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COTTON PRODUCTION IN NORTH-WEST NSW: CLIMATE CHANGE MITIGATION OPTIONS

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OBJECTIVE

High yields associated with Australian cotton production minimise greenhouse gas emissions intensity. However, the industry as a whole continues to face pressure to demonstrate environmental credentials, especially given market pressure from synthetic fibres and developing nations. To respond to this pressure, we estimated the climate change impact of cotton production in North-West New South Wales, using Life Cycle Assessment (LCA) and tested the effect of an array of mitigation options.

METHODS

We conducted the study in SimaPro LCA software for the 2011-2014 production years, drawing on published data, survey data, scientific literature; and Australian and international databases. We assumed that 96% of production was from irrigated systems, with 85% of irrigation water pumped by diesel-powered irrigation pumps; and assumed a median yield of 10.28 bales per ha. We applied emissions formulae and factors from the Australian National Inventory Report, except where more specific published literature was available, particularly for fertiliser-related N_2O emissions and emissions from the decomposition of cotton residues.

RESULTS

We calculated the climate change impact on a cradle-to-port basis as 1601 kg CO_2-e per tonne of cotton lint, with 26% of emissions occurring during the pre-farm stage, 48% during the on-farm stage and 26% post-farm. Production and use of nitrogenous fertiliser contributed approx. 45% of the emissions.

RESULTS CONT'D

Several management scenarios were shown to reduce emissions intensity, including: optimising nitrogen application rate (2.6% to 13.2% reduction, for N=240 and N=180), use of controlled-release and stabilised N fertilisers (5.9%), solar-powered irrigation pumps (8.1%), biofuel-powered farm machinery (3.4%), legume crop rotations (3.9%) and fertigation (2.1% to 12.5%).

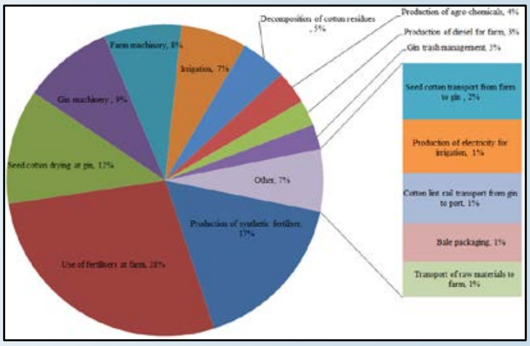

Figure 1. The relative contribution of different processes in the life cycle climate change impact.

CONCLUSION

We provide guidance about potential emissions reduction opportunities for incorporation into extension material and a platform to underpin ongoing analysis. Further research is required to understand the full life cycle consequences of biodiesel production, including alternative uses of the biomass and displacement of other land uses. From a legume break crop perspective, there is a need to better understand the potential reduction in carbon sequestration due to inclusion of a lower biomass crop in rotation.

[Source: NSW DPI Image Library]

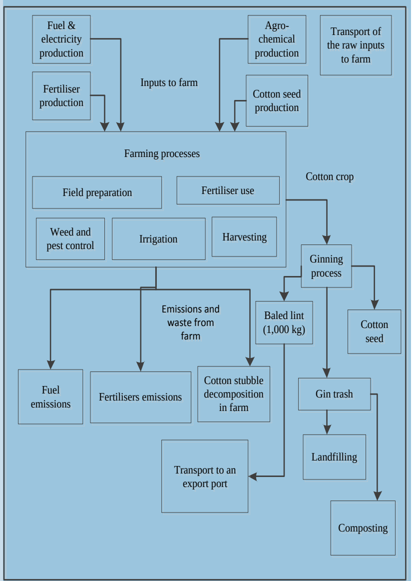

Figure 2. System boundaries

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MORE INFORMATION

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