Waste discharge from pangasius raised in ponds, flow-through and recirculating aquaculture systems

Nhut Nguyen[1], Nguyen van Hao[1], Roel Bosma, Ep Eding, Johan Verreth, Marc Verdegem[2]

[1] Research Institute for Aquaculture No. 2, Hochiminh City, VN. [2] Aquaculture and Fisheries Group, Wageningen University, NL

Background

There are concerns about the sustainability of the pangasius pond farming in Vietnam. Important sustainability indicators include water use and nitrogen, phosphorus and COD discharge. Other possible farming systems are flow-through and recirculating aquaculture systems (RAS)

Objective

To compared sustainability indicators of pangasius production in flow-through, ponds and recirculating systems.

Introduction

Pangasius production in Vietnam reached > 1.4 million tons per year in 2012. The product is exported to 150 countries. The industry consumes about 2.06 million metric tons of feed per year. Nitrogen, phosphorus and COD inputs are 14.5, 4.2 and 360 MT per ha per year, respectively. This results in highly concentrated effluents, providing a good opportunity for cost-effective treatment in recirculating aquaculture system.

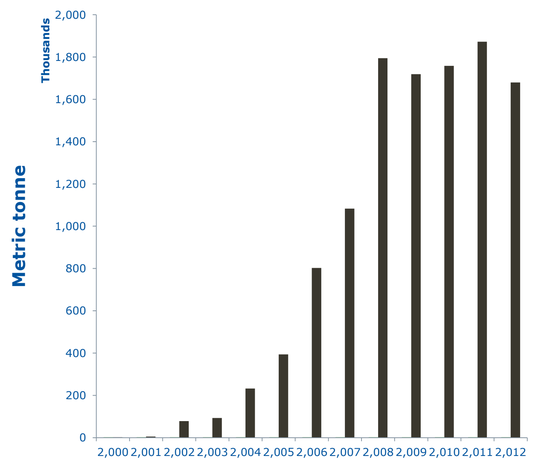

Figure 1. Pangasius production in Mekong Delta, Vietnam

Results

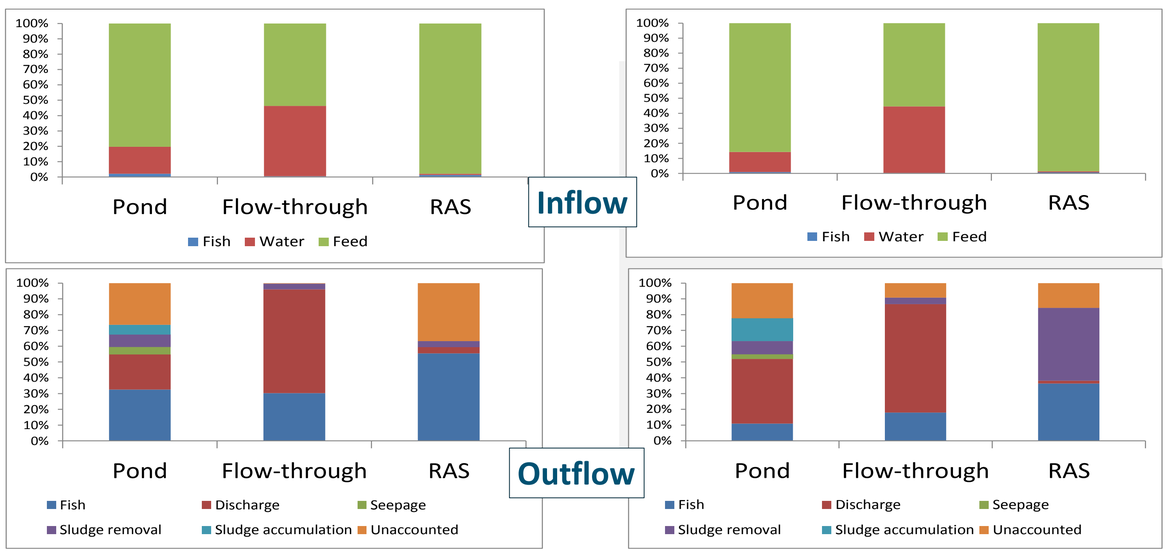

Figure 2. Nitrogen mass balance

Figure 3. Phosphorus mass balance

- Feed accounts for more than 90% of nitrogen and phosphorus input in RAS.
- Nutrients retained in fish biomass in ponds 50% lower in ponds compared to RAS.
- Nutrients discharged with effluent much lower in RAS.

The water budgets presented the lowest in amount of water discharge in the RAS for pangasius culture. The results illustrated that water consumption in the pond and flow-though system is 27 times higher than the RAS.

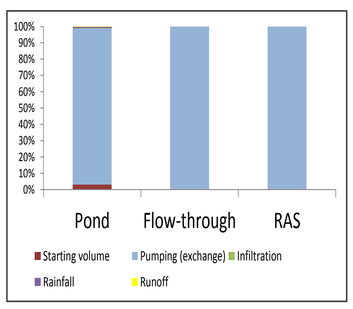

Figure 4.Water inputs

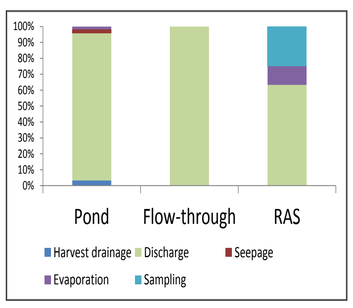

Figure 5. Water outputs

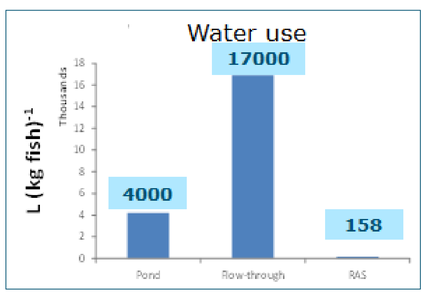

Figure 6. Water use

Specific growth rate, survival and production in RAS were much higher than in ponds. The feed conversion ratio in RAS was 31% lower than pond, resulting in less pollution. In addition, less feed is needed to obtain the same production as in ponds. Feed is the most expensive cost factor in pangasius production.

Table 1. Pangasius growth performance in pond, flow-through and RAS

Growth performance	Unit	Pond	Flow-through	RAS
Survival rate	%	63.7	97.0	93.0
Production	$kg.m^{-3}$	7.8	212.5	206.3
SGR	$\% bw.d^{-1}$	1.2	1.7	1.7
FCR	-	1.6	1.1	1.1

Conclusions

Compared to ponds, pangasius production in RAS results in lower nutrient discharge, reduced water use, faster growth and higher nutrient retention by fish. Testing RAS technology at larger scale will be necessary to evaluate economic feasibility.

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AFI
P.O. Box 123, 6700 AB Wageningen
Contact: nhut.nguyen@wur.nl
T + 31 (0)317 12 34 56, M +31 (0)6 12 34 56 78
www.wageningenUR.nl