



## Radioactive waste co-exists with agriculture worldwide

Radioactive waste facilities and farms have succeeded side-by-side for decades, both in Australia and around the world, without any reputational or market impact on surrounding agriculture, tourism or other community activities.

In fact, the common experience of such facilities located in the farming regions of France, Belgium, the UK, Spain, the United States and Germany, is that this industry plays an important role in the life of local communities by providing jobs and investment, and strengthening local economic and social development.

Australia's National Radioactive Waste Management Facility will be a world-class, purpose-built and state-of-the-art. It will be operated in an open and transparent way, in line with international best practice.

The facility will be expertly run, backed by publicly available environmental and safety monitoring, and overseen by independent radiation safety, and environmental regulators, all of whom will be tasked with ensuring its safe operation.

Radioactive waste is already spread among more than 100 sites around Australia, including about five sites within 200 kilometres of Kimba.

**These facilities – internationally and around South Australia – have resulted in no impact on local or regional farming products, prices or reputations, and the new facility will be no different.**

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Australia's limited nuclear activities also play an important role in supporting farmers, their families and the agricultural industry directly and indirectly. Australia has an advanced nuclear medicine industry, with one in two Australians on average requiring a potentially life-saving medicine dose, for diagnosis or treatment.

Nuclear science is also used extensively in agricultural research, to protect and improve crop yields, and

gaining a better understanding of water resources and the impacts of climate.

While we all benefit enormously from these activities, we also have a need to manage the relatively small amount of waste products, responsibly and safely. This centralised facility will do that, while also providing valuable long-term economic and social support for a local community and region.

## Examples of co-located radioactive waste facilities in farming communities

Large radioactive waste facilities operate in Europe, Russia and the USA including in well-known, high-value agricultural and world heritage tourism regions. For example:

- The Lake District in Northern England is home to the UK's largest and most visited National Park (awarded UNESCO World Heritage Site status in 2017), and the UK Low Level Waste Repository. This facility receives thousands of visitors every year.
- The Champagne region of France – renowned for its grapes and wine including some of the most expensive agricultural land in the world, also hosts a major low level and intermediate waste facility. The local community is currently bidding to host a new waste facility. Local populations, farm output and tourism numbers have all increased in this time.
- The El Cabril Facility in Spain is located in a national park and hunting reserve. Between 1992 and 2014 more than 100,000 people visited El Cabril's information centre.



▲ The French low and intermediate level waste repository, in the Champagne region.

### Case study: Champagne, France

In 2017, a delegation from France visited South Australian communities and explained that the radioactive waste facilities in the Champagne region have not affected the production of wheat, canola, grape or dairy. Community members were told that the Champagne region's vineyards shipped 312 million bottles, at a value of \$7.1 billion (in 2015). Vineyard prices around the facility averaged over 1 million euros per hectare.

**Pierre Jobard, 73, is Mayor of Fresnay and a wheat and canola grower and cattle farmer in the Aube region. His property is close to the ANDRA Aube Facility.**

*"If you can see the curve of evolution regarding the Champagne vine land prices, production and sales, that's been growing in a stable fashion, and there hasn't been any impact from ANDRA's facilities. ANDRA has not affected our way of living or working."*

**Phillipe Dellemagne, Mayor of Soullaines and tourism board member, was initially opposed to the ANDRA facility. After learning about its safety, and seeing the benefits that have rejuvenated the local area, he is now a strong supporter.**

*"We've been able to restore a lot of buildings in our region and get back some of the architectural richness that was there before. Thanks to this we've been able to rediscover our cultural and historical heritage, which has been able to attract a lot of tourists... we do not ever want to lose the facility as it provides too much to our community."*



# Radioactive materials and waste have also existed in and around Australian farming communities for decades without any impact

In South Australia, according to a 2003 study by the South Australian Environment Protection Authority, radioactive materials can be found in some 80 locations across the state, including near regional towns and agricultural producers.

In Queensland, a small intermediate level radioactive waste store in the farming community of Esk, in the upper reaches of the Lockyer Valley, has been safely operating without incident for over 20 years.

The ANSTO Lucas Heights campus, which is the home of research and medicine production in the OPAL nuclear reactor and several waste storage facilities, is located in Sydney's south, around 31 kilometres from the CBD. Important farming and fishing industries operate less than 20 kilometres away. About 50,000 residents are located within 5 kilometres, with the closest neighbours less than 500 metres away. ANSTO's campus includes a childcare centre widely used by staff, and is just four kilometres from a K-12 School of about 740 students.

None of these Australian communities or farmers have experienced adverse impact on land values, agricultural prices or in accessing domestic or export markets.

**Trevor Cliff is a member of Eyre Peninsula Co-operative Bulk Handling Limited, and attended the Kimba Agricultural Bureau trip to ANSTO's Lucas Heights campus.**

*"ANSTO was a really impressive facility, and from visiting it I saw that it's a well regulated industry where safety is of the highest priority.*

*"When it comes to the risk of transporting radioactive waste, it's all processed and grouted into steel drums – we see trucks carrying more hazardous materials, which go through our town and across the country every day.*

*"I think there are benefits that would come from a facility. It could mean improved phone and internet service for the Eyre Peninsula, because trucks carrying the waste would need to be trackable throughout their route, so any blackspots in the area would need to be fixed.*

## Export markets will not be affected

In October 2017, representatives from the Australian Government's Department of Agriculture met a farming group from the Kimba region, and addressed concerns raised by some that the location of the National Radioactive Waste Management Facility may inadvertently impact on the ability of nearby farms to participate in domestic and export markets.

*"The Department does not expect any implications for domestic or export products originating from these farms. In particular, the Department notes that products such as grains have radiation standards, and the regulatory requirements imposed by Australia's independent nuclear regulator will ensure these standards are not exceeded. More importantly, they protect the safety of workers, public health and the environment.*

*Given that the main buyers of Australian livestock and grain products also have advanced nuclear and radioactive waste management programs, it is not evident why there would be discrimination against Australian products where there is no evidence of actual contamination."*

They also noted that Bangladesh is the only country requiring a radioactive statement for grain exports and that a number of Middle Eastern countries require radioactive statements for livestock exports. Australia has never had any issues supplying these statements, or with market access due to radiation.

*"The facility would only take up 40 hectares of the whole site of approximately 160 hectares, so we could use that extra land for agricultural research and trials, environmental projects and community projects.*

*"This facility would be state-of-the-art, attracting people from all over the world to come and see it, and see what is being done there, boosting our local economy.*

*"There's also the benefit of new employment. With agriculture becoming more mechanised and automated, we don't need so many workers, so an outside industry would be beneficial to the whole community and economy."*

## How can we be sure it is safe for farming and the environment?

The facility will have numerous state-of-the-art, defence-in-depth systems to ensure it is entirely safe for the surrounding environment, communities and workers. These include:

1. All waste, low and intermediate level, will be solid and immobilised in an appropriate matrix (glass, synroc or concrete) and will contain nothing liquid, corrosive or gaseous.
2. All waste will be packaged in shielded cells or containers, ensuring radiation meets the requirement of the regulator and falls below their stringent acceptable safety levels. There will be no measurable radiation above background levels at distances well within site boundaries.
3. Site design and construction will be to recognised national radiation and building standards and assessed against all plausible risks such as fire, flood or seismic events. Site design will feature impermeable barriers, traps and inspection points.
4. This will be supported by real-time, publicly-available radiation monitoring, along with regular independent environmental testing and reporting to further demonstrate that there are no contaminants of any kind entering the environment from the facility.

To ensure these systems are effectively implemented, the facility will be assessed and overseen by independent regulators. The facility will include public reporting, open days and community representatives to ensure full transparency for local communities.

These measures will ensure that there is no way that radioactive materials will enter the environment or pose a risk to farms or the community.



For more information

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## What benefits can it bring to the farming community?

The facility, through its construction and operation, will bring \$8 million per year to local businesses and employees. It will provide 45 long-term jobs along with a range of infrastructure benefits, including improved internet and mobile phone services, which will improve farm business productivity.

In 2018 the \$31 million Community Development Package was announced, in recognition of the need to build economic capacity, skills and resilience within the NRWMF host community.

Details of this package are available at [www.radioactivewaste.gov.au](http://www.radioactivewaste.gov.au)







# Myths and misconceptions – your questions answered

## Will this facility harm farm values, agricultural prices or access to domestic or international markets?

No. There is no credible evidence, in Australia or anywhere else in the world, that well-managed radioactive waste facilities such as the one proposed for Australia have any impact on market access or land or commodity prices.

## Will valuable agricultural land be lost from production?

No. Only a relatively small amount of land – around 160 hectares – will be taken up by the facility. This will include a 40 hectare facility set inside a wider buffer zone. Some estimates from local farmers in South Australia are that this would represent around \$100,000 in lost wheat or livestock income.

By comparison, the project will generate many millions of dollars each year to the local community through wages, infrastructure investment, tourism and other means. The government is also working with the Kimba communities to explore how the unused buffer at the facility could be used, and how additional support could be provided to boost farm productivity.

## Will this facility impact the organic status of accredited farms?

No. The experts at Organics Australia have advised that organic certification would not be impacted by a nearby piece of land holding a National Radioactive Waste Management Facility.

## Will this facility affect local waterways or rivers?

No. All material stored at the facility will be solid, immobilised and safe, and in addition there will be a number of barriers between it and the environment to further ensure that all risks are mitigated.

A program of environmental monitoring will be part of the licencing arrangements to provide assurance to regulators and the public, that the facility continues to operate safely.



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## National Radioactive Waste Management Facility

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# Agricultural research and nuclear science

It's not well known that nuclear science and technologies, including the OPAL reactor at Sydney's Lucas Heights, are used to benefit the agricultural industry quite significantly.

Every year, researchers and scientists from agricultural businesses and universities, use technologies at the Australian Nuclear Science and Technology Organisation (ANSTO) for research including:

- Analysing soil cores
- Environmental and pollution monitoring
- Analysing new machinery for wear and fatigue
- Analysing new farm chemicals
- Irradiating seeds to produce new traits for disease resistance, different food qualities and agronomic traits to improve the productivity and marketability of grain crops
- Groundwater assessment

In addition ANSTO provides other services to industry, such as fruit fly sterilisation and fruit irradiation, which assist Australian farmers and make it possible to access key export markets. As an example, New Zealand now accepts irradiated Australian mangoes.

## ANSTO meets with Kimba farmers

When CEO of ANSTO, Dr Adi Paterson visited Kimba in May 2018, he met with local farmers and explained how the facility will offer its host community a chance to partner into the broader Australian science and research community.

"The facility will be resourced as a centre of excellence, becoming part of Australia's world-class nuclear science network that includes the OPAL reactor and associated science infrastructure at Lucas Heights in Sydney, the Australian Synchrotron in Melbourne, and other government and medical facilities."

In May 2018, ANSTO Senior Researcher Dr Mathew Johansen discussed with locals' environmental projects ANSTO is conducting that focus on agriculture.

"ANSTO is involved in a range of research with different universities across Australia and the world conducting agricultural research. Examples include helping grain producers optimise their existing fertiliser methods and adopt new technologies to help improve crop yields, as well as water research that helps to better understand environmental sustainability issues around arid rivers, which could have significant implications for land management."

In 2017, some Kimba farmers visited ANSTO's Lucas Heights campus and met researchers including Dr Justin Davies, Manager of ANSTO's Gamma Irradiations, who spoke about the applications of his work to food and agriculture.

"Our research uses nuclear science to really practical outcomes for agricultural communities, to protect crops and even improve some crops. One of the projects focuses on the irradiation of wheat, and how it could potentially contribute to the creation of new varieties resistant to wheat stem rust."





# Radiation and the facility

Radiation exists naturally in the environment, normally present in rocks and soil and even in bricks, mortar, tiles and concrete.

In Australia, the average background radiation dose is approximately 1.5 millisieverts (mSv) per year. We can also be exposed to additional doses of radiation in a number of common ways – from things like air travel, having a granite kitchen, radon from construction materials or medical scans. These everyday items and activities can minimally increase our radiation does, but they do so well within safe limits.

At the National Radioactive Waste Management Facility, radiation will be no higher than background levels at the boundary, and will be well within safe levels inside the facility itself.

This will be guaranteed by a multi-barrier approach to waste management, which can involve processes such as locking it up in concrete or glass, placing it in shielded containers and placing those containers in concrete or a forged steel storage and transport containers in addition to strong oversight by the independent radiation protection and nuclear safety regulator, ARPANSA.

The facility will at all times be required to operate within safety limits required by relevant legislation (the *Australian Radiation Protection and Nuclear Safety Regulations 1999*), which specifies dose limits for the general public as well as those who work with radioactive materials.

## Case study: the Australian Nuclear Science and Technology Organisation (ANSTO)

ANSTO, which operates the OPAL nuclear reactor in Sydney's Lucas Heights, as well as low and intermediate level radioactive waste facilities, monitors radiation around its campus and reports the levels as part of its environmental monitoring program.

The organisation is very well supported by its local community, in part because it operates in such a transparent way. Significant amounts of data from radiation and environmental monitoring is made available on the ANSTO website and in annual reports.

ANSTO measures the environmental dose continuously at 15 locations around the Lucas Heights site. The levels measured at the site and in surrounding suburbs averaged 1.31 mSv in 2016-2017, which is well within the range for normal background levels.

## Table of comparable radiation doses

SOURCES OF DOSE	AVERAGE DOSE	COMMENTS/COMPARISONS
Normal background radiation in Australia	1.5 mSv per year	This is the radiation we all receive from day to day natural sources (our houses, our food, and the sun, earth and atmosphere).
The average dose that a radiation worker at ANSTO receives per year	1.75 mSv per year for radiation workers	This is added to the background dose that a radiation worker – who works directly with the material – receives per year, to give the worker a dose of 3.25mSv/y. This is the equivalent of receiving one abdomen scan (13mSv) every 7.4 years.
ARPANSA safety limits for radiation workers	20 mSv per year for radiation workers	These limits are additional to the background radiation. As you can see, ANSTO manages exposure levels for workers and to the public well below ARPANSA limits.
ARPANSA safety limits for the general public	1 mSv per year	These limits are additional to the background radiation. By way of comparison, if you stood at the boundary of ANSTO for an entire year, you would get a maximum additional dose of 0.1 mSv. This is equivalent to radiation caused by the sun at altitude, received in a flight from Melbourne to London.