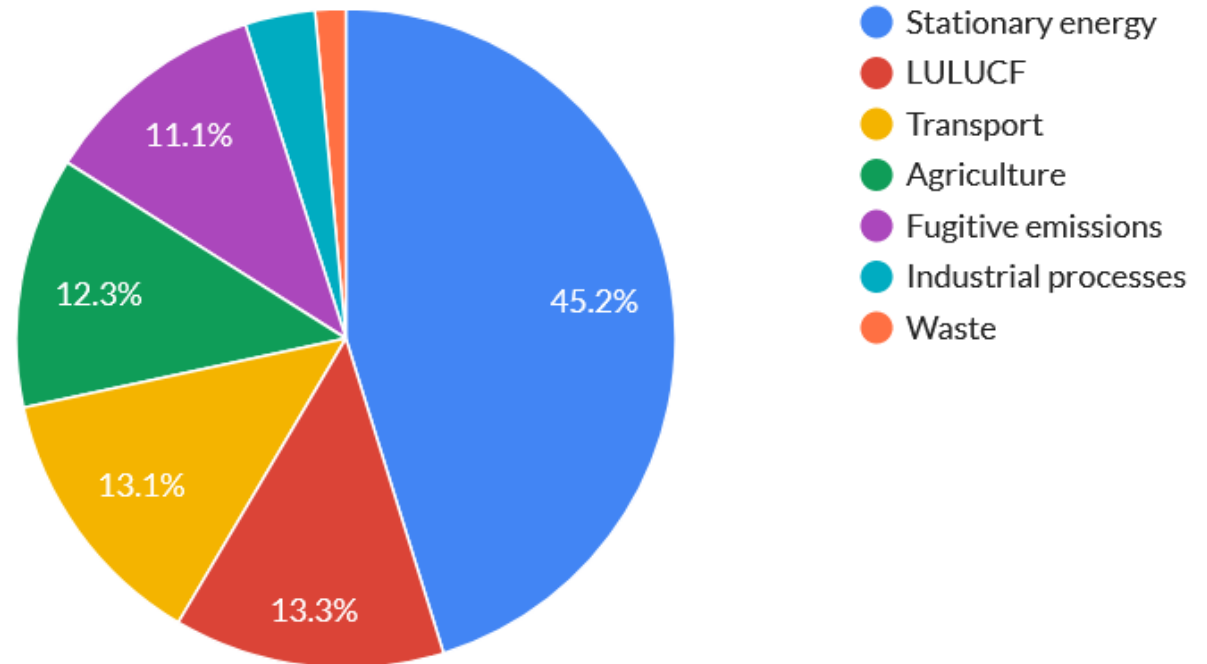


Meeting net zero emissions in the beef cattle sector



Australian Green House Gas Emissions

- Focus on grazing livestock
- Low cost solutions
 - <\$0.2 day/animal



Feed additives

- Two feed additives show promise
 - 3NOP (Bovaer)
 - *Asparagopsis* (Red Seaweed)
- 30%-90% reduction in methane
- Cost?
- Delivery in extensive environments?



Genomic selection

- Methane emission level is heritable (0.2)
- Expensive to measure
- Genomic selection a solution
- Ireland, Australia, Europe



Genomic selection

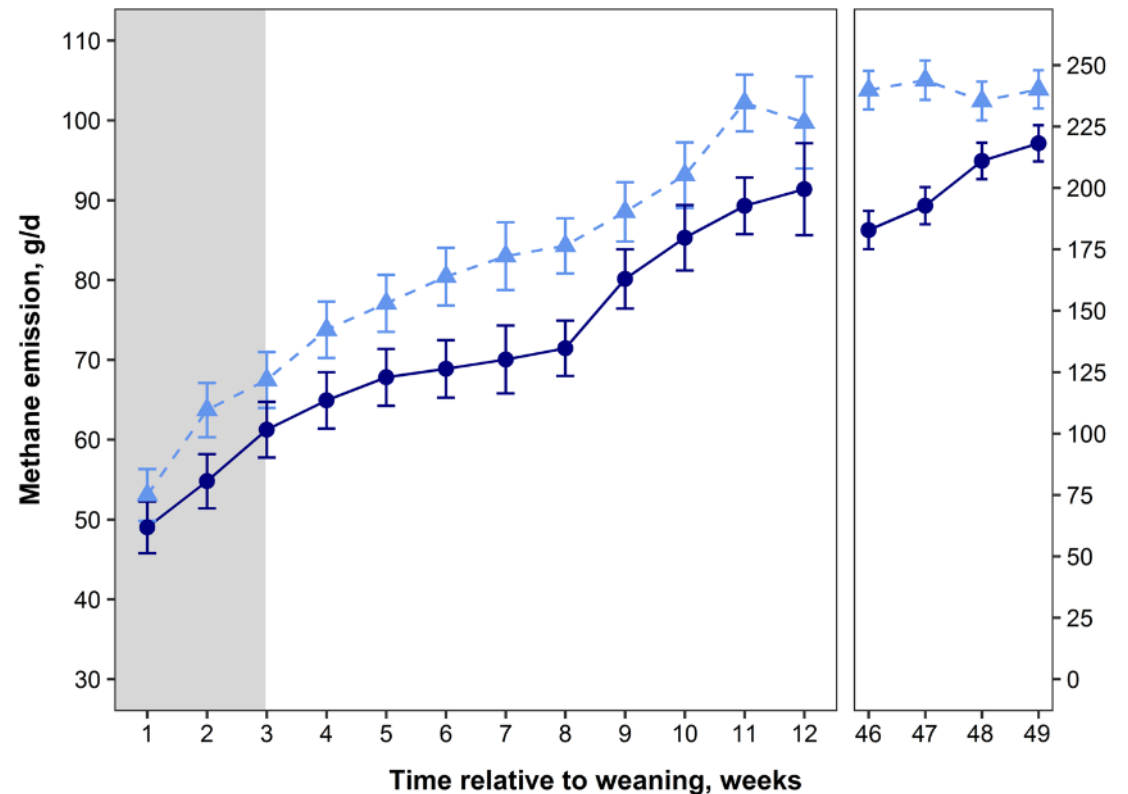
- Requires large reference populations of genotyped and phenotyped animals
- Selection for improved fertility can improve farm systems emissions



Early in life rumen modification

- Some evidence altering rumen early in life with feed additives can lower methane emissions later in life

Meale, et al. Early life dietary intervention in dairy calves results in a long-term reduction in methane emissions. *Sci Rep* 11, 3003 (2021).



Legumes and pastures

- Incorporating Leucaena can reduce farming systems emissions
- Selection/modification of pastures to reduce emissions when grazed by cattle?



Conclusion

- Range of different technologies to reduce methane emissions
- Cost profile important – must be profitable to be adopted
- To get to net zero, technologies will have to be combined (stacked)



Zero Net Emissions Agriculture CRC



ZNEAgCRC.com.au





**SMEs and
Indigenous Enterprises**



**National and
Multinational Industry**



**Growers and Natural Resource
Management Groups**

ZNE Agriculture CRC Innovation Ecosystem



**State, Territory and
Federal Government**



**Universities, Research
and Education Agencies**



**Research and
Impact Investors**



PROGRAM 1: Low-emissions plant solutions	PROGRAM 2: Towards methane-free cattle and sheep	PROGRAM 3: Whole-farm and mixed-enterprise systems analysis	PROGRAM 4: Delivering Value from Net Zero
<ol style="list-style-type: none"> Genetic solutions Plant nutrition solutions Legumes In-setting emissions in plant-based and mixed-farming production systems 	<ol style="list-style-type: none"> Novel individual animal methane measurement and proxies Selection for low-emission livestock Rumen manipulation for low emissions Delivery of low emissions innovation from lab to landscape 	<ol style="list-style-type: none"> Enabling on farm mitigation by developing protocols, metric and benchmarking tools for monitoring of GHG sources and sinks Integrated systems-level studies on-farm and landscapes analysis Synergies and tradeoff with other emerging ESG priorities 	<ol style="list-style-type: none"> Barriers, drivers, policy and consumers Circular economy solutions Renewable energy solutions Improved supply chain traceability
PROGRAM 5: Education, Training and Adoption			
<ol style="list-style-type: none"> Research capability development for ZNE Agriculture 	<ol style="list-style-type: none"> Industry capability development for ZNE Agriculture 	<ol style="list-style-type: none"> Integrated demonstration sites 	<ol style="list-style-type: none"> Next-generation teacher professional development and community outreach