



This note is extracted from “Life Cycle Assessment of UK Pig Production Systems: The impact of dietary protein source”, a dissertation sponsored by BPEX and prepared and submitted by Katie Stephen, July 2011.

Background and Method

The aim of the project was to quantify the environmental impacts of producing grower-finisher pigs (12–105kg) using different diet scenarios.

A Life Cycle Assessment (LCA) was developed to evaluate the environmental impacts of producing 1kg pig liveweight (LW). The model includes all processes involved in the production system but does not extend to transport of the pigs to slaughter or the slaughter process.

Diet scenarios

- Conventional soya based diet
- Home grown bean based diet
- Home grown pea based diet
- Home grown lupin based diet.

The trial diet formulations were nutritionally equivalent.

Two UK sites were modelled, one in East Anglia and the other in Yorkshire. A Brazilian corn-soya rotation was simulated for the production of soybean meal. Individual soil and climate conditions were defined at each site and two fertiliser scenarios were modelled – synthetic and slurry – specifically to compare the effects of slurry management.

The environmental impacts assessed were:

- Global Warming Potential (GWP)
- Eutrophication
- Acidification

Results

Figure 1 The contribution of all processes to the total GWP per kg pig LW at East Anglia (slurry fertiliser scenario)

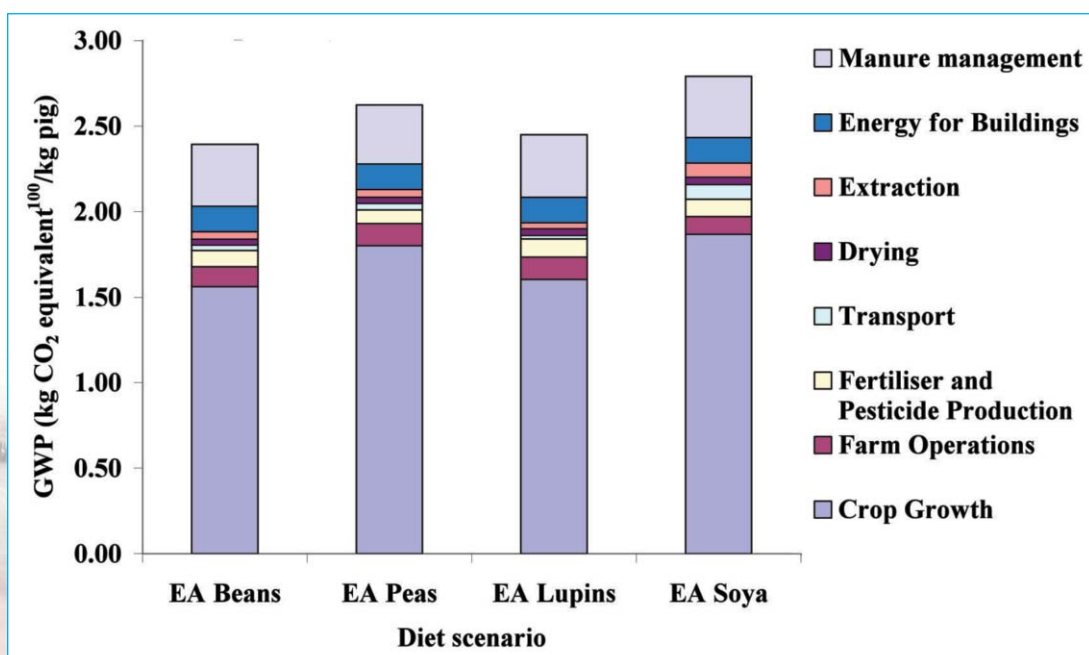
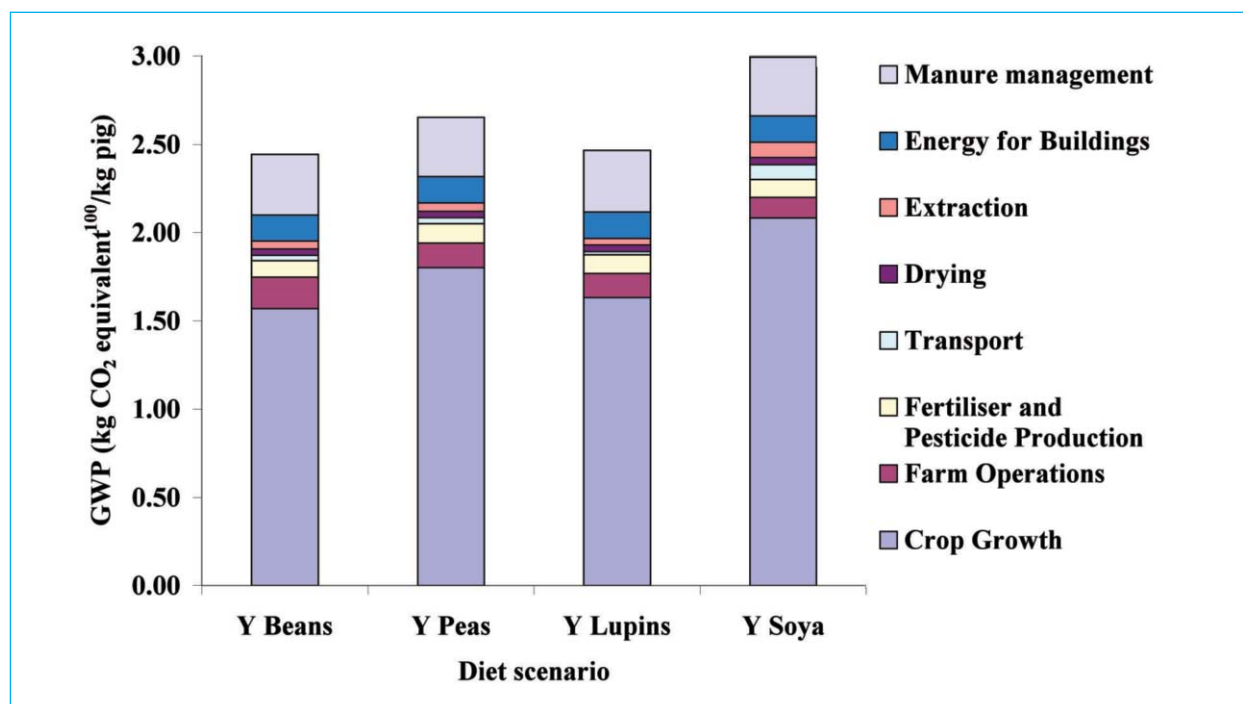


Figure 2 The contribution of all processes to the total GWP per kg pig LW at Yorkshire (slurry fertiliser scenario)



Results

- The bean based diets resulted in the lowest GWP per kg pig LW ranging from 1.85 to 2.67 kg CO₂ equivalent¹⁰⁰
- The soya based diets with the highest GWP per kg pig LW, 2.52 to 3.08 kg CO₂ equivalent¹⁰⁰
- Diet production contributed the most to per kg pig LW, ie 63.9–78.5%. Transport contributed approximately 1% to GWP in the home grown diet scenarios, however in the soya based diet scenarios, this was on average 3%
- Eutrophication potentials were higher in the synthetic fertiliser scenario. The lupin based diets were associated with the highest eutrophication potential, 0.056–0.133 kg PO₄ equivalent in both fertiliser scenarios. Whereas the pea based diets were consistently associated with the lowest eutrophication potential, 0.049 to 0.103 kg PO₄ equivalent
- The soya based diets concluded with the highest acidification potential, 0.054 to 0.129 kg SO₂ equivalent in both fertiliser scenarios.

Conclusion

The results were weighted from the lowest to highest results for each environmental impact category for each diet scenario at each site. The overall conclusion is that the bean based diets have the lowest environmental impacts per kg pig LW and the soya based diets have the highest environmental impacts per kg pig LW. Both the pea and lupin based diets have equal environmental impacts per kg pig LW.

This work highlighted that crop production is the main contributor to environmental impacts of pig production systems. It is also important to consider the fertiliser scenario when trying to reduce the environmental impacts within the management system. This has highlighted the importance for pig production systems to utilise slurry efficiently by considering crop nutrient requirements and the relevance of minimising the amounts of applied synthetic fertiliser.

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