Paper/Poster Title	Modelling Land-use change through alternative pig production systems in the Irish Agricultural Sector

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Abstract	*200 words max*

The global demand for protein is rising while enhancing pig health and welfare, minimizing environmental impact, and ensuring economic sustainability. Outdoor pig production systems, especially those embracing agroforestry practices, are positioned to address these challenges. Agroforestry pig production aligns with animal welfare goals and offers environmental benefits. However, the widespread adoption of extensive agroforestry pig production may intensify the demand for land, potentially transforming existing agricultural land. In Ireland, reported afforestation rates have fallen below national targets, attributed to barriers in farmers' initial land use decisions, such as concerns about future flexibility. This research employs the FABLE modelling framework to assess the potential impact of agroforestry pig production on Irish agriculture. By simulating land use, land-use change, and forestry (LULUCF), the study evaluates various scenarios, considering feed, pig farm management, and farm characteristics. key focus of the modelling exercise is on the uptake of agroforestry as a means by which to produce pigs in a high welfare outdoor production system. The results will be used to evaluate the implications on Irish agricultural economic and environmental indicators at national level covering a possible impact range.

Keywords	Land use change, pig production, agroforestry
JEL Code	Relation of Economics to Other Disciplines (A120), environment and ecology (Q5). General Welfare; Well-Being (I310)

Introduction	*100 – 250 words*

In Ireland, 0.2% (310 farms) of farms are in pig production (Eurostat, 2020), and production is increasing over time. In 2020, the national herd consisted of 1.6 million pigs with 46.7% in the Southern region (CSO, 2020). Along with environmental concerns, the 'One Welfare' framework is recognised as the interconnectedness of animals, humans, and the environment in which they live. Given this trend, it is important to seek alternative pig production systems, such as agroforestry, and investigate how they meet societal expectations regarding the welfare of animals, humans, and the environment. Ireland has reported afforestation rates below national targets in recent years (DAFM, 2020). This lower uptake has been explained that there is a barrier in the initial land use decision making for farmers such as lack of flexibility in future land use. Therefore, it is important to show what alternative land-use with agroforestry in pig production bring to Irish agricultural sector. In addition, uptake rate of such systems will increase the demand for land for this outdoor pig system. This demanded land will have to move out of existing other uses, mainly agriculture land (arable and grassland). Therefore, agricultural land would need to be transformed into agroforestry land. These changes in total land use may increase the pressure on the agricultural

land market and will affect the marginal returns from agriculture activities which are determined by land rents. This study aims to examine how land use changes in pig production might affect Irish agriculture by exploring different scenarios.

Methodology	*100 – 250 words*

To examine the economic and environmental implications of agroforestry on alternative land-use, model-based projections of future agricultural activity levels and land-use are required. We employ the FABLE model to access these variables in a consistent framework. It uses economic and environmental indicators simulated with the land use, land-use change, and forestry (LULUCF) module. It is built in Excel and offers everything to compute long-term pathways of food and land use systems up to 2050. It can test the impacts of numerous alternative assumptions with using pre-filled with global databases. The FABLE Calculator is currently being used by the FABLE Consortium (https://fableconsortium.org/), a global network of researchers from local knowledge institutes in 20 different countries. A desk-based literature review was conducted to find key variables that may affect land use change and environmental performance of agroforestry pig production systems. The variables include the area of agroforestry required for outdoor pig production, various emission from feed production, pig production, pig housing and manure management.

Results	*100 – 250 words*

Through the literature review, we assume that variables related to emissions from feed and pig farm management, and area (ha) /quantity of feed are associated with land use change. The environmental performance of agroforestry pig production systems is expected to improve/ minimise environmental impact compared to conventional pig farming system. Farm characteristics and production indicators such as the number of piglets weaned per sow are also associated with environmental performance. Based on these findings and expert knowledge on agroforestry pig production, we expect to develop alternative land-use change scenarios resulting from a potential increase in agroforestry pig production. The FABLE calculator for Ireland has been established so far and the Current Trends Pathway will be generated. Based on above, agroforestry pig production will be incorporated into the FABLE calculator, and a land-use change pathway will be developed and analysed.

Discussion and Conclusion	*100 – 250 words*

Through the literature review and analysis of the scenarios, we will have modelled factors from agroforestry pig production and develop the pathway using the FABLE calculator to see how it will change land use and its potential environmental impact. A key focus of the modelling exercise is on the uptake of agroforestry as a means by which to produce pigs in a high welfare outdoor production system. The results will be used to evaluate the implications on Irish agricultural economic and environmental indicators at national level covering a possible impact range. The scenarios we develop will be consistent with the aims and targets for the Irish agri-food sector as laid out in the Food Wise 2030 strategy document. The analysis on the impact of agroforestry systems for pig farming will enable us to provide recommendations to policy makers to consider national-level policy levers appropriate to achieve welfare and climate change priorities, including levels of financial support for farmers.