

ENVIRONMENT

Title: Reducing the Environmental Footprint of Pig Finishing Barns - NPB #09-055

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Scientific Abstract:

Design, construction, and management of pig production buildings in Minnesota and the upper Midwest have changed little in the past 30 years. Inexpensive energy (fossil fuel and feed), plentiful water, and limited concern of air emissions has resulted in few incentives to critically evaluate, modify, or significantly change pig housing designs. However, recent global trends have forced the pork industry (both in Midwest and throughout the U.S.) to reduce the environmental impact of swine production systems. For pork production this could partially be accomplished through the development and use of smarter and/or “greener” housing designs and management that reduces both fossil and feed energy use as well as air emissions including hazardous (ammonia and hydrogen sulfide) and greenhouse (carbon dioxide, methane, and nitrous oxide) gases plus odor and particulate matter (NPB, 2007). In this study, the new pig finishing housing design proposed is referred to as the “Greener Pig Barn” or GPB.

A 2400-head double wide, tunnel-ventilated, fully slatted, deep pit finishing barn was used as the reference facility to compare energy use and air emissions with the new GPB housing design. The tunnel ventilated (TV) barn was used as a baseline in this study because it has been the most commonly built pig finishing facility in the upper Midwest for the past 5 to 10 years. It is estimated that over 80% of all pig marketed in the upper Midwest are either grown in a tunnel ventilated (TV) or the deep pit, fully slatted, curtain sided (CS) barn.

This report includes four GPB design variations. Version A features pens with partially slatted floors and in-floor heating and cooling in the solid floor section, shallow gutters under the slats with mechanical scrapers for manure removal to an outside covered manure storage tank, and an evaporative cooling system. Version B is similar to Version A but integrates a mechanical (geothermal) cooling system (rather than evaporation pads). Version C is similar to Version A, but has fully slatted floors and is cooled only with evaporative cooling pads. Version D is similar to Version B (mechanical cooling) but has fully slatted floors. All GPB design versions use shallow gutters with mechanical scrapers and an in-ground, covered, concrete manure storage tank located adjacent to the barn.

All versions of the Green Pig Barns are expected to save energy in the winter due to better insulation and environmental control. Reduced emissions are also expected due to the lack of long term manure storage

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inside/under the barn and to barn cooling. Building construction costs per pig space, which includes an outside, covered, in-ground concrete manure storage tank, are expected to be 1.3 to 2 times higher than typical construction of the baseline TV barn. These costs are offset by a 3-7% increase in average daily gain and 5-10% decrease in feed consumption per pound of pork produced. Other benefits include better pig health and worker environment. Using these assumptions in a standard economic projection, annualized net present value per pig space is between \$2.43 and \$9.03 with 6.0 to 12.8 years to payback over the baseline (TV) facility. These economic projections would improve significantly with additional gains in animal performance. It is generally thought that these performance gains are anticipated but there is currently no research data to confidently predict the magnitude of these performance improvements on an annual basis in commercial scale operations.