Appendix F

A comparative analysis of on-farm greenhouse gas emissions from agricultural enterprises in south eastern Australia

N.A. Browne1, R.J. Eckard1, R. Behrendt2, R.S. Kingwell3

1 Melbourne School of Land and Environment, The University of Melbourne, VIC 3010, Australia

2 Future Farming Systems Research, Department of Primary Industries, Private Bag 105, Hamilton, VIC 3300, Australia

3 School of Agricultural and Resource Economics, The University of Western Australia, 35 Stirling Highway, Crawley, WA 6009, Australia

Abstract. Agriculture in Australia contributes 16% of national greenhouse gas (GHG) emissions, with enteric CH4 and N2O contributing 10.4% and 2.8% of national emissions, respectively. If agriculture is to face an emissions constrained future then it is important to understand the emission profiles of different agricultural land uses and emissions associated with different production systems. Using the Australian National Inventory methodology, whole farm GHG emissions were calculated for different farm types in south eastern Australia. Fourteen representative farms were examined that included production of Merino fine wool, prime lamb, beef cattle, milk, wheat and canola. These farm systems were defined by the production parameters of an average farm and a top producing farm, ranked on gross margin/ha/100 mm rainfall in benchmarking studies. Emissions from the systems were allocated to the primary product from each farm such as wool, meat, milk fat plus protein (MFP) or grains. The biophysical models GrassGro and DairyMod were used to simulate the livestock systems and model outputs were then used in an emissions calculator. This calculator used a yearly time frame and employed the International Panel on Climate Change methodology, as currently used in the Australian National Inventory. The calculator included CH4 and N2O on-farm emissions but excluded emissions from pre- and post-farm processes, such as meat processing and fertiliser production. Energy and transport emissions were also excluded because they are not defined as agricultural emissions in the Australian National Inventory. Dairy farms produced the highest emissions/ha (8.4–10.5 t CO2-eqv/ha), followed by beef (3.9–5.1 t CO2-eqv/ha), sheep (2.8–4.3 t CO2-eqv/ha) and grains (0.1–0.2 t CO2-eqv/ha). When compared on an emissions intensity basis (i.e., t CO2-eqv/t product), cow/calf farms emitted the most (22.4–22.8 t CO2-eqv/t carcass weight) followed by wool (18.1–18.7 t CO2-eqv/t clean fleece), prime lamb (11.4–12.0 t CO2-eqv/t carcass weight), dairy (8.5–9.4 t CO2-eqv/t milk fat + protein), steers (6.3–6.7 t CO2-eqv/t carcass weight) and finally grains (0.04–0.15 t CO2-eqv/t grain). Emissions intensities of top farms were not always less than average farms. If a C price were imposed on agriculture, emissions intensity provides insight about relative cost impacts of the C price on production of different agricultural products under different production systems. The incidence of the C price on different products and production systems could trigger land use change.

See Browne N, Eckard RJ, Behrendt R, Kingwell R (2011). A comparative analysis of greenhouse gas emissions from agricultural enterprises in south eastern Australia. Animal Feed Science and

Technology, 166-167, 641-652. doi:10.1016/j.anifeedsci.2011.04.045