcome, some of the alternatives currently in use include:

- Cold storage
- Cold treatment
- Heat/steam, vapour treatment
- Hot water dips
- Atmospheric control with oxygen, carbon dioxide or nitrogen
- Physical disinfestation, i.e. cleaning or washing
- Hygienic and safe production management practices
- Pest exclusion zones
- Early harvesting
- Organic production and handling methodologies

### **5a. Dietary Modelling**

FSANZ’s approval of earlier applications (herbs, spices, tropical fruits, persimmons) were justified partly on the basis of the relatively low intake per capita of these foods. But the present application and the recent approval of tomatoes and capsicums represents a quantum leap in the risk to Australian and New Zealand public health, given the very high levels of intake of these foods. Dietary modelling indicates that the inclusion these 12 fruits in the already excessive list of allowable foods is a substantial increase in what amounts to an experiment on the effects of intake of irradiated food on a national population.

## 5b. Safety Assessment

We are highly concerned that the issues we raised about FSANZ's general approach to safety assessment and dietary modelling in previous assessments (A1038 – Persimmons and A1069 – Tomatoes and Capsicums) have been either ignored or trivialised in this latest assessment.

The FSANZ position of “no toxicological hazards” is incorrect, since it makes no reference to new evidence of an allergenic effect from low doses of irradiation. This allergenicity is due to the protein, rather than lipid, content of the food, which undermines FSANZ's contention that the low lipid content of fruits makes toxicity unlikely.

For example, there is a paucity of published accounts of the effects of irradiation on the integrity of folate. The proposal states that only the integrity of vitamin C and beta-carotene are relevant. Scurvy and vitamin A xerophthalmia are extremely rare in Australia, so the sole focus on vitamins C and A are spurious. Folate is relevant to nutrition in Australia, as inadequate folate intake has prevalent consequences such as neural tube defect, despite the fortification of the bread supply with folate.

For example, zucchini contains 17 micrograms per hundred grams of folate. The EAR for young women is 320 micrograms per day. Despite widespread fortification of cereal products, the preferred sources of folate are vegetables and fruits. Any potential deterioration of folate in these foods would represent a significant public health risk. The applicant should provide DIRECT, PUBLISHED and PEER-REVIEWED evidence that folate integrity is maintained.

Another example is the food component category collectively known as flavonoids. These various compounds are found almost exclusively in vegetables and fruits and have been linked to risk/prevention of a range of cancers and coronary heart disease. Flavonoids are complex organic molecules, and thus potentially radio labile. Apples are a major source of quercetin in the Australian diet. Cherries are one of the few foods that contain peonidin and likewise strawberries are an important source of anthocyanidins. This application provides NO evidence that flavonoids are not modified when exposed to irradiation.

We previously have raised the concern that whilst high irradiation will obliterate food proteins, at the lower dosages proposed, irradiation has the potential to modify the tertiary structure of proteins presenting the risk of generating allergenic epitopes. A recent study has shown that smaller irradiation dosages (~1 Gy) can render protein more allergenic than either non-irradiated protein, or protein irradiated at a higher dosage. It has been speculated that this effect may be due to increased exposure of conformational and linear epitopes resulting from the formation of partially unfolded and aggregated species in response to irradiation. Prevalence of allergies to vegetables and fruits are low, but not insignificant, and most likely due to reactions to glycoprotein food components. FSANZ and the applicant have still not adequately addressed this concern in either the application or the various responses. We also have previously identified serious misinterpretation of dietary intake studies which FSANZ has not adequately addressed.

FSANZ has belatedly acknowledged the feline pathogenic model for toxigenicity related to consumption of irradiated food despite providing no insight into the exact mechanisms involved in this toxic effect. To arrive at the conclusion that these effects are indeed cat-specific, other animal models would need to have been tested. It is incumbent upon FSANZ to present these data to substantiate their conclusions). Until the specific mechanisms of toxicity are elucidated, it is irresponsible to declare these observations “not relevant” to humans. A pertinent analogy is that thalidomide is not teratogenic in rodents, but is devastating for humans *in utero*. On this basis, it is remarkable, and indeed irresponsible, that FSANZ categorically deems this model to be irrelevant to human health.

Contrary to FSANZ's implications, irradiated food is not “chemical free” since irradiation causes the accumulation of radiolytic compounds, such as alkylcyclobutanones, to levels not seen in untreated food.

There are at least five radiolytic biomarkers available to test for irradiated food (namely n-pentadecane, 1-hexadecene, 1,7-hexadecadiene, n-heptadecane and 8-heptadecene). The chemical changes to meat in response to irradiation are detectable, repeatable and specific.

Claims that no significant change to fruit occurs due to irradiation are also misleading. Delayed ripening – an acknowledged and sometimes sought-after outcome of irradiation - is indicative of major, biologically significant compositional change. Claims that macronutrient content are unaffected is also incorrect and misleading. Irradiation causes substantial documented changes to both proteins and lipids.

## **5c. International precedents**

FSANZ justifies approving the application - in part “by virtue of consistency with other international regulations on irradiated food”. This is misleading. While some countries have general approvals for fruits and vegetables, the 12 fruits specified in A1092 do not generally require irradiation of for any purpose.

In a search on the IAEA irradiation authorisation database “***Irradiated Food Authorization (IFA) Database (IFA)***” of the proposed 12 fruits, only strawberries came up as specifically listed for irradiation in a few instances. None of the others were listed specifically for any country.

FSANZ also cites the Codex revised standard on irradiated food (2003) in support of their proposed approval. However, this Codex document predates the emergence of well-documented, but little understood, serious toxic effects of the consumption of irradiated food.

## **5d. Review of consumer attitudes: Consumer rejection of irradiated food.**

Both industry and governments know that irradiation is highly unpopular with Australians and New Zealanders and that synthetic chemicals have fallen out of favour too. So many people will find a problem with the unpleasant “choice” this application purports to offer: irradiation or organophosphates.

Appendix B also comments on Australian’s rejection of irradiated foods. Recent surveys, industry reports and even media from irradiation supporters acknowledge consumer opposition or concern about the technology and point to a need for marketing strategies to gain public acceptance if the irradiated food industry is to grow. Unfortunately for the consumer, the industry sees clear and accurate labelling as a threat to, rather than a marketing strategy for, irradiated food.

Research commissioned by irradiation supporters themselves reveals little public awareness about irradiation and consumer hesitation to support it. An overview of some of the issues brought up by recent tomato and capsicum approvals appeared in The Land. It clearly articulates retailer concerns about consumer perception of irradiation- Woolworth’s basically states that identifying products as irradiated will be a death-knell to their purchase. The article reveals market research in to inaccurate or deceptive statements such as “cold sterilisation” which would make irradiation more palatable to the consumer. Ultimately, “The survey results showed that even when informed, irradiation was not the preferred treatment method among consumers. “Some of the key points follow:

### **“In the eyes of the public**

Perhaps the biggest battle facing the further implementation of fresh produce irradiation is public awareness.

Retailers have expressed concern over public resistance to the very term irradiation” and a consumer backlash against them.

Woolworths declared it is not willing to “go it alone” on the introduction of irradiated produce to the public.

When questioned about the company’s position at the Horticulture Australia Limited (HAL) November 2012 Forum in Sydney, Paul Harker, head of produce, Woolworths said the industry needed a united voice on the subject before it proceeds.

“It’s going to be an extremely emotional product and we are not going to stand alone trying to convince Australian consumers that there is nothing wrong with **irradiation**,” **Mr Harker said.** **“We’ve communicated that back to industry and we said unless there is a concerted campaign that is led not only by the people peddling irradiation as an alternative, but unless the government and everyone else is involved in actually talking to the customer about it, the last thing I am going to do is plonk it on my shelf because I can tell you that fresh produce sales will die. People won’t shop there.”** (our emphasis)

An Aldi spokesperson said the supermarket chain had nothing to say about the topic. Fairfax Agricultural Media contacted Coles for comment but received no reply.

Last year, Ausveg commissioned a Klein Partnership research study into consumer attitudes toward irradiated produce.

The research found that just over half (56 per cent) of respondents were aware of methods used to control insect pests on fruit and vegetables.

A total of 81pc of respondents said they were aware that chemical spraying and dipping was used as a treatment method.

Just over a third (33pc) were aware of irradiation.

The survey results showed that even when informed, irradiation was not the preferred treatment method among consumers.

Although grounded in concerns over public health, the act of suspending dimethoate and fenthion increased public suspicion over what chemicals are still being used.

The Klein Partnership research found wariness of the products increased in survey subjects when told the names of the chemicals.

In response to other treatment methods, methyl bromide received some negative reactions when labeled as such, while cold disinfestation was found to be the “least intimidating” method with some saying it sounded similar to refrigeration.

The survey found 88pc of respondents would accept cold disinfestation as a treatment method, while 42pc said they would accept irradiation.

“Interpretively, for irradiation to be successful, it would require significant investment in public education,” the report said.

Murray Lynch, CEO of the sole irradiation business currently in Australia, Steritech, said generally, consumers are not as welcoming of the application new technologies to food production as they are in other areas.

“Consistent with this attitude, consumers can tend to be uncertain and wary of food irradiation when first introduced to the technology,” he said.

“This is usually due to questions about product safety and quality derived from the mistaken association of the technology with radioactivity.

“Nonetheless, where there are clear benefits to them as consumers – particularly in terms of food safety, quality and price – people tend to be positive towards food irradiation.

“This is backed by consumer attitude studies from around the world.”

<http://www.theland.com.au/news/agriculture/horticulture/general-news/irradiation-pros-and-cons/2665981.aspx> The Land Irradiation: pros and cons Ashley Walmsley 31 Jul, 2013

### **Consumer awareness- consumer concern**

In 2013, FSANZ approved the irradiation of tomatoes and capsicum. The application for approval came from Queensland Department of Primary Industries; a key rationale was to expand Queensland/Australia tomato exports markets to New Zealand. While the New Zealand government – and even the conventional tomato industry – supported the irradiation approval as a quarantine measure, the issue of labelling was seen as a key area of concern.

The ensuing debate provides some of the most recent – and local - information about consumer awareness and attitudes in our region. In June 2013, 72% of respondents to on New Zealand Herald on-line survey expressed concern about irradiated food:

On June 23, 2013, the New Zealand Herald published these outcomes to its online survey:

Are you concerned about irradiated food? 7050–7100 votes

I'm very concerned and would never touch any ray-treated food	40%
I'm a little worried, but want to see more information	32%
I'm not concerned about it at all	24%
Bring it on, I want to see what it tastes like	4%

[http://www.nzherald.co.nz/opinion/news/article.cfm?c\\_id=466&objectid=10892295](http://www.nzherald.co.nz/opinion/news/article.cfm?c_id=466&objectid=10892295) Tomatoes will test our trust Sunday Jun 23, 2013

In its Dec 2012 Industry newsletter, Cherry Growers Australia – a supporter of irradiation for cherries identifies consumer reluctance to purchase irradiated food.

#### *Consumer awareness*

*There is very limited awareness and understanding of irradiation in primary industry and among consumers.*

*There is abundant scientific evidence that irradiated food is toxicologically safe, and presents no special nutritional or microbiological problems, but there is a need for good information to be made available to consumers and producers alike.*

*There is limited information available on consumer attitudes for Australian markets, although new consumer research has just been completed as a HAL/AUSVEG initiative. The Klein Partnership (TKP) consumer survey included irradiation as a choice when gauging consumer opinions, offering*

several alternatives which included irradiation among others. The TKP survey confirmed that in general;

- consumers are unaware of food irradiation
- consumers become more accepting of irradiated food with well-targeted information
- consumers prefer options that can be seen to reduce chemical residues, including irradiation as a low-chemical option
- un-informed, or mis-informed consumers hold similar views on irradiation, fumigation and insecticides.

[http://www.cherrygrowers.org.au/assets/cga\\_newsletter\\_201212.pdf](http://www.cherrygrowers.org.au/assets/cga_newsletter_201212.pdf)

Cherry Growers Australia Inc December 2012 - No 8

History of opposition in Australia and New Zealand: A huge campaign against food irradiation in the 1980s resulted in a 10-year moratorium, lifted in 1999, with little public fanfare. Opinion surveys conducted for FSANZ, along with other reports, have repeatedly found that irradiation is still a little known process and that irradiated foods do not have wide public acceptance.

One of Canada's largest ever food recalls took place In September/October 2012: E. coli contaminated beef. Canadians are responding skeptically to the immediate promotion of irradiation as a solution. An overwhelming majority of those commenting on an article on the Canadian Broadcasting Corporation website oppose irradiation and see this as a false solution. In Australia, when food irradiation applications have been open for public comment, an overwhelming majority of respondents have also been opposed.

## 6. Failure to Benefit Consumers: Critique of Cost Benefit Analysis

The cost-benefit analysis makes dubious claims in regards to the benefits and costs for Consumers, Industry and Government. A full set of comments and remarks have been listed below in regards to the Costs and Benefits provided by FSANZ in the Cost Benefit Chart.

### OPTION 1: ACCEPT APPLICATION 1092

#### Government Benefits

**Claim: Additional pest disinfestation treatment which may facilitate trade when some methods are not accepted or are being phased out e.g. some chemical treatments.**

***Our response:*** *The fact that irradiation “may” facilitate trade, is conjecture. ”*

**Claim: Possible enhanced economic development in rural and regional Australia.**

***Our response:*** *The possibility of enhanced economic development is also conjecture – it is not weighted against other “possibilities” such as – irradiation leading to the “possible” decline of rural markets due to competition from imported products produced more cheaply and irradiated as a quarantine treatment. It is also not weighted against the possible growth of the organics industry –which does not allow for irradiation – and is one of the world’s fastest growing industries.*

#### Government Costs

***Our response:*** Costs that have not been considered include:

*Approving an extra 12 Fruits and Vegetables for irradiation – particularly those which are commonly consumed in Australia will increase costs associated with labelling and monitoring such as testing and enforcement as there will be a larger number of fruit and vegetables to track. This is not only the case for Australian grown produce, but also the monitoring of imports, which may also be irradiated.*

*Costs associated with healthcare impacts from nutritional depletion, allergenicity, and other identified risks.*

*There is potential for costs to occur in the process of changing and updating of legislation. In the future there is potential that costs may arise in regards to extra waste etc. leading to environmental or health damage.*

*Opportunity cost in the fact that money spent on approving irradiation of these 11 Fruit and Vegetables could be spent on other initiatives or searching for a cheaper, safer alternative to chemicals been phased out.*

### **Industry Benefits**

**Claim: Availability of an alternative internationally-endorsed phytosanitary measure when the current chemical-based treatments are restricted. Other postharvest options for example, heat treatments, cold disinfestation, fumigants, new insecticides are available, although unsuited for use for particular fresh produce due to possible phytotoxicity and quality issues, length of treatment time, as well as costs or the time frame needed to gain approval from quarantine authorities.**

**Our response:** *Whether it is internationally endorsed or not is up for debate which may limit its potential to facilitate trade. Irradiation's legislated approval in certain countries does not indicate consumer acceptance of irradiated food.*

**Claim: Increased shelf life and quality of fruit and vegetables, depending on the dose.**

**Our response:** *FSANZ must be called upon to clarify the meaning of the above statement. Any claim that irradiation IMPROVES the quality of food must be supported with peer-reviewed science. This is a marketing statement – and a dangerous precedent from our regulator – in particular as the claims are not relevant to the purpose upon which this application is presented – Phytosanitary measure. As the regulator FSANZ knows that irradiation approvals are made for the specific purpose of the application. The rationale for this application was phytosanitary control for quarantine purposes. Irradiation is not being approved for the purposes of shelf- life extension or “increased quality” and may not be done so even if this application is approved. FIWatch understands this claim to be an inference to situations in which irradiation has been promoted for microbial control. Proponents of irradiation for microbial control claim it improves the quality as it “destroys harmful micro-organisms.” The elimination or neutralisation of certain micro-organisms may have some benefit- but must be evaluated in relation to destruction of beneficial micro-organisms, nutrient depletion and the production of radiolytic compounds in irradiated food – Irradiation changes the quality of food - with all factors weighted one cannot assert that it “increases” quality. Furthermore, as the regulator FSANZ should know that whether or not, there is a case of irradiation for microbial contamination, this application DOES NOT ALLOW FOR IT. Further applications for the approval of irradiation for microbial control would need to be processed if it were to be. FSANZ should not act as a de-facto promoter of irradiation and should certainly not make claims/rationalise irradiation on grounds irrelevant to this application.*

**Claim: Assistance and maintenance of the economic viability of an important segment of the horticulture sector.**

**Our response:** *\*Potential for\* the above, it is not a definite outcome and should be stated that way.*

**Claim: Increased trade opportunities and increased markets available to growers due to an alternative treatment being available to meet quarantine requirements. Permission to irradiate could facilitate market access to New Zealand.**

**Our response:** *This is still conjecture. Furthermore – for NZ growers the increase of imported produce can be threatening to their markets.*

**Claim: Introduction of a cost-effective technology in relation to other alternative treatments (hot water, vapour heat treatment, cold or heat treatment) without some of the inherent quality issues that alternative treatments may cause.**

**Our response:** *This is a vague statement without quantifiable details: The CBA should present the figures on the costs of other treatments so that an informed analysis can be made. The meaning of the “inherent quality issues that alternative treatments may cause” must also be explained –qualified for any meaningful assessment to take place. The use of the word “alternative treatments” should be re-considered. Irradiation is in fact the “alternative” as non-irradiation of these fruits is the status quo – the norm.*

**Claim: Reduction in the costs of using pesticides**

**Our response:** *As above the actual estimated costs of any “reduction” in pesticide use needs to be quantified. Irradiation is a post-harvest process and will not necessarily lead to the reduction of pesticides in the planting through harvesting phases of crop production – it will be used in conjunction.*

### **Industry Costs**

**Our response:** *A number of potential costs have been ignored. Approving irradiation for the 12 fruits and vegetables will open up the market to irradiated imports, which has potential to create more competition for Australian farmers, reducing their share of the market and therefore revenue.*

*There is also potential for job loss in the industry as not everyone would be able to make the switch to irradiation.*

*A lack of scientific research on the impacts of irradiation on chemicals and pesticides in crop production. Irradiation is a post-harvest process and will not necessarily lead to the reduction of pesticides in the planting through harvesting phases of crop production – it will be used in conjunction.*

### **Consumer Benefits**

**Claim: Possibly greater year-round availability of these commodities in some markets/regions in Australia and New Zealand.**

**Our response:** *This claim is outright conjecture. “Possibly” greater year-round availability of these fruits. There is great scope in growing climate and production practices which enable both countries to supply their markets. Imports of these commodities are already impacting on the ability of local growers to sell their produce. It is therefore unlikely that irradiating them would significantly impact on their availability.*

**Claim: Possibly better quality fruit and vegetables depending on the dose of irradiation, as other treatments (such as heat and cold) can affect fruit and vegetable quality.**

**Our response:** *This also is purely unsubstantiated conjecture and also raises alarm bells. If irradiation is to occur, one would expect the regulator to ensure a dose that is the least detrimental possible. This statement raises concerns about the suitability of a dosage range and uncertainty about the process and its*

*appropriateness. Also presentation of the quantity irradiation also affects quality and will not be used in lieu of other treatments and food processes. Irradiated food will be subject to cold storage for transport purposes.*

**Claim: Produce may be transported for longer periods while maintaining desirable sensory qualities for consumers.**

**Our response:** *“Maintenance of desirable sensory qualities” is not maintenance of food quality. Consumers do not benefit from (being tricked in to) purchasing food that looks good but is actually be less nutritious -of poorer quality. If this were a true quantifiable benefit-it would be to industry/producers –not consumer. It is not listed in the Industry section of this CBA as it is conjecture and calls in to question as to whether consumers will choose food that is older (and of poorer nutritional value) and has been irradiated to maintain its fresh appearance. According to ACCC fresh food is food that is as marketed as close to possible at production point (with minimal manipulation).*

**Claim: Provides choice to consumers wanting to avoid exposure to other treatments such as chemicals and the resulting residues in those foods.**

**Our response:** *Irradiation is a post-harvest process and will be used in conjunction with chemical treatments/ pesticides in the planting through harvesting phases of crop production. Irradiation will be used on top of pesticides and be followed by other food transport and processing treatments/practices.*

**Claim: Approval of these commodities may increase competition in the marketplace, improve seasonal availability and increase price competition.**

**Our response:** *Once again, conjecture.*

### **Consumer Costs**

**Our response:** Costs to Consumers that have not been considered include:

*Potential for loss of vitamin intake depending on the amount of irradiated produce consumed.  
Health risks associated with consuming irradiated food.*

*For consumers who do not choose to eat irradiated produce there is a time cost involved, as consumers will have to look closely at labelling to differentiate between irradiated and non-irradiated produce.*

## **OPTION 2: MAINTAINING PROHIBITION**

### **Government Benefits**

**Our response:** *Government lives up to its mandate to protect public health and benefits through engendering peoples trust in the food regulatory systems. The public have over 30 years expressed their disapproval of and concern about irradiation.*

*Government is involved in promoting and maintaining Australia’s global reputation for clean, green, wholesome food.*

### **Government Costs**

**Our response:** *The fact that no costs were identified with non-approval suggests that there has been no international demand for Australia to market irradiated food.*

## Industry Benefits

**Our response:** Major benefit as local producers will not have to compete with irradiated overseas products. Irradiation is an import-enabling tool – not just an export enabling tool. Approvals allow for imports of irradiated produce. Australian producers cannot compete with cheaply produced irradiated products from overseas.

Opportunities to invest in and develop non-chemical non-radiation-sourced solutions to quarantine matters (which is what people around the world are demanding – with the organics market being one of the fastest growing market/industries in the world)

Opportunities for research and development of broader pest-free systems.

Maintenance of Australia's reputation as a clean, green food producer.

Less risk of jeopardising organic industry.

Less risk of confusion re differentiating between irradiated and non-irradiated products. The current push to remove labelling of irradiated products may see complete shoppers rejection of all produce potentially irradiated as consumers cannot enact their choice.

Food producers who choose not to irradiate will not have to bear the costs entailed in differentiating their fresh and non-irradiated products with irradiated products.

## Industry Costs

**Claim:** Costs in research and development incurred in an attempt to identify alternative treatments as existing chemical or other treatments are phased out.

**Our response:** The reviews of the major chemicals in question were initiated/flagged in 1995 - there has been a long period of potential R&D time – it is unacceptable that industry and government push irradiation on to the market as a substitute for bona fide research and development of alternatives to chemicals.

## Consumer Benefits

**Our response:** Refocusing of energy and development of local economies and local producers.

**Claim:** A potential cost to consumers was identified as the possible limitation of the supply of some fruits and vegetables due to the phase out of chemicals that normally reduce fruit fly disinfestation. If there was not an efficacious alternative treatment, such as irradiation, there is a strong possibility that the fruit and vegetable supplies will decrease and prices may increase.

**Our response:** Approximately 80% of canned tomatoes are imported though Australia industry – which is now looking for markets. The problem is loss of markets through global competition and failure of Aus/NZ governments to support and protect local industries. Irradiation will not solve the root cause of the erosion of markets.

FSANZ is mandated to ensure that Australians and New Zealanders have access to safe and healthy food. Despite dismissing even the known and accepted detrimental impacts of irradiation and omitting any risks from the Cost/Benefit Analysis, FSANZ fails to show that this Application would provide any benefits to shoppers. At best, FSANZ claims irradiating these fruits may provide “possibly better quality” which we refute and “possibly greater availability.” Which is unnecessary.

Either way, these and the other claimed possible benefits are irrelevant to guaranteeing the public a nutritious, safe and healthy food supply. A1069 provides no tangible benefits but carries many known risks, hazards and costs.

We recommend that FSANZ adopt Option 2 and reject the application.

## **7. Failure to Demonstrate a Technological Need**

The technological need to use irradiation as a quarantine measure has not been established in this Application.

No other country in the world specifically call for the irradiation of apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, table grapes, zucchini and squash. Indeed, only strawberries mentioned on the International Atomic Energy Agency's (IAEA) irradiation authorization information portal as being approved for irradiation.

Application A1092 suggests that irradiation is necessary to control the spread of fruit fly, in particular Queensland fruit fly, to allow greater trade of food grown in potentially fruit fly infested areas. Though Queensland has lodged this application, the Victorian Government recently acknowledged that its attempts to contain fruit fly infestations in the state had failed and that it would not continue to fund control measures. This suggests that irradiation may also become a fruit fly control measure throughout the country if other options remain unexplored.

Irradiation is not a substitute for a holistic approach to fruit fly and other pests.

### **7a. The false choice between irradiation and pesticides**

Two toxic chemicals, fenthion and dimethoate, nerve inhibiting pesticides are used in Australian horticultural production. They are both under review, with dimethoate already prohibited and fenthion seemingly extended/still under review. Use of these organophosphates is severely restricted overseas because of their public health impacts. Australian growers have known about potential health problems with these chemicals since the review of fenthion began in 1994 and dimethoate was announced in 1995, but not begun until 2005. Despite the reviews, Australian growers, under pressure from supermarket chains and large food corporations, continued to use these chemicals because it was cheaper than to establish good production practices that produce quality, healthy food. The many years since the reviews were announced have not been used to develop positive, safe and healthy food production practices or to explore options for growing fruit and controlling fruit fly without chemicals. The status quo continued.

Now, governments and industry claim fenthion and dimethoate were necessary for "cost-effective" market access. They are urgently pushing for another dubious post-harvest decontamination treatment to be used in their place: food irradiation. Other potential methods, systems and materials are ignored.

The phase out of toxic chemicals is a cause to celebrate and should be lauded as a chance to review and improve food production practices. As it is, however, we are being offered a false choice, the swapping of one toxic industry for another dangerous and toxic one.

Irradiation as a "phytosanitary" measure, in this case irradiating food to control fruit fly, benefits food corporations wishing to transport and trade volumes of food at the expense of the public health. Providing nutritionally depleted food and putting us all at risk in order to protect or expand trade and markets is unacceptable and not in keeping with FSANZ objectives.

As mentioned earlier, FSANZ is aware that the public see irradiation as a “high risk, low benefit” technology, and repeatedly attempts to legitimise the process by falsely claiming that a technological “purpose” for irradiating food has been established. A technological “need” for irradiating, however, has not been established.

### **Irradiation to control bugs**

Irradiation is not a “clean” alternative to chemicals. Irradiation for “phytosanitary control” is actually a prime example of the use of irradiation in lieu of healthy and environmentally sustainable production systems and practices.

In 1986, Queensland DPI produced research promoting the post-harvest use of dimethoate and fenthion for controlling fruit fly on tomatoes. The research states: “the insecticides dimethoate and fenthion as high volume spray (flood) treatments can disinfect tomatoes post-harvest with levels of security similar to ethylene dibromide for other fruits, but with the added advantage of handling efficiency and without phytotoxic or tainting effects.”

35 years on, this research has proven faulty. APVMA is in the process of banning this use of these chemicals because they harm human health. Queensland is Australia’s largest producer of fresh tomatoes and the pressure is on to maintain its markets. (Victoria produces the most tomatoes for processing and also now has widespread fruit fly infestations) The Queensland government then presented its own, new, unpublished research to secure approvals to irradiate tomatoes and capsicums in lieu of using these toxic chemicals. Now it is following suit with A1092.

Once again, the Queensland government is getting it wrong.

Irradiation will not be used as a total substitute for chemical use in food production. Irradiation is a post-harvest treatment that would be used in conjunction with other chemicals applied pre-harvest, raising further concerns about the effects of radiation on pesticides and their metabolites on foods – and the lack of data on the risks. Unless there is a thorough review of all chemical uses in food production, or fruit and vegetables are organically grown, chemicals will still be used in the growing of fruits and vegetables.

There is no technological need for irradiation to replace dimethoate and fenthion.

Australia was the only country permitting dimethoate to be used for post-harvest pest control so other producers found other options. Indeed, the chemicals taskforce phasing out dimethoate has proposed numerous chemical alternatives. Non-chemical options, such as organic production also exist.

There is simply no need to irradiate fresh fruits and vegetables as there are numerous alternatives.

As mentioned above, some of the alternatives currently in use include:

- Cold storage
- Cold treatment
- Heat/steam, vapour treatment
- Hot water dips
- Atmospheric control with oxygen, carbon dioxide or nitrogen
- Physical disinfestation, i.e. cleaning, washing
- Hygienic and safe production practices
- Pest exclusion zones
- Early harvesting
- Organic production

Irradiation is not a substitute for holistic control for fruit fly and other pests.

## **7b. Irradiation-free trade**

Numerous practical chemical-free and irradiation-free options are available. They pose little or no health risk to the public so using irradiation as a phytosanitary measure – to protect markets – is insupportable. Irradiation as a mandatory protocol for trade in food is the exception, not the rule, around the world. This is highlighted by the existence of non-chemical and non-irradiation trade protocols to and from Australia for the products approved for irradiation in Australia and New Zealand. For example, some Australian chemical and irradiation-free treatments of Rambutans, Mangoes, Longans and Lychees follow:

### **Australian Fruit Growers wash their fruit for access to Japan**

The method is simple: after harvesting, the fruit is washed. It is then coated with food-grade/edible oil to seal the fruit against contamination and pests. Australian Rambutans are now exported to Japan using this method. Water and edible oil maintains the integrity of organic products, which are not allowed to use synthetic chemicals or irradiation, facilitating trade in both organic and conventionally grown fruit.

### **North Queensland Mango growers expand market with “Modified Atmosphere”**

“Mango growers in the Burdekin and Atherton Tablelands have created a small operation to process second grade mangoes. (Tableland Export Coop Ltd). This has been based on R&D commissioned to create a sliced mango product using MAP (Modified Atmosphere Technology). This produced a “fresh” mango slice with an extended shelf life (up to 6 weeks in a commercial environment). It has the advantage of being no mess, ready to use, discards 60% by weight of a whole fruit, with a high value to weight ratio and easier access to markets as a processed product ... The distributor has advised that market enquiries already far exceed the capacity of the plant to produce.

The same group hopes to produce a fresh avocado product ... Trials have been completed with positive results using second grade fruit ... Trials have also commenced on a similar pawpaw product.

Initial discussions have been held with growers in the Northern Territory, with the prospect of expanding and extending these operations across Northern Australia.”

### **Non-chemical alternatives for trade and intrastate commerce**

Many products are already traded globally without the use of chemicals or irradiation, including foods Australia has approved for irradiation. A combination of regulation, specific harvest practices, non-chemical cleaning, inspection and certification can be sufficient to allow products into Australia or to facilitate intrastate trade. Australia should promote these alternatives in its own production and advocate for these methods for import and export approvals.

### **Longan and lychees may be imported from China and Thailand after:**

- ♣ cold treatment (CT) or vapour heat treatment (VHT) for the management of fruit flies;
- ♣ cold treatment or orchard control, inspection and remedial action for the management of litchi fruit borers;
- ♣ inspection and remedial action (i.e. withdrawal, re-export, destruction or further treatment) for the management of mealybugs and soft scales; and
- ♣ operational maintenance and verification systems.

### **Mangos may be imported from India after:**

- ♣ vapour heat treatment (VHT) or hot water treatment (HWT) for the management of fruit flies;
- ♣ designated pest free places of production or production sites for the management of mango pulp weevil and mango seed weevil; and
- ♣ inspection and remedial action (with VHT or HWT) for other quarantine pests such as red-banded mango caterpillar, mealybugs and scale insects.

**Alternatives used in interstate trade in Australia:**

- ♣ standard physical treatments, such as washing;
- ♣ maturity and condition standards like hand-green condition - picking unripe fruit to avoid its infestation with pests, and unbroken skin;
- ♣ cold treatment or heat treatment;
- ♣ area freedom, such as Fruit Fly Exclusion Zones.

**The Organic option:**

Organics is one of the fastest growing industries in Australia. Irradiation is not allowed in “Organic” production practices. Organic producers have been successfully supplying the increasing global organic market without using either synthetic chemicals or irradiation.

**More examples:**

Radio frequency Heating of Persimmon Fruit as a Treatment for Control of the Mexican Fruit Fly, Hot water dips kills insects in bananas and pawpaw, cold storage kills fruit fly in grapefruit, steam treatment kills some forms of fruit fly in mangoes ... The US Department of Agriculture developed an “acoustic coupler” which detects fruit fly larvae vibrations when the larvae eat the fruit, and infested fruit can then be removed. CSIRO has been conducting feasibility trials for the use of Ultra-high Pressure (UHP) processing for juices, jams and purees.

## 7c. International Phytosanitary obligations

The fact that irradiation is accepted/listed as an international phytosanitary measure is not a rationale for using irradiation for that purpose.. International Standards for Phytosanitary Measures, that mention irradiation, also identify many possible phytosanitary technologies and management processes and recommend a systems approach. Though irradiation is one possibility for post-harvest treatment it is easily avoidable as the existence of numerous other options shows. There is no technological imperative or requirement to irradiate, nor a situation in which irradiation is the only choice.

“In principle, systems approaches should be composed of the combination of phytosanitary measures that can be implemented within the exporting country. However, where the exporting country proposes measures that should be implemented within the territory of an importing country and the importing country agrees, measures within the importing country may be combined in systems approaches.

The following summarizes many of the options commonly used:

**Pre-planting**

- healthy planting material
- resistant or less susceptible cultivars
- pest free areas, places or sites of production
- producer registration and training.

**Pre-harvest**

- field certification/management (e.g. inspection, pre-harvest treatments, pesticides, biocontrol, etc.)
- protected conditions (e.g. glasshouse, fruit bagging, etc.)
- pest mating disruption
- cultural controls (e.g. sanitation/weed control)
- low pest prevalence (continuous or at specific times)

- testing.

## **Harvest**

- harvesting plants at a specific stage of development or time of year
- removal of infested products, inspection for selection
- stage of ripeness/maturity
- sanitation (e.g. removal of contaminants, “trash”)
- harvest technique (e.g. handling).

## **Post-harvest treatment and handling**

- treatment to kill, sterilize or remove pests (e.g. fumigation, irradiation, cold storage, controlled atmosphere, washing, brushing, waxing, dipping, heat, etc.)
- inspection and grading (including selection for certain maturity stages)
- sanitation (including removal of parts of the host plant)
- certification of packing facilities
- sampling
- testing
- method of packing
- screening of storage areas.

## **Transportation and distribution**

- treatment or processing during transport
- treatment or processing on arrival
- restrictions on end use, distribution and ports of entry
- restrictions on the period of import due to difference in seasons between origin and destination
- method of packing
- post entry quarantine
- inspection and/or testing
- speed and type of transport
- sanitation (freedom from contamination of conveyances).

## **7d. Summary of concerns re Technological Need:**

The Applicant has not established a technological need for using irradiation as a quarantine measure for apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash.

- Irradiation is not required by Australia’s trading partners and can be avoided for inter-state trade or trade between Australia and New Zealand.
- The benefits of using irradiation over cold-storage or other treatments have not been demonstrated.
- Comparative models have not been provided or assessed.
- No evidence is provided to ensure the safety of eating irradiated apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash.
- Numerous alternatives to irradiation exist, are already approved by trading partners and avoid the risks of potentially harmful chemicals and irradiation.

## **8. Harmful to Australian Farmers: Market access is only half the story**

While promoted as a “tool” to protect or broaden Australian markets, irradiation is more likely to further destroy the livelihoods of local small producers, family farmers, local horticulture, agriculture, organic and alternative food production systems.

Irradiation is a tool of large agri-business. Irradiation approvals in Australia would not benefit our farmers in the long term; as such approvals will also facilitate importation of those irradiated foods from overseas, where food can be typically produced more cheaply. Imports already play a key role in the demise of local markets. Now irradiation is touted as a tool to expand markets for those whose local markets are being destroyed by imports. Supporting practices that protect and develop local economies would make more sense.

The recent approval for the irradiation of tomatoes is a case in point. Since 2007, tomato imports have reportedly increased 40%, due to low domestic production, the high value of the Australian dollar, higher Australian labour costs and a legal challenge upholding market access through international trade agreements. As it stands, only 2 out of 10 cans of tomatoes sold in Australia are locally made. There is a surplus, not a shortage of tomatoes on our domestic market. In a move to increase output and lower production costs, Australia is already seeing its tomato industry move to large hothouse-style production, which has brought devastating impacts to smaller growers – closing Queensland’s (and Australia’s) largest tomato producer, SP Exports.

Irradiation cannot provide the solution to what is causing the tomato market’s demise: market saturation and competition created by large food corporations and supermarket chains. Australia’s weakened tomato industry was presented a temporary quick fix –“market access tool” –irradiation. Unfortunately this then brings further threat to other local economies – including New Zealand – while opening up Australia to further irradiated imports.

In the long term, it would be in Australian farmers’ interests to use alternatives to chemical fruit fly control and also reject irradiation. If public perception alone is not enough to deter food producers from irradiation, add the threat of increased competition from cheaply produced irradiated imports.

## **8a. Irradiation facilitates imports**

FSANZ suggests that irradiating the 12 specific fruits will have a trade enabling effect, facilitating interstate and international trade of Australian and New Zealand and providing shoppers with year-round access to seasonal fruit.

Approving the irradiation of these products in Australia and New Zealand, however, is also a de-facto approval for the importation of irradiated tomatoes and capsicums from overseas.

Supporting the importation of irradiated apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini and squash seems contradictory to the underlying intention of this application – to protect Australian apple, apricot, cherry, nectarine, peach, plum, honeydew, rockmelon, strawberry, table grape, zucchini and squash markets.

Trade harmonization is a major consideration for the WTO and irradiation proponents. Australia’s attempt to protect its tomato industry, for example, was been successfully challenged in the past. Allowing irradiation will potentially open the floodgates for irradiated imports while, at the same time, Australia’s failure to adhere to international labelling standards may penalize Australian export potential.

As Australia and New Zealand’s trading partners do not at the moment require the irradiation of apples, apricots, cherries, nectarines, peaches, plums, honeydew, rockmelon, strawberries, table grapes, zucchini

and squash there is no foreseeable trade/market benefit from this proposal and more likely a negative impact on local growers.

## 9a. Labelling inadequacies

Food Standard 1.5 requires novel food products with no history of safe use, and those from new technologies such as genetic manipulation and irradiation to undergo pre-market assessments and to be labeled. Another rationale for labelling is that the public has a right to know and make informed decisions about radically new foods that are unfamiliar and have no history of use.

So far irradiation approvals in Australia and New Zealand including, A1092, have claimed to offer shoppers more food options. However, most irradiated food is either poorly labelled or not labelled at all and the Forum, which represents all governments, is moving for removal of all labelling in 2014.

In 2011, the Blewett National Food Labelling Review asserted that as food irradiation was no longer a new technology the requirement to label its products be reviewed. This recommendation was based on the claim that irradiated foods had been on the market for over 30 years and are safe. In adopting or rejecting the Blewett recommendations last December, the Forum resolved that FSANZ review the labelling requirements with the intention that they be terminated by within two years.

While irradiation technology has been under development since the early days of the nuclear age in the 1950s, irradiated food has only been in the Australian market for since 2001. A huge campaign against food irradiation in the 1980s resulted in a 10-year moratorium, lifted in 1999, with little public fanfare. Opinion surveys conducted for FSANZ, along with other reports, have repeatedly found that irradiation is still a little known process and that irradiated foods do not have wide public acceptance.

The first approval, for irradiated herbs, spices and herbal infusions was in 2001, nine tropical fruits approved in 2003. But apart from a small amount of irradiated Australian mangoes and lychees sold in New Zealand, very few irradiated foods have been sold in either country. Interstate trade protocols for the sale of irradiated fruit on the Australian domestic market were only finalised this year. Any claim that Australians and New Zealanders have 30 years of safe experience of irradiated foods and that they have been widely available is clearly untrue. No long-term research has been done on the patterns of consumption of irradiated foods.

Irradiation has a longer history in a few other countries and the international food standards Codex Alimentarius requires that all irradiated foods be labelled. The USA, UK and Canada all have more stringent guidelines than Australian and New Zealand labelling regulations.

A lack of mandatory statements for irradiation labelling is unprecedented amongst other English-speaking nations and our trading partners. The mandatory individual labelling of individual products is the only mechanism that observes our right to make fully-informed choices about whether or not we, our families, pets and livestock will eat irradiated foods.

FSANZ suggests that irradiating these fruits will provide greater choice. However, we are not reassured as existing labeling requirements fail the public, are inadequate by global standards, and are under threat of complete removal.

The current labelling regulations fail because they do not:

- prescribe mandatory labelling statements;
- ensure individual labelling of irradiated products;
- require that products such as pet food and animal feed are labeled.

They also allow:

- wording such as “treated with ionizing electrons” which may be technically incorrect;
- wording that does not include “irradiation” or “radiation”;
- positive statements that may mislead;
- a sign near a point of sale to be displayed instead of individual products being labelled.

Misleading and deceptive labels have been used in Australia and NZ. For example:

**Ongoing:** Use of the labelling statement “treated with ionizing electrons” when the irradiation source used in Australia is actually gamma rays is technically inaccurate and misleading because of its failure to use any words that signify the treatment uses radiation;

**2005:** Mangoes exported to New Zealand from the Northern Territory carried stickers on which the average letter size was 0.6mm. The words “irradiated fruit” measured just 1cm;

**2006:** Mangoes exported to New Zealand were removed from an export case and sold without any labelling or signage;

**2010:** “Radurised” irradiated spices were imported from South Africa and sold in a major supermarket chain. A sticker on the top or bottom of the box named the importing company and the words “irradiated spices” (1.5cm) or “radiated spices” (2.5cm), product of South Africa. The actual packaging included the term “radurised” (7mm) which is not used in Australia and in some cases carried the Radura mark (total size with word radurised 8mm)

**2012:** On Feb 5, WA Senator Scott Ludlam received an answer to a question on notice at the October 19 2011 Senate Estimates informing him that a irradiated curry spices that he displayed to the committee were not properly labeled. The company had labeled the box that contained packaged irradiated curry spices but had failed to label the individual packets.

**It is imperative that FSANZ and state governments (the Forum members) enforce stricter labelling for irradiated products and ensures that all are labelled individually, fully and factually.**

## **9b. Australia and New Zealand: Failing to meet world labeling standards**

The international food regulatory body Codex Alimentarius, the EU and other trading partners all require mandatory labelling of irradiated foods. Their standards are:

### **9c. Codex Alimentarius**

GENERAL STANDARD FOR THE LABELLING OF PREPACKAGED FOODS (CODEX STAN 1-1985)  
Adopted 1985. Amended 1991, 1999, 2001, 2003, 2005, 2008 and 2010.

5.2.1 The label of a food which has been treated with ionizing radiation shall carry a written statement indicating that treatment in close proximity to the name of the food. The use of the international food irradiation symbol, as shown below, is optional, but when it is used, it shall be in close proximity to the name of the food.

5.2.2 When an irradiated product is used as an ingredient in another food, this shall be so declared in the list of ingredients.

5.2.3 When a single ingredient product is prepared from a raw material which has been irradiated, the label of the product shall contain a statement indicating the treatment.

#### GENERAL STANDARD FOR IRRADIATED FOODS (CODEX STAN 106-1983, REV.1-2003)

##### 7.3 Foods in Bulk Containers

The declaration of the fact of irradiation should be made clear on the relevant shipping documents. In the case of products sold in bulk to the ultimate consumer, the international logo and the words “irradiated” or “treated with ionizing radiation” should appear together with the name of the product on the container in which products are placed.

## 9c. Overview of regulations in other countries

### The European Union:

According to Article 6 of Directive 1999/2/EC any irradiated food or any irradiated food ingredient of a compound food must be labelled with the words “irradiated” or “treated with ionising radiation.”

### The United States of America:

Since 1986, all irradiated products must carry the international symbol called a radura. This must also be accompanied by the statement: “**Treated with irradiation**” or “**Treated by irradiation.**”

The Food and Drug Administration requires that both the logo and statement appear on packaged foods, bulk containers of unpackaged foods, on placards at the point of purchase (for fresh produce), and on invoices for irradiated ingredients and products sold to food processors.

Processors may add information explaining why irradiation is used; for example, "treated with irradiation to inhibit spoilage" or "treated with irradiation instead of chemicals to control insect infestation."

### New Zealand:

While FSANZ is a shared Australia and New Zealand authority, the New Zealand Food Standards Authority has in the past been more candid than FSANZ when informing its public on irradiated food labelling. New Zealand’s material clearly says that irradiated products like fruit will not be individually labelled.

“Under the Australia New Zealand Food Standards Code, which the New Zealand Food Safety Authority is responsible for enforcing in New Zealand, foods that have been irradiated must be clearly labelled showing that they have undergone this treatment.

For items such as fruit that do not carry labels, a statement must be displayed beside the produce stating that it has been treated with ionising radiation.”

### Canada:

Canadian law requires both the Radura mark and a written statement about irradiation to be on packaged irradiated products. Non-packaged irradiated products must carry both the Radura symbol and written statement to be “displayed immediately next to the food.”

The Radura symbol is required to “appear in close proximity on the principal display panel” or on the sign to one of the following statements or a written statement that has the same meaning:

- (a) "treated with radiation";
- (b) "treated by irradiation"; or
- (c) "irradiated".

#### **9d. Labelling Recommendations:**

Australia and New Zealand must label in accordance with global standards.

Appendix A includes our further concerns about the current Australia New Zealand labeling regime and a more detailed list of labeling recommendations. To ensure customer awareness and accurate information we recommend that Australia and New Zealand uphold international standards by requiring labelling with the words:

- irradiated (name of the food)
- treated with radiation
- or treated by irradiation

Our call for comprehensive labeling is intended to rectify the serious failings of the current regime and is not tacit support for irradiation. People have shown an aversion to irradiated food. Comprehensive, objective, factual, honest and mandatory labeling is the only assurance that shoppers can know and make the decision that suits them. Failure to do so is contrary to the public interest and unjust.

### **10. Conclusion: A1092 Must Be Rejected**

**We call on FSANZ to decide on option 2 and reject A1092 which seeks permission to irradiate. In brief, the grounds for our recommendation are:**

- the safety and nutritional integrity of irradiated foods is not established;
- the application and the assessment are flawed in the ways we discussed;
- the technological need for this irradiation has not been established;
- irradiation is not the only option for fruit fly control that exists or is used now;
- the assessment has no cost/benefit analysis of other phytosanitary measures;
- FSANZ must ensure a whole systems approach is used that would guarantee - or at least make accessible – other approaches to quarantine solutions;
- A1092 offers no credible benefits to Australians or New Zealanders;
- if A1092 were approved, the Australian and New Zealand public would be unfairly and unnecessarily exposed to further risks, costs and hazards;
- exporting irradiated may expose local growers to greater competition from, further reducing or wiping out local production;
- only full, honest irradiated food labelling would support public confidence in the wholesomeness of Australian foods and the integrity of the food industry itself.

## 11. APPENDIX A

### OTHER PROBLEMS WITH LABELLING

**Rather than loosening labelling regulations, Australia and New Zealand need to develop stricter, more accurate and more comprehensive labelling guidelines.**

To ensure that the public has the right to choose, we also call on FSANZ to:

- Mandate prescribed wording:
- Prohibit the use of the wording “Treated with Ionising Electrons”
- to mandate individual labelling of irradiated products, including fruit and the containers holding products irradiated in bulk
- to remove positive statements re the irradiation process **and**
- to prohibit the Radura symbol

**Mandate prescribed wording:** For accuracy purposes labelling must include the words: irradiation or treated with ionising radiation. (as above)

#### **Prohibit the use of the terms “TREATED WITH IONISING ELECTRONS”:**

The phrase “Treated with ionizing electrons” has been removed as an example in the Code, however it is still permissible as a labelling statement as these are determined by the industry. FSANZ has agreed that it is difficult to understand in its use of unfamiliar terms, does not indicate to the general public the use of radiation, and depending on the type of radiation used is technically inaccurate. Australian irradiation facilities use gamma radiation. Gamma radiation bombards the exposed product with high energy electromagnetic radiation and does not consist of electrons. X-ray irradiation, which is also permitted in Australia, is also high energy electromagnetic radiation.

#### **Mandate for Labelling and not signage**

Though FSANZ has updated its website to include info about food that does not require labelling, FSANZ’s assessment of A1092 and assessments in the past have repeatedly repeatedly asserted that consumers will have the choice as irradiated products will be labelled. The fact is that most fresh fruit falls into the category of food not otherwise required to bear a label. The requirement in this case is signage nearby at the point of sale.

According to the Cambridge English Dictionary, 1990, a “label” is “a slip of paper, &c., affixed to something stating name, contents &c.” A sign nearby at point of sale is not a label.

We have previously mentioned the case Australian irradiated mangoes imported into New Zealand, removed from a labelled carton and sold without any labelling or signage. This case was exposed simply because a person who saw the mangoes for sale was an environmental and consumer advocate who knew that Australian mangoes sold in New Zealand were irradiated. This coincidental discovery of an infraction of labelling regulations begs the question “how many other such cases are there that are not being monitored?” While the EU conducts regular checks into irradiation and labelling, we are not aware of any checks being conducted by FSANZ. In light of the lack of regulatory follow-up, a regulation that allows products to go unlabelled is begging to be breached! Comprehensive and mandatory individual labelling would alleviate this problem and would provide the public with the assurance that when FSANZ says a product is labelled, it is actually labelled.

**Positive statements:** FSANZ currently allows the inclusion of positive statements alongside irradiation labelling. Examples of such that have been used in Australia or New Zealand are: treated with irradiation – “to protect New Zealand’s environment” or “to destroy harmful micro-organisms”. Irradiation is known to change the molecular structure of a product and to deplete vitamin and nutritional content. Permitting the

use of a positive statement about the process without any requirement for potential negative impact of the process is biased and inappropriate for fair consumer education.

**Radura symbol:** Furthermore, we oppose the use of the Radura symbol and call for FSANZ to disallow its use as it is misleading and deceptive, therefore breaching FSANZ’s duty of care and legal obligations to the public.

The Radura symbol, permitted but not required, on irradiated products in Australia, has clearly been designed to lead the public to believe that the process is “clean and green”. The design consists of a plant inside a circle, which is dashed on the top, reported to represent radiation. There are two commonly used versions of this symbol, (below) the international version and the version required on irradiated food in the US. The Radura symbol is strikingly similar to the US Environmental Protection Agency logo and bears no resemblance to the commonly used and easily recognizable symbol for radiation. (also below)



[http://en.wikipedia.org/wiki/File:Radura\\_international.svg](http://en.wikipedia.org/wiki/File:Radura_international.svg)



The international Radura mark

US FDA Radura mark

US Environmental Protection Agency logo



Radiation symbol

New International Atomic Energy Agency sign warning about ionizing radiation

The original intention of the Radura mark is reported to have been to represent a high quality product that had a long shelf life.

*“The word “Radura” is derived from radurization, in itself an artificial word combining the initial letters of the word “radiation” with the stem of “durus”, the Latin word for hard, lasting.*

*The inventors of the symbol Radura - knowing this proposal for a new terminology - came from the former Pilot Plant for Food Irradiation, Wageningen, Netherlands, which was the nucleus for the later Gammaster today known as Isotron. The director at the time, R.M. Ulmann, introduced this symbol to the international community. Dr. Ulmann in his lecture also provided the interpretation of this symbol: denoting food - as an agricultural product - i.e., a plant (dot and two leaves) in a closed package (the circle) - irradiated from top through the package by penetrating ionizing rays (the breaks in the upper part of the circle).*

*The Radura was originally used in the 1960s exclusively by a pilot plant for food irradiation in Wageningen, Netherlands that owned the copyright. Jan Leemhorst, then president of Gammaster, untiringly propagated the use of this logo internationally. The use of the logo was permitted to everybody adhering to the same rules of quality. The symbol was also widely used by Atomic Energy of South Africa, including the labelling by the term 'radurized' instead of irradiated. By his intervention, the new logo was also included in the Codex Alimentarius Standard on irradiated food as an option to label irradiated food. Today it is found in the Codex Alimentarius Standard on Labelling of Prepacked Food.*

It is clear that irradiation proponents developed, designed and promoted this logo with the intention of making irradiation seem attractive to consumers and removing any recognizable reference to radiation in the process.

Recent research shows that consumers are inclined to accept products irradiated with the Radura symbol, despite having little knowledge of the irradiation process.

*“In Chile the “Radura” symbol is not frequently present on food labels. The irradiation treatment is normally identified by the statement “tratado por energía ionizante” (treated by ionizing energy); 95.8% of the responders in the present study were not familiar with this symbol for irradiated food. However, 55.8% said that they would buy irradiated food because of the symbol, affirming that the “Radura” transmits the sensation of confidence and safety.*

*The association of the symbol “Radura” with the statement “treated by ionizing energy” might facilitate the consumer’s acceptance of irradiated food in Chile since most of the interviewed persons affirmed that the symbol means confidence and safety. A similar situation exists probably in many other countries.”*

While the logo denotes a plant, and is usually green in colour suggesting life or freshness, the purpose of irradiation is to use radiation to extend the shelf life – allowing irradiated products to appear fresh though they are not. Irradiation does not clean a product or remove contaminants, such as animal feces in poorly produced herbs or on hastily slaughtered beef, it simply acts to neutralize or mask these contaminants.

The reality of the process is far removed from the image suggested by the logo.

The logo is suggested by irradiation proponents as a means to encourage consumption of irradiated products – in this sense it is a marketing tool. We call on the FSANZ to actively ban its use and ensure that this logo will not be permitted on packaging or products in Australia or NZ.

### **Summary of Labelling recommendations:**

Labelling in the public interest and information provision is a duty of FSANZ. We, therefore, recommend:

Mandatory labelling on all irradiated food with the words:

- Irradiated...
- treated with radiation

or

- treated by irradiation

and

- Prohibition of the terms “treated with ionizing electrons”

- Individual labelling of irradiated products, including fruit and the containers holding products irradiated in bulk
- Removal of positive statements re the irradiation process.
- Prohibition of the use of the Radura symbol

## 12. APPENDIX B

### **Australian and New Zealand consumers' knowledge of and attitudes towards irradiation**

Over the past 30 years, Australians have shown considerable opposition to food irradiation. In the 1980s there was a huge movement against food irradiation in Australia and worldwide. International consumers' conventions in Europe and Australia called for a moratorium on food irradiation. Politicians came on board the campaign and in Australia; a Public Inquiry into irradiation saw the participation of all major environmental organizations, including Australian Conservation Foundation, Greenpeace, Friends of the Earth Australia as well as consumers' organisations and women's organisations.

"In 1987, the Australian Consumer's Association joined with all the major national and international consumer bodies in voting for a worldwide moratorium..." Records show that thousands of Australians signed petitions opposing food – making it a stand-out issue during its time.

A moratorium was put on the practice in 1989. This moratorium was lifted without much public awareness in 1999, coincidentally within weeks the Caboolture Shire Council gave approval for the building of a nuclear irradiation plant at Deception Bay.

It is our understanding that most young Australians are unaware of food irradiation and that older Australians who were aware of the issue believe that the practice was successfully stopped in 1989.

Between 1999 and 2003 a renewed campaign was waged against a nuclear irradiation facility in Queensland and the first-ever application to irradiate food in Australia – Application A413 by the irradiation company Steritech for herbs... Again thousands of petitioners petitioned both the state and federal governments on these issues and many made submissions against the application. In 2003, a further application A443 for the Irradiation of Tropical fruits saw an overwhelming majority of submissions opposing the application 675 in against, 16 in favour- the application was nonetheless approved.

As a testament to the political understanding that the broader community does not support food irradiation in August 2003, the Australian Senate passed a motion calling for the Australian government to commission further research and disallowing further irradiation approvals until such research had been done. (chamber/journals/2003-08-14/0010). The motion passed with the support of the Labor Party, the Greens and the Democrats.

We have no reason to believe that Australian consumers' attitudes towards irradiation have changed since the strong shows of opposition in the 1980's and early 2000s.

Food Irradiation Watch speaks with people from all walks of life who are alarmed by the prospects of food irradiation. In 2005, FI Watch surveyed 1000 Australian food companies on their food irradiation policies, attitudes and practices. The research enabled us to produce the Irradiation-free Food Guide, which was reprinted with slight changes in 2007. Though FI Watch has been fairly inactive since 2008, the Food Irradiation Watch website and Irradiation-Free Food Guide continue to be popular. To date, approximately 25,000 hard copies of the Guide have been distributed, and orders for the Guide and/or other information continue to be received via email almost weekly.

We receive frequent requests for our Irradiation-free Food Guide and information from concerned consumers who have contacted food manufacturers about irradiation. Since the Guide's original publication, several major food producers have developed irradiation-free policies, which we understand is due to consumers concern about this issue expressed through their contacting the companies.

The research that has been done in Australia and overseas consistently indicates consumer resistance to the technology.

In December 2001 the report: Qualitative Research with Consumers – Food Labelling Issues, produced for FSANZ (then ANFA) found that:

*“There was even less awareness and more misunderstanding about irradiated foods [than Genetically Modified foods.] The word ‘irradiation’ is almost synonymous with ‘radiation’ [also connoting ‘nuclear’] (their brackets) and is consequently suspected to be unsafe or bad for you. Much would need to be done by ANZFA to educate people about exactly what irradiation means, how irradiated foods compare safety-wise and nutritionally to similar products preserved in other ways, and what the potential benefits are before it would be acceptable to consumers at large.”*

Despite the apparent research bias towards promoting irradiation, the researchers found that there is little consumer acceptance of the technology.

The same research found that Australian consumers believe that:  
they have the right to access to information about their food and  
that the government will facilitate that right.

This was demonstrated by the fact that:

*“Consumers expressed an absolute right to know about any GMOs included in any products...”*

Consumers, also, expected all genetically modified food to be labelled as such.

*“It was generally thought by most people that even if a product was not specifically labelled as ‘GMO-free’ it would not be genetically modified. That is, they would expect any product that contained genetically modified organisms to be clearly labelled that this was the case.”*

Overall, consumers expressed general concern about the food supply and regulation and suggested that they trust their government to inform them about products and to label products clearly.

*“The concern over the use of GM illustrates the level of general apprehension about the food supply and the perceived importance of maintaining stringent control over it...”*

However,

*“There is an over-riding belief that the food system in Australia and New Zealand is safe, and this sense of trust is extended to food labels. People generally have faith that the labels will be fairly accurate and reliable - as long as the governing body continues to check the products to ensure compliance. In this way there is a belief in ‘good’ governance.”*

This research has great significance for FSANZ when considering labelling regulations and, in particular, labelling proposals linked to this Application.

Consumers’ reported concerns over irradiation must be met with access to comprehensive and accurate information about the process to ensure FSANZ lives up to its mandate to enable consumers’ rights to choose. We can extrapolate from this research that if a product is not labelled as irradiated then the public will assume that it is not.

Incidences such as the illness of Australian cats after eating irradiated food has highlighted an area of ongoing concern for FI Watch and the public: the lack of understanding that many products consumed by Australians and New Zealanders are not labelled as they are not legally “food” under Australian and New Zealand law. It is the case in Australia that one company’s irradiated herbal teas and irradiated “therapeutic

quality” herbal teas appear similarly packaged, side by side or near each other, on shelves in stores. The packaging of the tea regulated as food contains a statement re irradiation, the packaging of the tea regulated as therapeutic goods do not. The average consumer cannot ascertain that the “therapeutic quality” teas may also be irradiated – nor can they be expected to.

As a result of ten years work culminating in the distribution of 25,000 consumer guides on the issue, is our opinion that consumers are not aware that products they consume may fall under different regulatory regimes and therefore have different labelling requirements.

Consumers are unaware of the “food-drug interface”, and have no obvious means by which to assess that products which may be marketed in one store may fall under differing regulatory bodies and therefore have no labelling requirement. The average consumer has no way of knowing that some fall under the “food” regulatory regime – while others fall under the therapeutic or veterinary regulatory systems and consequently do not require labeling. This is a grave failure of the regulatory system.

When conducting its Review of Food Labelling Law and Policy Review, the government acknowledged an “optimism bias whereby consumers assume that unmentioned factors are favourable.”

Coupled with “optimism bias” felt by Australian consumers, the current flawed labelling regimen leads consumers to believe that products that are not labelled “irradiated” are not irradiated.

Australian cat owners whose cats were disabled by eating irradiated food were shocked to find that the food they bought for their cats was not “food” by law.

The fact is that the majority of irradiated and genetically modified products are not labelled as they either fall into the category of foods that don’t require individual labelling – such as fruit – or are classified as animal feed, pet food or therapeutic goods.

The current status and definition of “food” denies consumers the right to make an informed choice around whether they will consume irradiated products or feed them to their animals.

Australian consumers – and their counterparts overseas - have shown ongoing resistance to irradiated food – which has been expressed by campaigning over 30 years, opposition to food irradiation applications, rejection by informed consumers of irradiated foods on the market, community campaigns to close irradiation plants and community campaigns to support local and organic agriculture.

Pushes by industry to remove labelling and/or to use labelling that does not include the words “radiation” or “irradiation” and/or to use euphemistic terms such as cold-pasteurisation”, or “pasteurization”, “ionizing electrons” suggest that industry also acknowledges consumer rejection of the technology.

Consumers do not want to eat irradiated food. In light of this rejection Australia should move towards banning irradiated foods – or at a minimum ensuring that comprehensive, non-biased labelling is guaranteed so that consumers can make an informed choice.

## **13. APPENDIX C**

### **Concerns about the nuclear aspects of the food irradiation industry.**

#### **Nuclear industry**

From the mining of uranium to the use of nuclear power or development of nuclear weapons, the nuclear industry produces intractable waste. The use of nuclear materials for the purpose of irradiating food continues the dangerous and unjustifiable nuclear industry, which we oppose.

There are three commercial irradiation facilities in the Australia and one in New Zealand. All of these commercial irradiation facilities in Australia and New Zealand, and the majority of irradiation plants around the world, are nuclear facilities that use radioactive Cobalt-60 as the source of ionizing radiation.

Caesium 137, a nuclear waste product, is also permitted in the US and other countries. The nuclear cycle is neither clean nor sustainable. It produces waste that is radioactive for thousands of years and leaves a legacy of environmental destruction and human health impacts, such as cancer, leukemia and birth defects. Uranium mines, nuclear reactors and irradiation facilities are often pushed on unwilling communities violating democratic principles and indigenous land rights.

The Cobalt-60 used by Australia's only commercial irradiation company, Steritech, is imported from Canada and transported to Steritech's three locations, Dandenong, VIC, Wetherill Park, NSW and Deception Bay, QLD.

The transport, storage and ongoing use of Cobalt-60 put the community and environment at risk. Accidents and incidents have occurred in Australia and overseas.

Not covered by insurance: A major concern to the Narangba and Deception Bay communities located near the then proposed nuclear irradiation plant at Deception Bay was the fact that insurance companies would not cover them in case of nuclear accident.

## 14. Supporting Organisations

### Food Irradiation Watch

PO box 5829  
West End QLD 4101  
[www.foodirradiationwatch.org](http://www.foodirradiationwatch.org)



Food Irradiation Watch is a not-for-profit consumer advocacy organization aimed at raising awareness about food irradiation. We are an affiliate of Friends of the Earth Australia. We oppose the irradiation of food and work to ensure the consumer's right to choose to avoid irradiated foods, pet foods and therapeutic goods.

Food Irradiation Watch works with, educates and advocates for the community on the issue of food irradiation, alternatives to food irradiation, and related food, environment and social justice issues. As a community organization, we play a role in supporting the rights of citizens where government and corporations have failed them. We act in response to a need in the community that should not exist – or we feel would not exist if governments and corporations acted along principals of ecological and social justice in relation to food – its production and distribution.

While we act in a necessary role as a watchdog, we believe that it is in fact the role of the government to inform the community about food and food processes, and to create legislation and regulations that protect the consumer's "right to know" about what they consume.

Food Irradiation Watch (FI Watch) formed in 2003 from a partnership of Friends of the Earth Brisbane and several community networks opposed to the development of the food irradiation industry in Australia. FI Watch works closely with U.S. advocacy organization Food and Water Watch and international campaigns around food irradiation awareness in the E.U. and Japan. It is our understanding that Australians do not wish to consume irradiated foods or feed them to their pets and that at a minimum Australians expect their food to be accurately and comprehensively labelled when "novel" technologies such as irradiation and GMOs are used.

### Gene Ethics Network

Gene Ethics is a non-profit educational network of citizens and kindred groups. We want the precautionary principle, scientific evidence and the law rigorously applied to all proposed uses of genetic manipulation (GM) technologies and their products.



Gene Ethics generates and distributes accurate information and analysis on the ethical, environmental, social and economic impacts of GM. Our education programs critically assess GM for the public, policy-makers and interest groups.

### Friends of the Earth Australia

Friends of the Earth (FoE) Australia is a federation of independent local groups working for a socially equitable and environmentally sustainable future. Friends of the Earth Australia is part the world's largest grassroots environmental network, uniting 76 national member groups and some 5,000 local activist groups on every



continent. Friends of the Earth aims to support local communities in gaining environmental and social justice through mobilising resources, and resisting destruction of global eco-systems. Friends of the Earth opposes all forms of the commercial and military nuclear industry and supports sustainable agriculture as the viable alternative to food irradiation.

### **GM-Free Australia Alliance**

"The GM-Free Australia Alliance supports this submission. We oppose the irradiation of apples, apricots, cherries, honeydew melons, nectarines, peaches, plums, rockmelons, strawberries, table grapes, zucchinis and scallopinis. We have concerns about the wholesomeness of irradiated food as well as the environmental and social impacts of food irradiation. Better alternatives to irradiation exist. We do not believe that the irradiation of these fruits benefits the eaters of Australia.



Our export markets should be consulted before we even consider this risky step."

GM Free Australia Alliance [www.gmfreeaustralia.org.au](http://www.gmfreeaustralia.org.au)  
PO Box 333,  
Wonthaggi 3995

### **MADGE Australia Inc**

We are a group concerned about new technologies in our food. We are concerned that poorly tested and potentially hazardous technologies are being used to increase the profits of the food industry while remaining unlabelled and therefore hidden from the knowledge of the public. We consider this to be deceptive and misleading conduct and therefore contrary to FSANZ's brief. Before any expansion of irradiation can commence we need full and open public discussion and information, not the current methods of approval that are hidden and exempt from proper scientific and ethical scrutiny. This is an issue of human rights as we have a right to safe food.



## References

Other than those directly mentioned in text

<http://www.fda.gov/AnimalVeterinary/SafetyHealth/ProductSafetyInformation/ucm319463.htm>

<sup>1</sup> Public Citizen Critical Mass Energy and Environment Program , The Top 10 Problems With Irradiated Food Program Washington D.C. <http://www.citizen.org/documents/Top10.pdf>

<sup>1</sup> FSANZ, Supporting document 1 Food irradiation in Australia, New Zealand and other countries – Application A1069 Irradiation of Tomatoes & Capsicums, Sept 26, 2012 , pg 8.

<sup>1</sup> FSANZ, Supporting Doc 2: Risk and Technical Assessment Report Application A1069 Irradiation of Tomatoes and Capsicums, Sept 26, 2012 pg.i,3, 5,22

[http://www.foodstandards.gov.au/\\_srcfiles/A1069%20Irradiation%20of%20Tomatoes%20&%20Capsicums%20SD2%20Risk%20&%20Tech%20Assess.pdf](http://www.foodstandards.gov.au/_srcfiles/A1069%20Irradiation%20of%20Tomatoes%20&%20Capsicums%20SD2%20Risk%20&%20Tech%20Assess.pdf)

<sup>1</sup> Patterson, Zappelli and Chalmers , ANZFA FOOD LABELLING ISSUES C01033, Prepared for ANZFA by NFO Donovan Research (2001) p 16

<sup>1</sup> Summary: EFSA Journal 2011;9(4):1930 Suggested citation: EFSA Panel on Food Contact Materials, Enzymes, Flavourings and Processing Aids (CEF); Scientific Opinion on the Chemical Safety of Food Irradiation. EFSA Journal 2011;9(4):1930. [57 pp.] doi:10.2903/j.efsa.2011.1930. Available online: [www.efsa.europa.eu/efsajournal.htm](http://www.efsa.europa.eu/efsajournal.htm) p. 2

<sup>1</sup> FSANZ, Supporting Doc 2: Risk and Technical Assessment Report Application A1069 Irradiation of Tomatoes and Capsicums, Sept 26, 2012, pg.i

[http://www.foodstandards.gov.au/\\_srcfiles/A1069%20Irradiation%20of%20Tomatoes%20&%20Capsicums%20SD2%20Risk%20&%20Tech%20Assess.pdf](http://www.foodstandards.gov.au/_srcfiles/A1069%20Irradiation%20of%20Tomatoes%20&%20Capsicums%20SD2%20Risk%20&%20Tech%20Assess.pdf)

<sup>1</sup> European Food Safety Authority; Statement summarising the Conclusions and Recommendations from the Opinions on the safety of Irradiation of Food adopted by the BIOHAZ and CEF Panels. EFSA Journal 2011; 9(4): 2107. [155 pp.] doi:10.2903/j.efsa.2011.2107. Available online: [www.efsa.europa.eu/efsajournal](http://www.efsa.europa.eu/efsajournal) p. 38 p. 6 <sup>1</sup> Ibid, pg.38p.6

<sup>1</sup> DAFF, *Australian Food Statistics* 2012, Canberra: Department of Agriculture, Fisheries and Forestry

<sup>1</sup> Vaz, A.F., et al., *Low-dose gamma irradiation of food protein increases its allergenicity in a chronic oral challenge*. Food Chem Toxicol., 2012. **51C**: p. 46-52-doi: 10.1016/j.fct.2012.09.011.

<sup>1</sup> Galan, I., M.L. Garcia, and M.D. Selgas, *Effects of irradiation on hamburgers enriched with folic acid*. Meat Sci., 2010. **84**(3): p. 437-43-Epub 2009 Sep 24.

<sup>1</sup> Caulfield, C.D., J.P. Cassidy, and J.P. Kelly, *Effects of gamma irradiation and pasteurization on the nutritive composition of commercially available animal diets*. J Am Assoc Lab Anim Sci, 2008. **47**(6): p. 61-6.

<sup>1</sup> Caulfield, C.D., et al., *The experimental induction of leukoencephalomyelopathy in cats*. Vet Pathol, 2009. **46**(6): p. 1258-69.

<sup>1</sup> Mamaril, M.E., et al., *ASPAN's [corrected] EBP conceptual model: framework for perianesthesia practice and research*. J Perianesth Nurs., 2006. **21**(3): p. 157-67.

<sup>1</sup> Ito, T., H. Ando, and H. Handa, *Teratogenic effects of thalidomide: molecular mechanisms*. Cell Mol Life Sci., 2011. **68**(9): p. 1569-79-Epub 2011 Jan 5.

<sup>1</sup> Vaz, A.F., et al., *Low-dose gamma irradiation of food protein increases its allergenicity in a chronic oral challenge*. Food Chem Toxicol., 2012. **51C**: p. 46-52-doi: 10.1016/j.fct.2012.09.011.

<sup>1</sup> Hijaz, F., et al., *In vitro and in vivo metabolism of the radiolytic compound 2-dodecylcyclobutanone*. J Food Sci., 2010. **75**(4): p. T72-80.

<sup>1</sup> Toledano, R.M., et al., *A quick method for identifying radiolytic hydrocarbons in low-fat-containing food*. p. 0.

<sup>1</sup> Zanardi, E., et al., *Detection of irradiated beef by nuclear magnetic resonance lipid profiling combined with chemometric techniques*. p. 0.

<sup>1</sup> International Atomic Energy Agency, Irradiated Food Authorization Database (IFA), International Atomic Energy Agency, Vienna Austria, accessed October, 2014 <http://nucleus.iaea.org/ifa/>

<sup>1</sup> Thompson M, Heneghan C, and Cohen D, *How valid is the European Food Safety Authority's assessment of sports drinks?* British Medical Journal, 2012. **345**: p. e4753.

<sup>1</sup> Facchiano, L. and C.H. Snyder, *Evidence-based practice for the busy nurse practitioner: Part two: Searching for the best evidence to clinical inquiries*. J Am Acad Nurse Pract., 2012. **24**(11): p. 640-8-doi: 10.1111/j.1745-7599.2012.00749.x. Epub 2012 Aug 14

<sup>1</sup> Legislative and Governance Forum on Food Regulation (convening as the Australia and New Zealand Food Regulation Ministerial Council) Response to the Recommendations of Labelling Logic: Review of Food Labelling Law and Policy (2011) Dec 2011, pp38-39

<sup>1</sup> **National Response Plan Responding Effectively to Changes in Approved Uses of Dimethoate and Fenthion**  
Version 7 , 17 December 2010 [www.domesticquarantine.org.au/index.cfm?objectid=CE5CAA29...](http://www.domesticquarantine.org.au/index.cfm?objectid=CE5CAA29...) (This document is available on line however the original website is "down for maintenance" at time of writing) pg 4

<sup>1</sup> FSANZ, Supporting document 1Food irradiation in Australia, New Zealand and other countries – Application A1069 Irradiation of Tomatoes & Capsicums, Sept 26, 2012 , pg 8.  
[http://www.foodstandards.gov.au/\\_srcfiles/A1069%20Irradiation%20of%20Tomatoes%20%20Capsicums%20SD1%20Supp%20info.pdf](http://www.foodstandards.gov.au/_srcfiles/A1069%20Irradiation%20of%20Tomatoes%20%20Capsicums%20SD1%20Supp%20info.pdf)

<sup>1</sup> Heather, N. W. , Hargreaves.,P. A, Corcoran, R. J and. Melksham , K. J, Queensland Department of Primary Industries, **Dimethoate and fenthion as packing line treatments for tomatoes against Dacus tryoni (Froggatt)** Aust. J. Exp. Agric., 1987, 27, 465-9 465 Indooroopilly, Qld 4068, Australia, pg 468

<sup>1</sup> Questions and Answers from the Dimethoate/Fenthion Forum 28 October 2009 Canberra ACT, PHC Meeting 35  
<http://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.domesticquarantine.org.au%2Findex.cfm%3Fobjectid%3D47567BC4-95E7-801C-3E9A6238D9EEE324&ei=5AGCULnqLquciAefmoGwDQ&usq=AFQjCNEPJq9Alt0vEvWBETy9nwiwnRpNlw>  
(It appears that relevant pages from the original website are not functioning:  
<http://www.domesticquarantine.org.au/index.cfm?objectid=E689D721-B6C9-605B-DE1D813E4CDA3339>)

<sup>1</sup> *Department of Transport and Regional Services: Australia Forum – Northern Forum Reports - INVESTING IN NORTHERN AUSTRALIA, KEY OPPORTUNITIES - EMERGING INDUSTRY SECTORS, Food Processing*

<sup>1</sup> Longan and lychee fruit from the People's Republic of China and Thailand, Final Import Risk Analysis Report, Part A, February 2004, Australian Government Department of Agriculture, Fisheries and Forestry, Commonwealth of Australia, 2004, pp 96-104.

<sup>1</sup> Mangos from India, Draft Revised Import Policy, July 2004, Australian Gov't Dep't of Agriculture, Fisheries and Forestry, Commonwealth of Australia, 2004, pp 100-118.

<sup>1</sup> Initial Assessment Report Proposal )291 Review of Novel Food Standard , Food Standards Australia New Zealand2005, p 88

<sup>1</sup> International Standards for Phytosanitary Measures No. 1 to 24 (2005 edition) Produced by the Secretariat of the International Plant Protection Convention FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS Rome, 2006 (2005 edition) p167

<sup>1</sup> Fyfe, Melissa and Millar, Royce, **Canned: why local tomatoes cop a pasting** The Age, May 27, 2012  
<http://www.theage.com.au/national/canned-why-local-tomatoes-cop-a-pasting-20120526-1zc2q.html>

<sup>1</sup> [http://www.tomatoesnz.co.nz/industry\\_statistics.htm](http://www.tomatoesnz.co.nz/industry_statistics.htm)

<sup>1</sup> <http://www.unctad.info/en/Infocomm/AACP-Products/COMMODITY-PROFILE---Tomato/>

<sup>1</sup> CBC News, Oct 7, 2012 10:04 AM **XL Foods meat recall revives food irradiation idea**  
**Microbiobiologists claim practice is safe** <http://www.cbc.ca/news/health/story/2012/10/05/food-irradiation-beef-recall.html?cmp=rss>

<sup>1</sup> Legislative and Governance Forum on Food Regulation (convening as the Australia and New Zealand Food Regulation Ministerial Council) Response to the Recommendations of Labelling Logic: Review of Food Labelling Law and Policy (2011) Dec 2011, pp38-39

<sup>1</sup> <http://scott-ludlam.greensmps.org.au/content/estimates/food-irradiation-standards-australia>

<sup>1</sup> GENERAL STANDARD FOR THE LABELLING OF PREPACKAGED FOODS(CODEX STAN 1-1985) Adopted 1985. Amended 1991, 1999, 2001, 2003, 2005, 2008 and 2010.

<sup>1</sup> GENERAL STANDARD FOR IRRADIATED FOODS CODEX STAN 106-1983, REV.1-2003

<sup>1</sup> Commission of the European Community, *Report from the Commission on Food Irradiation for the year 2001*Brussels 25.2.2005 – com (2004) 69 Final, p.3

<sup>1</sup> US Department of Agriculture: [www.ers.usda.gov/Briefing/IndustryFoodSafety/unconventech/](http://www.ers.usda.gov/Briefing/IndustryFoodSafety/unconventech/)

- <sup>1</sup> New Zealand Food Safety Authority: [www.nzfsa.govt.nz/consumers/food-safety-topics/food-processing-labelling/food-irradiation/index.htm](http://www.nzfsa.govt.nz/consumers/food-safety-topics/food-processing-labelling/food-irradiation/index.htm)
- <sup>1</sup> Canadian Legal Information Institute: [Food and Drug Regulations, \[C.R.C., c. 870\]](http://www.canlii.org/ca/regu/crc870/secb.01.035.html) PART B Foods  
[www.canlii.org/ca/regu/crc870/secb.01.035.html](http://www.canlii.org/ca/regu/crc870/secb.01.035.html)
- <sup>1</sup> Patterson, R.F., Ed, The Cambridge English Dictionary, Ramboro, London, 1990, p.229.
- <sup>1</sup> ^ a b D.A.E. Ehlermann, The Radura terminology and food irradiation, Food Control 20(2009), 526-528, doi:10.1016/j.foodcont.2008.07.023  
Sourced from: <http://en.wikipedia.org/wiki/Radura>
- <sup>1</sup> a b Ulmann, R.M., Introducing irradiated foods to the producer and consumer, in: Peaceful uses of atomic energy, Proceedings of the fourth international conference on the peaceful uses of atomic energy, v. 12 p. 299-308, Vienna (Austria), IAEA, 1972 Sourced from:  
<http://en.wikipedia.org/wiki/Radura>
- <sup>1</sup> ^ a b c CODEX-STAN - 1 (2005) labelling of prepacked food [http://www.codexalimentarius.net/download/standards/32/CXS\\_001e.pdf](http://www.codexalimentarius.net/download/standards/32/CXS_001e.pdf) Sourced from: <http://en.wikipedia.org/wiki/Radura>
- <sup>1</sup> Maria P. Junqueira-Gonçalves, M.P., Galottoa, MJ, Valenzuelaa, X, Dintenb, C., Aguirrec, P. and Miltzd, J., Perception and view of consumers on food irradiation and the Radura symbol Radiation Physics and Chemistry Volume 80, Issue January 2011, Pages 119-122
- <sup>1</sup> Food irradiation in Australia? Tony Webb and Beverley Sutherland-Smith Book  
Bib ID 676178 Format Published by Canberra Consumers Incorporated and National Coalition to Stop Food Irradiation, 1988.
- <sup>1</sup> Australian Federal Government Senate Hansard (chamber/journals/2003-08-14/0010)
- <sup>1</sup> Paterson, Zappelli, Chalmers, *Qualitative Research with Consumers – Food Labelling Issues, Report to ANZFA prepared by Donovan Research, December 2001*
- <sup>1</sup> Review Panel, Issues Consultation Paper: Food Labelling and Policy Review March 5, 2010 p8  
[http://www.foodlabellingreview.gov.au/internet/foodlabelling/publishing.nsf/Content/BFB4ACD9B215DEBFCA2576AF000E7C34/\\$File/Food%20Labelling%20Policy%20and%20Law%20Review%20-%20Issues%20Consultaton%20Paper.pdf](http://www.foodlabellingreview.gov.au/internet/foodlabelling/publishing.nsf/Content/BFB4ACD9B215DEBFCA2576AF000E7C34/$File/Food%20Labelling%20Policy%20and%20Law%20Review%20-%20Issues%20Consultaton%20Paper.pdf)