Unconventional Gas Mining

Impacts and opportunities for dairy

The rapid growth of the unconventional gas mining industry initially caused only concern about potential effects on agricultural industries and communities. Concerns were primarily based on whether coexistence was possible for agriculture and mining to both prosper.

Today, as the outcomes of research and study have increased knowledge and understanding, opportunities for agriculture and rural communities are also emerging and being explored in situ through trial and demonstration.

This Fact Sheet provides a snapshot of the potential impacts and opportunities considered most relevant to dairy.

Like any other agricultural industry, dairy’s wellbeing relies on access to the necessary inputs to produce milk and manufacture dairy products. The industry’s strength lies in the land on which the milk is produced, the people employed to do this, and the high quality product the industry is renowned for.

As a predominantly pasture-based industry, dairy relies strongly on access to affordable land and natural assets such as quality water and soil. More uniquely, dairy’s intensive farming systems are comparatively smaller land holdings than our broad-acre livestock and cropping cousins.

This scenario means gas production infrastructure has a greater physical impact when built and operated on dairy properties, and generally results in closer encounters with visiting gas company staff and contractors.

The challenge in general

Predicting the long-term impacts and opportunities of unconventional gas mining can be difficult due to different regional characteristics and the potential cumulative outcomes from multiple industries operating and drawing on the natural resources in a given area.

These variations include:
- nature of land use in the surrounding area;
- amount, density and location of existing and proposed farming and other surface infrastructure;
- existing geology;
- existing hydrodynamics (groundwater and surface water); and,
- economical and logistical arrangements of production and transportation for all industries.

Australia traditionally has had a strong mining focus, so why has unconventional gas mining raised new impacts and opportunities not previously explored?

Unconventional gas mining has different impacts and opportunities as the footprint is extensive rather than intensive. Whereas intensive industry of any type requires exclusive access to relatively small sites, unconventional gas in Australia is co-located with other land uses, usually agriculture.
Fugitive Emissions

Fugitive emissions are an unintended gas or vapour emission resulting in air pollution or economic loss. Many fugitive emissions contain naturally occurring chemicals, or compounds that are already found in the atmosphere due to other activities such as motor vehicles and fossil fuel-powered infrastructure like pumps and generators.

Although methane seepage from underground into the atmosphere (known as ‘background emissions’) is a common and naturally occurring phenomenon, concern has been raised over the potential human health and safety impacts due to possible induced seepage through CSG activities, mainly based upon concerns raised in the USA.

Fugitive emissions mainly consist of methane and carbon dioxide. Methane is the primary fugitive emission given that CSG gas typically averages 95-97% pure methane. Methane is a colourless gas that may be generated as a by-product of metabolic decomposition of organic molecules by bacteria.

Agriculture and farming are major methane sources, particularly those industries associated with livestock and cattle. Methane emissions from ruminants are estimated to account for approximately 10 per cent of Australia’s total greenhouse gas emissions (Grainger et al., 2009). According to studies intensive agricultural activities, such as feedlots, can emit far more methane than natural gas production (Day et al., 2013).

Increasing knowledge through data

Background and baseline measurement is the first step in determining the amount of methane that seeps into the atmosphere naturally relative to the amount released from fugitive emissions.

As fugitive emissions from unconventional gas mining are a relatively new concern in Australia, two national projects are currently investigating the subject. One commenced by looking at background methane emissions from soils, rivers and agricultural industries to determine methodologies for quantifying the magnitude of natural seeps (Day et al., 2013).

The other study is researching direct measurement of emissions from CSG production wells and other infrastructure across NSW and Queensland (Day et al., 2014).

Compliance

Under EPA licence conditions and/or environmental approval conditions, CSG companies are required to prepare an Air Quality and Greenhouse Gas Management Plan. These plans must identify potential risks and explain how they will be controlled, and monitor emissions, odours or dust. Discharge points are specified and discharge limits, maximum allowable discharge and concentration limits are set for those points. These are considered to be planned events.

Best practice relates to the use of technology, and the operation and maintenance of wells and pipelines. The Queensland Government has a mandatory Code of Practice for Coal Seam Gas Well Head Emissions Detection and Reporting (DEEDI, 2011) which specifies best practice management procedures to monitor fugitive emissions to comply with environmental approvals.

As there is currently no standard specifically for identifying and managing CSG leaks in field activities, the default reference is the code is the Australian Standard for gas network distribution (AS/NZS 2008).

This is considered to be a conservative approach as operational and leakage management obligations for natural gas distribution networks in CBD and metropolitan areas could be considered to be more stringent than required in the rural gas field setting, given the greater level of risk and consequence in urban areas.

In NSW, the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (EPA, 2005) is used to set limits and methodology for detection.

Where these systems may fail, compliance with fugitive and air emissions standards set in Environmental Protection Licences (EPL- or similarly named) in each State are enforceable.

Human health

The concentration and the pathway of exposure are critical factors in determining potential impact. Methane is considered to be a low toxicity gas with no impacts on human or animal health at common concentrations.

To provide some context, methane concentrations in the atmosphere today are quoted at an average of 1.79 ppm (parts per million molar) (CSIRO, 2015). The average concentration of methane levels over a dairy herd in holding yards has been recorded at more elevated levels of 2.07 to 2.8 ppm, and over an effluent pond, 1.87 to 2.15 ppm (Grainger et al., 2007).

At much high concentrations, methane can reduce oxygen levels which can lead ultimately to asphyxiation. These levels would usually be associated to confined, unventilated scenarios.

A field study by the CSIRO in 2014 (Day et al., 2014) looked at 43 CSG wells in NSW and Queensland. The study found only three well sites had no emissions. These were two plugged and abandoned wells and one suspended well disconnected from the gas gathering system.

The remainder had some level of emission but generally the rates were very low, especially when compared to the volume of gas produced from the wells. No leaks at all were detected from around the well casings themselves, but from other sources at the well pad including:

- exhaust from engines used to power dewatering pumps;
- vents and the operation of pneumatic devices; and,
- equipment leaks.

Emissions measured from these other sources were much lower than those reported for US gas production, and with concentrations considerably lower than regarded as reportable. It was suggested that these leaks were manageable through appropriate equipment maintenance (Day et al., 2014).

The median daily emissions from all sources across the sample 43 gas well sites is comparable with the methane emissions from two to three lactating Holstein dairy cows on pasture in Australia (Day et al., 2014; Grainger et al., 2007). The mean emissions are comparable to around 14 dairy cows, due to higher emissions from a water vent at one site.
Key Issues

Environment

Risks:
- Groundwater quantity decline due to increased demand.
- Groundwater quality decline if aquifers are damaged and chemical additives used during drilling and fracking escape.
- Accidental release of untreated produced water affecting surface water and soil.
- Competition for water resources among sectors.
- Increased dust and emissions affecting air quality.
- Increased noise in a predominantly rural landscape.
- Clearing of pasture and native vegetation reducing biodiversity.

Opportunities:
- Open access to baseline and ongoing monitoring data that may assist farm decision-making ie. soil testing for fertiliser decisions.
- Beneficial reuse options for treated produced water on dairy farms.
- Expansion arising from access to additional treated water for irrigation.
- Rehabilitation of disturbed areas to improved standards.
- Compensation.

See Fact Sheet Unconventional Gas Mining – Water Quality and Quantity for more information.

Regional Communities

Risks:
- Visual impact of ‘industrial style’ infrastructure in a rural landscape.
- Health impacts caused by air quality decline (fugitive emissions, dust).
- Wear and tear on local roads caused by increased traffic.
- Changes in traditional industry focus for the region.
- Water issues.
- Community divisions over gas mining industry.

Opportunities:
- Colocation of beneficial industry infrastructure, such as Waste Water Treatment Plants and roads.
- Diversification of local worker skill base.
- Community benefit funds to support new infrastructure and maintain community assets.
- Increased potential for local businesses, including dairy manufacturers, to establish joint youth training and employment opportunities.
- Preferred supplier status for local businesses.

Land Access

Risks:
- Loss of quality dairying land due to location of well pads.
- Unexplored biosecurity effects.
- Interruptions to seasonal and daily farm operations.
- Farm layout challenges.
- Decline in land values.

Opportunities:
- Farm layout and infrastructure upgrades to improve operations (eg. fences/gates, access tracks).
- Access to potential capital investment from the gas company to use treated produced water for crop and pasture irrigation.
- Contracts for the farmer to maintain and monitor gas-related infrastructure.
- Access to mining company machinery and equipment to undertake farm improvements during construction phases.

For more information, see Fact Sheet: Unconventional Gas Mining – Land access and farmers’ rights; or, Fact Sheet Unconventional Gas Mining – Planning and managing in a coexistence scenario.
How the dairy industry is representing your interests

The Australian Dairy Industry Council is developing a whole of supply chain policy position on gas mining in dairy regions. The position is being developed in consultation with dairy farmers, state dairy organisations and milk companies. The policy discussion is being guided by the fundamental principle that the Australian dairy industry must continue to operate and prosper without compromising the natural resources upon which the industry relies, and without loss to reputation as a producer of high quality, safe dairy products.

The dairy industry’s primary aim is to work collaboratively with other agricultural sectors on common issues and provide adequate dairy-specific input into broader conversations and formal responses.

Common issues with other agricultural sectors include:
- Land access and rights.
- Rural planning legislation and policy.
- Cumulative effects on water quantity and quality.
- Irrigation as a beneficial reuse option for treated produced water.
- Stock water as a beneficial reuse option for treated produced water.
- Testing for chemical residues in crops and animals to allay community concerns.
- Access to baseline and on-going monitoring information.
- Identification of research and technology development gaps.

Dairy-specific issues include:
- On-farm quality assurance programs for food and fodder production (Dairy Food Safety Authorities).
- Intensive farming systems with set routines (seasonal and daily).
- Dairy shed water needs as a beneficial reuse option for treated produced water.
- Testing for chemical residues in milk to allay community concerns.

Further Information

A full set of dairy fact sheets and a comprehensive contact list for each State is at www.dairyaustralia.com.au.

References


