

On-farm Greenhouse Gas Emissions Factsheet Series

#04 Modelled sheep enterprise

Holbrook Landcare Network used CSIRO's farm modelling decision tool GrassGro and University of Melbourne's Greenhouse Accounting Framework (GAF) calculator to model the greenhouse gas (GHG) emissions of two sheep enterprises, over two stocking rates. These were hypothetical properties, representative of sheep enterprises in the Holbrook area of southern NSW. The stocking rate, and therefore dry sheep equivalent (dse) was determined by soil fertility and pasture quality.

The objective was to provide baseline GHG emission information for these enterprises and the mitigation potential in the Holbrook area.

Enterprise 1 - Autumn lambing

- low stocking rate (8.9 dse/ha)
- high stocking rate (16.1 dse/ha)

Enterprise 2 - Spring lambing

- low stocking rate (9.1 dse/ha)
- high stocking rate (16.2 dse/ha)

The figures for each enterprise are based on a typical 1000 ha property in the Holbrook region with an annual rainfall greater than 700 mm. Both properties are Merino-cross enterprises with Phalaris and sub-clover based pastures.

TABLE 1. ANNUAL ON-FARM GHG EMISSIONS PROFILE OF GRASSGRO MODELLED SYSTEMS

System	Gross GHG emissions (t CO ₂ -e)	GHG emissions intensity (t CO ₂ -e / t liveweight)	Livestock gross margin / ha
Enterprise 1 - Autumn lambing			
Low stocking rate	1158	5.17	\$ 285
High stocking rate	2202	5.33	\$ 616
Enterprise 2 - Spring lambing			
Low stocking rate	1160	4.73	\$ 309
High stocking rate	2147	4.87	\$ 652

SUMMARY

- Low stocking rate results in slightly lower gross GHG emissions, but lower production.
- High stocking rate results in increased production, but slightly higher gross GHG emissions.
- High stocking rate results in higher gross margins, increasing the capacity to invest in mitigation activities (see Table 2).
- Spring lambing produces more meat per hectare and reduces emissions intensity.
- Spring lambing produced a higher gross margin per hectare for the same stocking rate as the autumn system.



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SUSTAINABLE INTENSIFICATION

Productivity growth is essential for global food security and is referred to as sustainable intensification. This is, the increase in food production from existing farmland while minimising pressure on the environment by optimising inputs. In simple terms, farmers must continually strive to produce more from a given area with more efficient use of resources and for less cost.

Sheep farmers in the high rainfall zone around Holbrook are achieving this by:

- increasing stocking rate through improving soil fertility and pasture improvement,
- matching feed supply to feed demand by lambing in spring.

The modelled systems have identified that as sheep farmers progress down this path, gross GHG emissions will **increase** with the rising stocking rate, however, GHG emissions intensity will **decrease** by lambing in the Spring. With farmers in the Holbrook area opting for higher stocking rates there will be a requirement for increasingly larger mitigation programs.

MITIGATION

In these modelled enterprises, situated in the high rainfall zone (> 700mm) of NSW, it was identified that it is relatively simple to offset each enterprise's total GHG emissions through revegetation. Table 2 outlines what area (ha) is required

TABLE 2. TOTAL REVEGETATION AND COSTS ASSOCIATED WITH BECOMING A CARBON NEUTRAL PROPERTY OVER 1000 HA.

System	Total GHG emissions (t CO ₂ -e)	Total ha required (% of property)	No. ha per year for 20 years	Cost per year over 20 years ^a
Enterprise 1 - Autumn lambing				
Low stocking rate	1158	31 (3.1%)	1.6	\$ 8,162
High stocking rate	2202	58 (5.8%)	2.9	\$ 15,271
Enterprise 2 - Spring lambing				
Low stocking rate	1160	31 (3.1%)	1.6	\$ 8,162
High stocking rate	2147	57 (5.7%)	2.8	\$ 14,745

^a based on the estimated cost of \$5266/ha for revegetation

This factsheet has been developed by Holbrook Landcare Network as part of the 'Carbon Farming and your business' project. This factsheet can be accessed on the Holbrook Landcare Network website www.holbrooklandcare.org.au/carbon.

Factsheets in this series:

#01 - Whole farm greenhouse gas modelling

#03 - Modelled cattle enterprise

#02 - Revegetation to offset greenhouse gas emissions

#04 - Modelled sheep enterprise

The GHG emissions have been calculated by inputting figures modelled in GrassGro, available at <http://www.hzn.com.au/grassgro.php>, into the Greenhouse Accounting Framework (GAF) calculators from www.greenhouse.unimelb.edu.au/Tools.htm. Holbrook Landcare Network and its employees do not guarantee that the modelled information is without flaw or assumption. These figures only take into account actual on-farm emissions and do not take into account any off-farm GHG emissions.

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