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ENVIRONMENTAL IMPACTS OF FARMS INTEGRATING AQUACULTURE AND AGRICULTURE IN CAMEROON

 Efole Ewoukem T, Aubin J., Tomedi Eyango M, Mikolasek O., Corson M.S., Tchoumboue J., Van der Werf H.M.G., Ombredane D.



Structure ➤Introduction ≻Methodology ➢ Results ≻Conclusion



Introduction

In sub-Saharan Africa

Fish provides 50% of human protein consumption

Although aquaculture is a recent activity, it increased up to 13% per year from 1970-2006 (FAO, 2007).

Fish is produced mainly in ponds and could help to diversify family-scale agricultural production

Slow development of inland fish farming

Location area of the study in Cameroon





Questions

Does Life Cycle Assessment (LCA) of low input fish farming systems make sense?

Can it be used as a tool for the improvement of the farming system?





Farm	pond size (m²)	pig manure (kg/m²)	crop by- products (kg/m²)	Wheat bran (kg/m²)	stocking density (Ind/m²)	pig feed	
F1	200	36.9	0	2	5.5	concentrate feed	
F2	200		0	2.4	3.5		
F3	150	12.8	0.33	0	3	Wheat bran & crop by-products	
F4	180	10.8	0	0	3	Wheat bran	
Fre	nch Nationa	al Institute fo	or Aaronomi	ic Research			

Other aquatic production systems								
	Peixe-Verde (PV)	Trout farming(TF)						
country	Brazil	France						
production system	Integrated semi-intensive (fish polyculture and crop- production)	intensive farming						
type	polyculture of carp	monoculture of trout						
species	Ctenopharyngodon idella, Hypophthalmichthys molitrix, Hypophthalmichthys nobili, Cyprinus carpio	Oncorhynchus mykiss						
feed	Forage plants	Concentrate feed						
yield(t/ha/yr)	7	241						







METHODOLOGY

LCA : according to CML 2001 method adapted to aquaculture (from cradle to farm gate)

•Economic allocation,

- Functional Unit: one ton of Fish
- Background data from Ecoinvent



METHOD:System boundary



METHOD: Inventory

Duration: one production cycle (from the seeding with fingerlings up to harvesting)

Farm data: direct measurement and farm surveys

Flows of nitrogen and phosphorus by nutrient-balance

modelling approach (Cho and Kaushik, 1990)







RESULTS

Dynamics of Nitrogen and Phosphorus

 \rightarrow Low N & P fixed by fish in these systems compared to the maximum: 5-25%N ; 5-18%P, Verdegem (2007)





RESULTS : Environmental Impacts

Potential impacts per ton of fish produced in different farms F1 to F4 compared to PV (an integrated semi-intensive system of fish polyculture and crop-production in Brazil) and TF (an intensive trout farming system in France)

Input								
Impact Category		Farms						
	Unit(/t)	TF	F1	F2	F3	F4	PV	
Eutrophication (E)	kg PO ₄ -eq.	66	908	318	401	157	23	
Climate Change (CC)	kg CO ₂ -eq.	2700	5100	1600	800	600	1200	
Acidification (A)	kg SO ₂ -eq.	19	22	7	3	3	8	
Energy Use (EU)	MJ	78200	17100	4000	1800	1700	11600	
Net Primary Production Use (NPPU)	kg C	62200	8600	1000	1000	1700	2300	
Water Dependence (WD)	m ³	52600	16900	20000	5100	23700	6300	
Good Mediocre								
Acceptable		Bad						
French National Institute for Agronomic Research								

Relative contribution (compared to F1) of processes to impact categories per ton of fish produced for the four farms studied.



CONCLUSION

- Iow quantities of nitrogen and phosphorous were fixed by the fish in these systems.
 - Eutrophication impact per ton of fish produced was higher for these Cameroon farms than that for other aquatic production systems
- The main processes contributing to impacts were the production of pig-manure and of wheat bran.
- The question of yield and efficiency is a central point to better characterise systems, which argues for the use of LCA.
- LCA is adapted to analyse low-input pond systems
- > For these systems data availability can be a limiting factor









Thank you for our Attention





