An Investigation into a Low-Input Pig-Fish System Appropriate for the Mekong Delta, Vietnam

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The use of pig manure as an input to freshwater fish culture is a well established system in parts of Asia. The pig production wastes, which may include urine and waste food in addition to faeces, may be used to provide nutrients for stimulating the growth of natural food organisms such as phytoplankton, zooplankton and detrital-bacterial aggregate. These feeds, present in both the water column and sediments of ponds, are consumed by suitable herbivorous and omnivorous fish species.

Research into integration between pigs and fish to date has been based on the wastes from modern pig production systems utilising nutritionally balanced feeds. Fish yields are related to the level and quality of nutrients in waste; the data from high input pig production therefore cannot be extrapolated to backyard, small-scale systems. These tend to utilise local feeds which are typically nutritionally inferior and produce wastes that are also less nutrient rich. The choice of fish species also has impacts on yields since phytophagous fish such as Nile tilapia (*Oreochomis niloticus*) are likely to optimise yields in eutrophic water. Their tendency to breed in the system may be either a benefit, if progeny can be marketed locally as 'seed', or a problem if their recruitment is uncontrolled leading to stunting of stocked fish. The use of suitable predatory fish to control excess progeny may therefore improve performance.

An experiment in which all the production wastes from fattening pigs fed a diet available to Vietnamese farmers was used to fertilise a

monoculture of Nile tilapia or a polyculture of the same species with hybrid clarias catfish (*Clarias macrocephalus* x *Clarias gariepinus*). All the wastes from pigs housed in stalls were loaded daily into a series of six earthen ponds (200m^2) over a period of 90 days. A ratio of 50 pigs/ha pond area was used, based on the normal numbers of pigs fattened per household and typical fishpond size in the target area. No other inputs were used except for an initial basal fertilisation of 75 kg/ha urea and 90kg/ha triple superphosphate during pond preparation.

Pigs (hybrid Large White x Landrace x Duroc) were fed a cooked mixture of rice bran, obtained from village rice mills in north-east Thailand, and chopped water hyacinth (*Eichhornia crassipes*) twice daily. Rice bran and water hyacinth were fed on a basis of 5% and 4% (wet weight) of the live weight of the pigs, adjusted monthly. The pigs used were modern hybrids obtained from a commercial farm at a mean size of 55.3 kg and raised over a period of 3 months, reaching a average marketable size of 88.9 ± 3.2 kg.

Net yields of the monoculture and polyculture of fish were not significantly different at 14-16 kg fish/pond (extrapolated yields of 2.9 and 3.3 MT/ha/year respectively). Stocking hybrid catfish as a predator to control tilapia breeding was ineffective. Large numbers of tilapia fry were harvested from both systems, although the polyculture had significantly less.

The simulated value of the harvest varied with local market opportunities for tilapia fingerlings or hybrid catfish. The use of the tilapia fingerlings as a supplementary pig feed is a potential option; yields of small fish (total length=<10 cm) varied between 5-8 kg per pond over the three month trial.

The energy requirements to prepare the pig feed were also accounted within a framework of woody biomass produced from *Leucaena leucocephala* in which the leaf was fed to small ruminants. Rotational cutting of a boundary fence (178m long, 1m wide) would satisfy the energy needs to produce feed for one fattening pig throughout the experimental period.