Economic Development, Jobs, Transport and Resources

An outline of agricultural stubble burning in Victoria

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Most farmers aim to retain their stubble

- Retention of crop stubble is advocated by agricultural organisations and farmer groups, e.g. the GRDC initiative '*Maintaining Profitable Farming Systems with Retained Stubble*'

- Stubble retention has well-documented benefits, including nutrient recycling, reduced erosion through provision of ground cover (>2.5 t/ha), improved rainfall infiltration and reduced moisture evaporation

- Across Australia and between years, levels of stubble retention varies

Average % of cropped area where stubble was retained through to planting

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Source: GRDC (2017) GRDC Farm Practices Survey Report 2016.
https://grdc.com.au/resources-and-publications/all-publications/publications/2018/farm-practices-survey-report-2016

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Stubble management can be a complex issue for farmers

- Challenging in the higher yielding crop years and in higher rainfall zones and crops under irrigation

- Heavy stubble can:
  - impede sowing equipment
  - harbour pests e.g. slugs, snails, mice
  - harbour chemical resistant weed seed
  - act as a ‘green bridge’ for carry over of diseases

- Generally, burning is undertaken as a last resort.

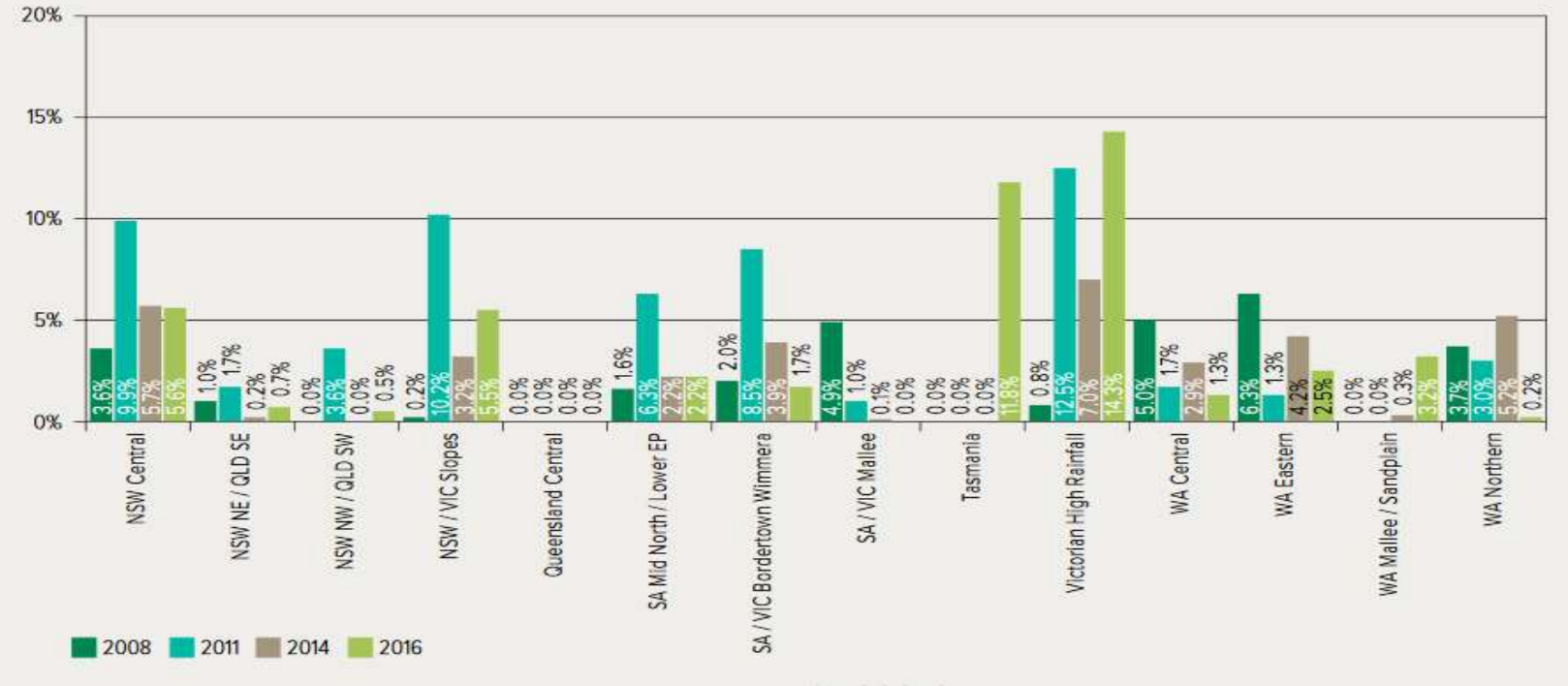

Image: Andrew Lang

Where is stubble burning most prevalent in Victoria?

- Crop areas where stubble is burnt represent a minority of the total Victorian crop
- Extent of burning varies widely from year to year and locality
- 2011 Victorian study estimated average extent of stubble burning over 13 year period (1996 – 2010) was 6.1% across the Wimmera cropping region (low-med rainfall zone)
- GRDC estimates the extent of stubble burning in Victorian high rainfall cropping regions to be higher, especially in high yielding years e.g. 2011 (GRDC 2017)

Where is ‘hot’ stubble burning most prevalent?

FIGURE 54 Average percentage of cropped area where stubble was burnt early (hot burn).



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Source: GRDC (2017) GRDC Farm Practices Survey Report 2016.
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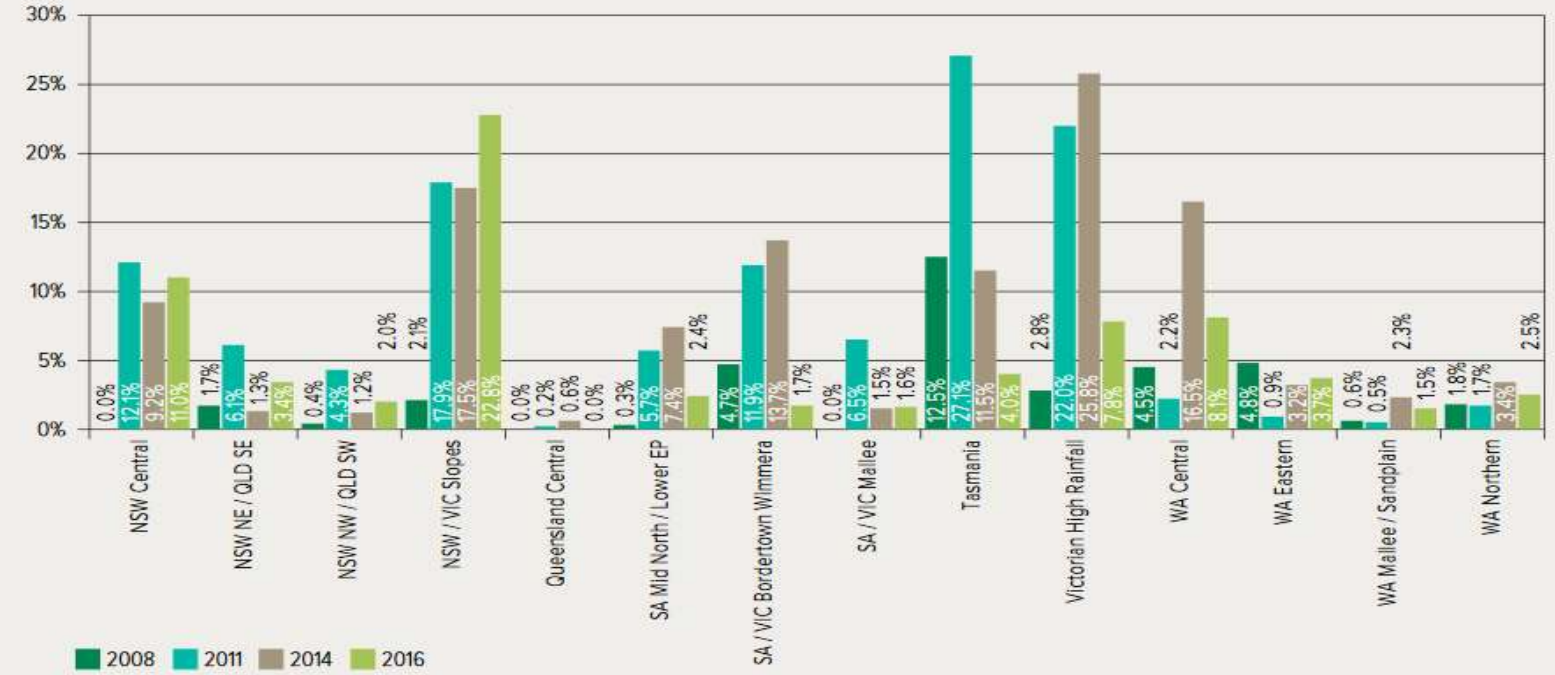
Where is ‘cool’ stubble burning most prevalent?

FIGURE 56 Average percentage of cropped area where stubble was burnt late (cool burn).



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Disadvantages of stubble burning

- Stubble burning results in:

➢ smoke and emissions; incl. nutrient loss (nitrogen, phosphorous, potassium, sulphur (*Norton and Sandral 2017)*

➢ via smoke, airborne ash, and later through wind and water erosion

- Can result in escaped burns


Image: Andrew Lang


Image: Andrew Lang

Opportunities/markets for removed stubble

Image: Colin Peace

Opportunities/markets for removed stubble

- Removal of some crop stubble (where stubble loads are particularly heavy) can improve accessibility of planting machinery
- Some stubble should be retained to stabilize paddocks and prevent wind erosion; usually recommended to be no lower than 13cm above ground
- Others recommend that the amount of retained stubble should between 1 and 1.5 tonne/ha, the latter being for the more northern Victorian cropping zone.

Energy markets for removed stubble

Countries adopting straw as a carbon-neutral energy fuel include:

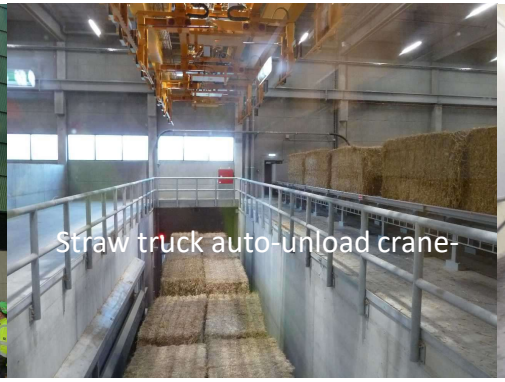
- Spain – the Sangűesa 25 mW-e plant (2002) uses 160,000 t/yr straw
- England – the Ely 38 MW plant (2001) uses 200,000 tonne/yr straw
- China - using dry ag. residues, mainly wheat and rice straw, as a fuel for up to an initial 40 CHP plants mostly of 25 MW-e baseload electricity capacity
- Denmark - Avedœre 2; 585 MW_e and 570 MW_{th} plant

➢ one of the world's most efficient CHP plant and district heating (94% efficiency)

➢ uses ~ 300,00 t/yr of wood pellets & 150,000 t/yr of straw.

Energy markets for removed stubble – power and heat e.g. Denmark

- Denmark has been converting straw into power and heat since the 1980's
- 55 District heating and CHP plants in Denmark use straw as sole fuel or with wood
- Currently ~ 1 million tonnes used for CHP production and another million or so for production only of heat mainly at smaller scale for farms, rural communities and industry
- Cost of straw production Denmark is higher than Vic - despite higher yields, smaller paddocks, smaller trucks - but the whole system now very streamlined
- *Photos & information – Courtesy Andrew Lang (World Bioenergy Association board member & SW Vic stubble-burning farmer!)*



Opportunities/markets for removed stubble

- The Central Highlands **Straw Alliance**, group of 9 landholders keen to develop alternatives to burning. Supported by Pyrenees Shire, RDV and other regional govt agencies and NGO's, completed 3 studies;

  - ➢ a feasibility assessment into opportunities/markets for use of straw
  - ➢ business case into the straw pellet manufacturing, and
  - ➢ a study into low cost straw production

- Continuing their research into technology and markets for their stubble. Portable straw pellet production is a potential option

- Working on two straw to energy projects;

  - ➢ installation of thermal straw to energy plant at Skipton hospital, and
  - ➢ a larger installation at a regional manufacturing business

ABC Western Victoria
Yesterday at 7:08 AM

CONVERTING STRAW INTO ELECTRICITY

Using straw to generate electricity could compete on cost with fossil fuels, according to the Central Highlands Straw Pellet Alliance.

Alliance members and farmers Nick Paterson and Scott Blurton are en-route to Germany to see the world's first mobile straw pellet machine.

The machine produces straw pellets in the paddock, and is an alternative to a fixed pellet plant, which the Alliance found to be not viable.

Pyrenees Shire Council is also part of the alliance and economic development manager Ray Davies said straw energy could be implemented at two pilot sites if government funding was received.

"We've completed a business case ... to convert straw into energy for the Skipton Hospital ... and a system that would be able to generate electricity and heating for [AME Systems in Ballarat]," he said.

"Bioenergy in the view of this group should be contemplated as a viable and realistic opportunity to complement sources of solar and wind power in the region.

"This is something that in European companies has been happening for a number of decades now."

Mr Davies said the production of straw pellets was most-suited to high-rainfall cropping regions.

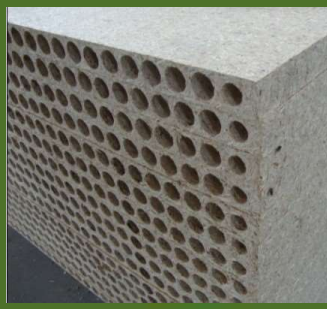
"In the high rainfall cropping area, farmers in essence are wanting to get away from burning stubble and that's a prime motivation for manufacturing these pellets," he said.

"We believe if these pilots are proven successful, it could be replicated across wheat belt areas throughout the state."

Opportunities/markets for removed stubble

- The **proposed** MacAnzac Project Coleambally (NSW)
- 2 x 130 MW boilers, each generating 50MW electric and 80MW of useable steam heat and each boiler consuming 350,000 tonnes of agricultural waste per year
- 30 briquette machines capable of producing 300,000 tonnes of briquettes per year
- Ratio of straw to other substrates will be ~ 70-80% straw to 20-30% secondary substrates
- Up to 110 permanent staff during operation and 350 staff for 2 years during construction
- Pelleted agricultural and garden fertilisers to be manufactured from boiler ash mixed with nutrients completing the recycling loop.

Other markets for stubble/straw



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Current markets for stubble/straw

- Pelletisation for inclusion into livestock feed
- Horticulture and garden supplies
- Substrate for mushroom growing
- Compressed sterilised straw for domestic and export for various uses including intensive livestock industries e.g. dairy (calf rearing), horse bedding, piggeries, poultry
- Cardboard and packaging paper from unbleached straw pulp and fine-quality paper from bleached straw pulp
- Insulation and straw bale houses, and
- Other building materials e.g. straw panelling and Stramit's Compressed Straw Board - (**negative emissions products**).

Current markets for stubble/straw

Stramit International make Compressed Straw Board - a natural product via process of heat and pressure that fuses the straw using its internal resins – manufactured since 1945 in UK and now produced in over 20 countries

Challenges around developing markets for stubble/straw

Collection of stubble is challenging:

- Many suppliers over a wide area
- High bulk, low density product – can be expensive to transport
- Variable quantity available from year to year
- Some potential uses/technologies untested in Australia – e.g. bioenergy

Stubble working group

- Informal group of interested parties incl; landholders, agribusinesses, local govt, bioenergy industry, EPA, CMA's/LLS's, Ag Vic aiming to:

- Share research and project ideas and developments around uses for stubble
- Gain better understanding of the extent and impacts of stubble burning
- Encourage support and investment in developing alternatives to burning

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Image: Colin Peace