Fertilizer and nutrient use in Egyptian Aquaculture

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Country Director, Egypt and Nigeria

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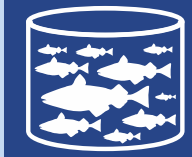
WorldFish vision

To be the research partner of choice for delivering fisheries and aquaculture solutions in developing countries.

Research Programs

Sustainable aquaculture



Enable sustainable increases in livelihoods from aquaculture production without creating adverse socio economic or environmental impacts.

Resilient small-scale fisheries

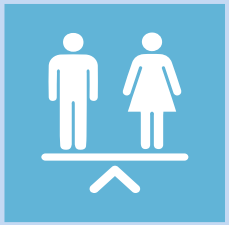
Secure and enhance the contribution of small-scale fisheries to poverty reduction and food security in priority geographies.

Value chains and nutrition

Increase the availability, access and consumption of nutrient-rich, safe fish, especially for women of reproductive age, infants and young children.

Cross cutting themes

Climate Change



Gender Equity

Entrepreneurship

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Challenges to aquaculture development

- Climate change and its effects
- Less sources of fish feed ingredients
- Water scarcity
- Increase in fish disease and shift in parasite incidences
- Funding constraints among farmers

Reduction of gas emissions

Alternative feeds or alternative fish? Diversification?

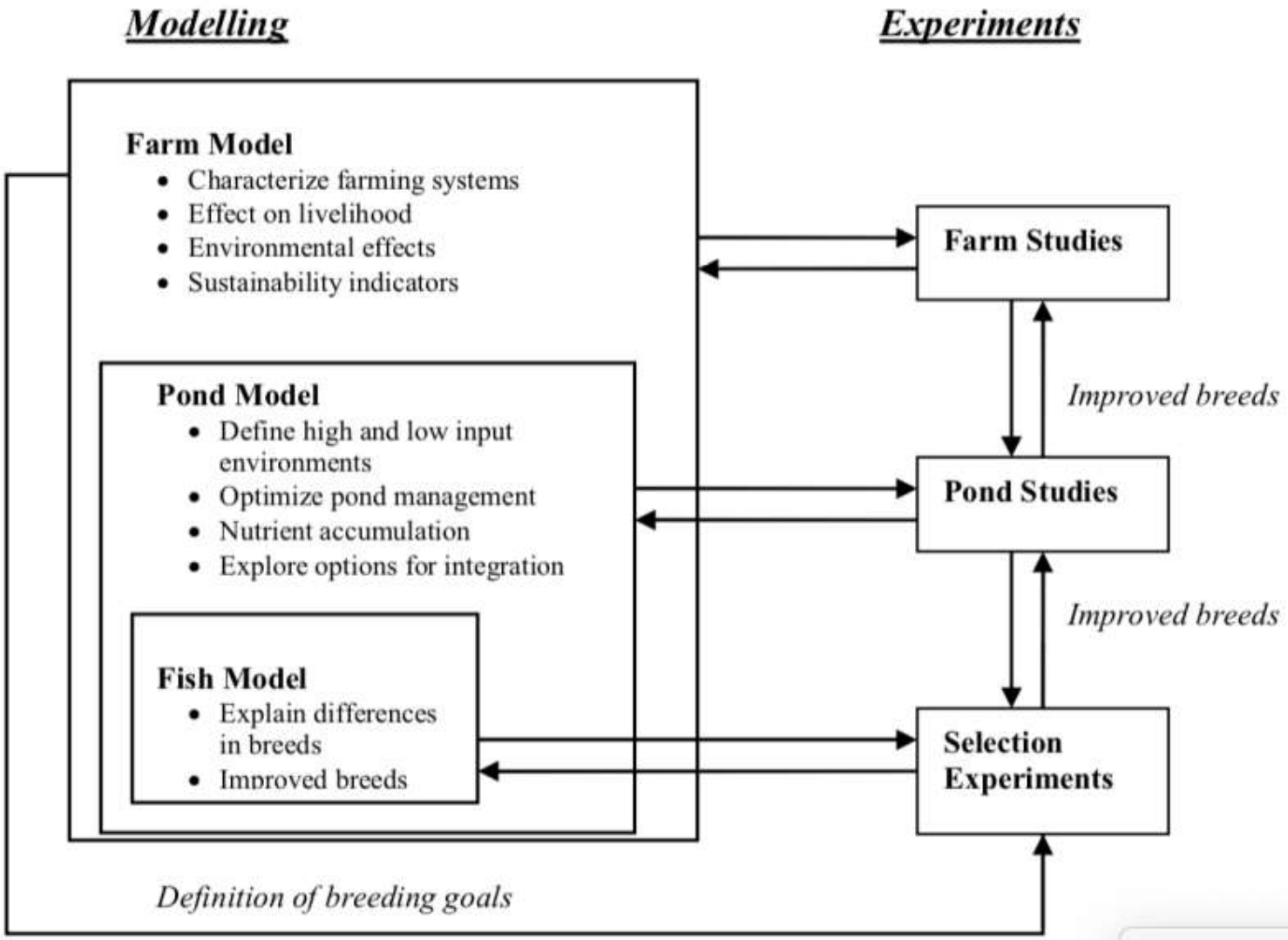
Water use efficiency at farm and production unit level

Environmental issues on-farm conditions

Reduce waste and add value

CGIAR RESEARCH PROGRAM ON Fish

Room for optimization of nutrient use efficiency



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Farm performance

Farm performance depends on access to a number of inputs: seed, feed, culture system, market access, and integrating technologies

Quality breeds and broodstock

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Quality seed produced by hatcheries

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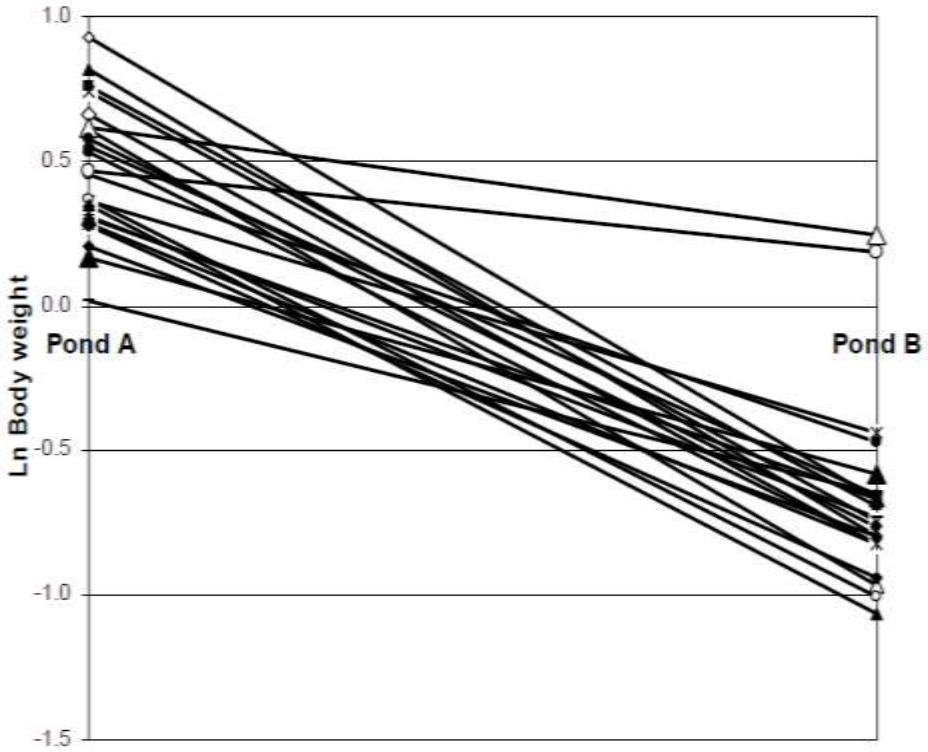
Quality seed delivered to farmers

↓

Quality seed used by farmers



genetics important for improved seed

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An overview of freshwater and brackish-water aquaculture systems in Egypt, 2005

System	Culture species	Stocking density (fish/ha)	Stocking ratio	Size of pond (ha)	Fertilization and feeding	Rearing period (months)	Harvest size (g)	Total yield (tonnes/ha)
Extensive								
Polyculture	Tilapia, mullets, seabream, seabass, carps, catfish	Natural populations	Varies	5 to over 40	Depends mainly on available natural food, without fertilization	9–14	varies	0.25–0.75
Semi-intensive								
1. Polyculture in brackish-water pond	Tilapia, mullets, carps	15 000–30 000	Varies	0.5–13.0	2–5 tonnes poultry manure + 29 kg super phosphate + 18 kg urea/ ha; 25% CP feed	7–12	200–300 100–200 200–500	5–10
2. Monoculture	Tilapia (mainly all-male)	15 000–30 000		0.5–2.0	2–5 tonnes poultry manure + 29 kg super phosphate + 18 kg urea/ ha; 25% CP feed	7–9	200–400	5–10
Intensive culture								
Monoculture	Tilapia (mainly all-male)	50 000–100 000		0.25–0.50	35–40% CP feeds at the beginning, reduced to 25% CP during fattening	7–10	200–400	15–25
Polyculture	Tilapia + grey mullets	50 000	3:1	0.5–1.0	36% CP feeds at the beginning, reduced to 25% CP during fattening.	9–12	200–300	15–20
Cage culture	Tilapia (mainly all-male)	60–100 fish/m^3		32–600 m^3	35–40% CP feed at the beginning, reduced to 25–30% CP during fattening.	8–14	300–400	25–35 kg/m^3

CP = crude protein

Source: author's field survey

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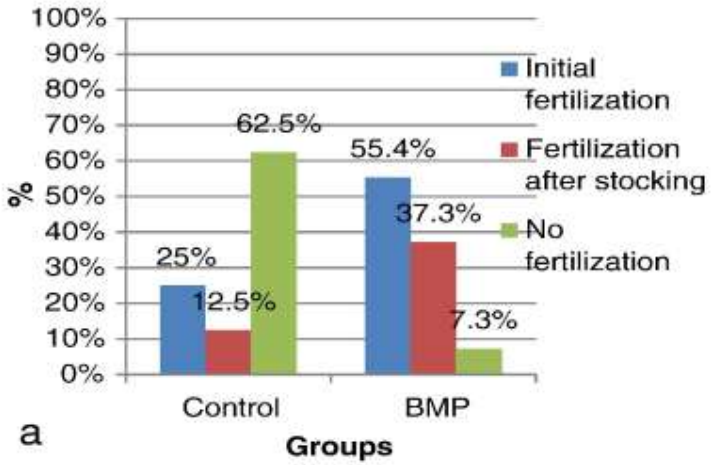
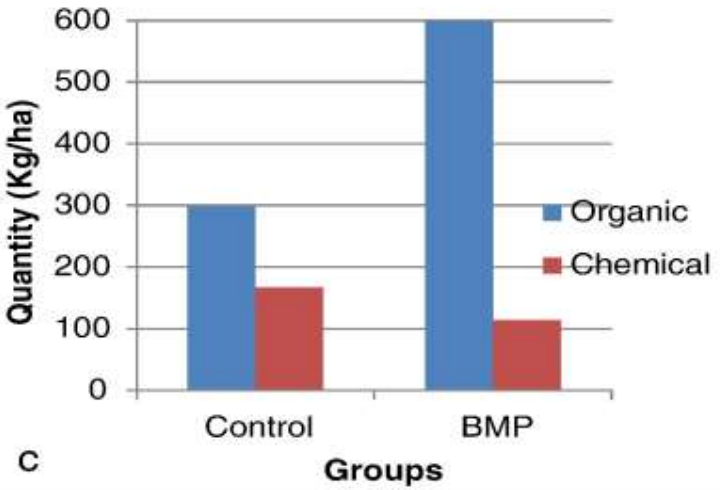
Fertilizer use in Egyptian aquaculture

(Malcolm et al 2016)

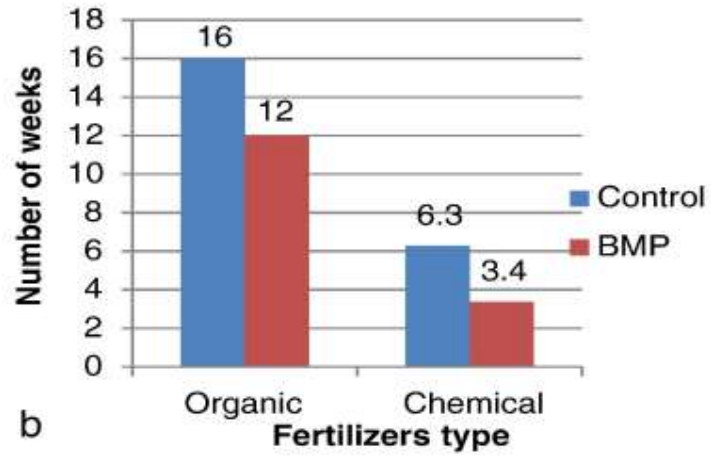
a. Proportion of farms using or not using fertilisers



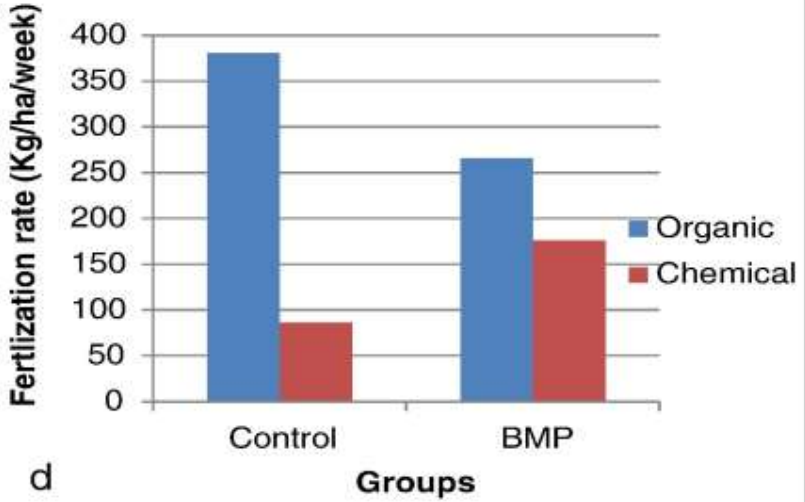
b. Initial fertiliser type and application rates



c. Average length of time that fertilisers were used (weeks) during grow-out



d. Application rates for fertilisers during grow-out (kg/ha/week)



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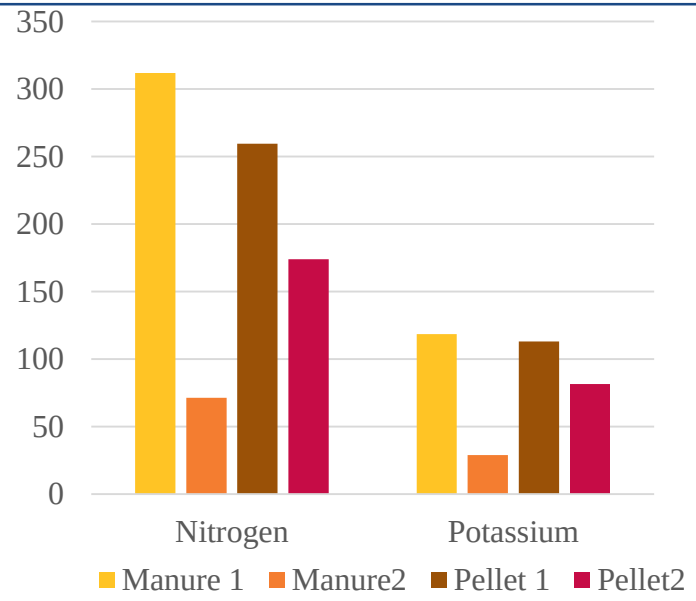
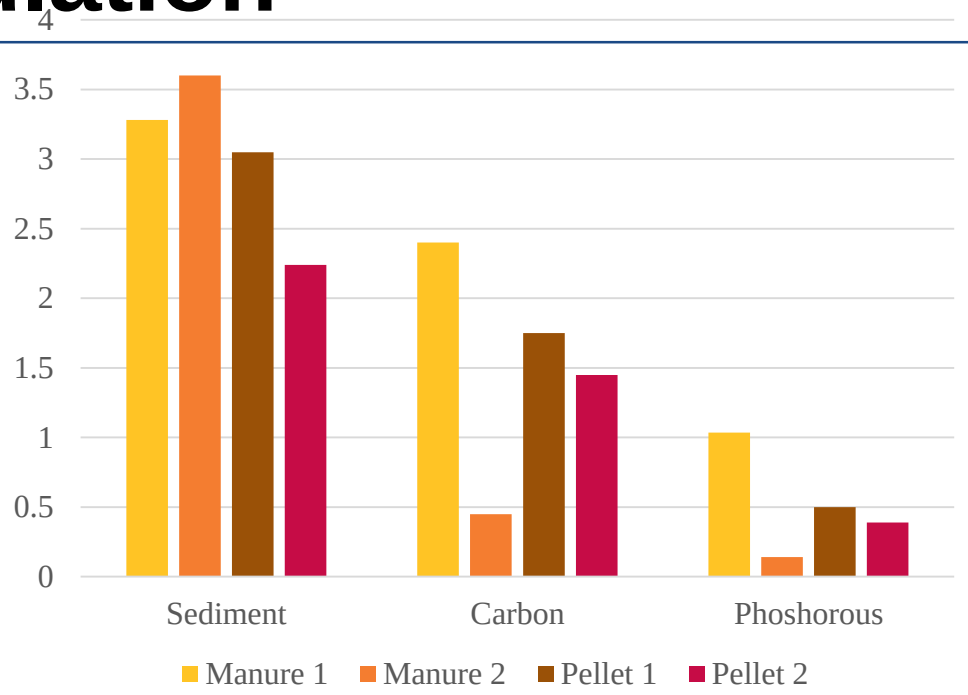
Manure levels determine sediment and nutrient accumulation





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Pond water can improve maize growth parameters and yield

Trait	Traditional culture (Canal water + 100% fertilization)	Fish pond water + 0 fertilization	Fish pond water + 50% fertilization
Plant Length	158±5.7	158±1.5	161±1.1
Plant Weight	0.6±0.05	0.5±0.02	0.7±0.1
Crop weight (kg)	0.34±0.02	0.3±0.03	0.35±0.01
Production kg/ Fed.	137±8.2	126±7	142±5.9

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Water use efficiency

Parameter	Site 1	Site 2
Water use in m^3		
Water discharge to maize	405	720
Total water use m^3	1,005	1,320
Yield		
Fish yield in kg	407	350
Maize yield	750	850
Revenue		
Maize Revenue EGP	2,775	3,175
Fish revenue	9,138	7,523
Fertilizers saving	560	460
Total Gross Revenue (EGP)	12,473	11,158
Return on unit of water used (EGP/m^3)	12.4	8.5

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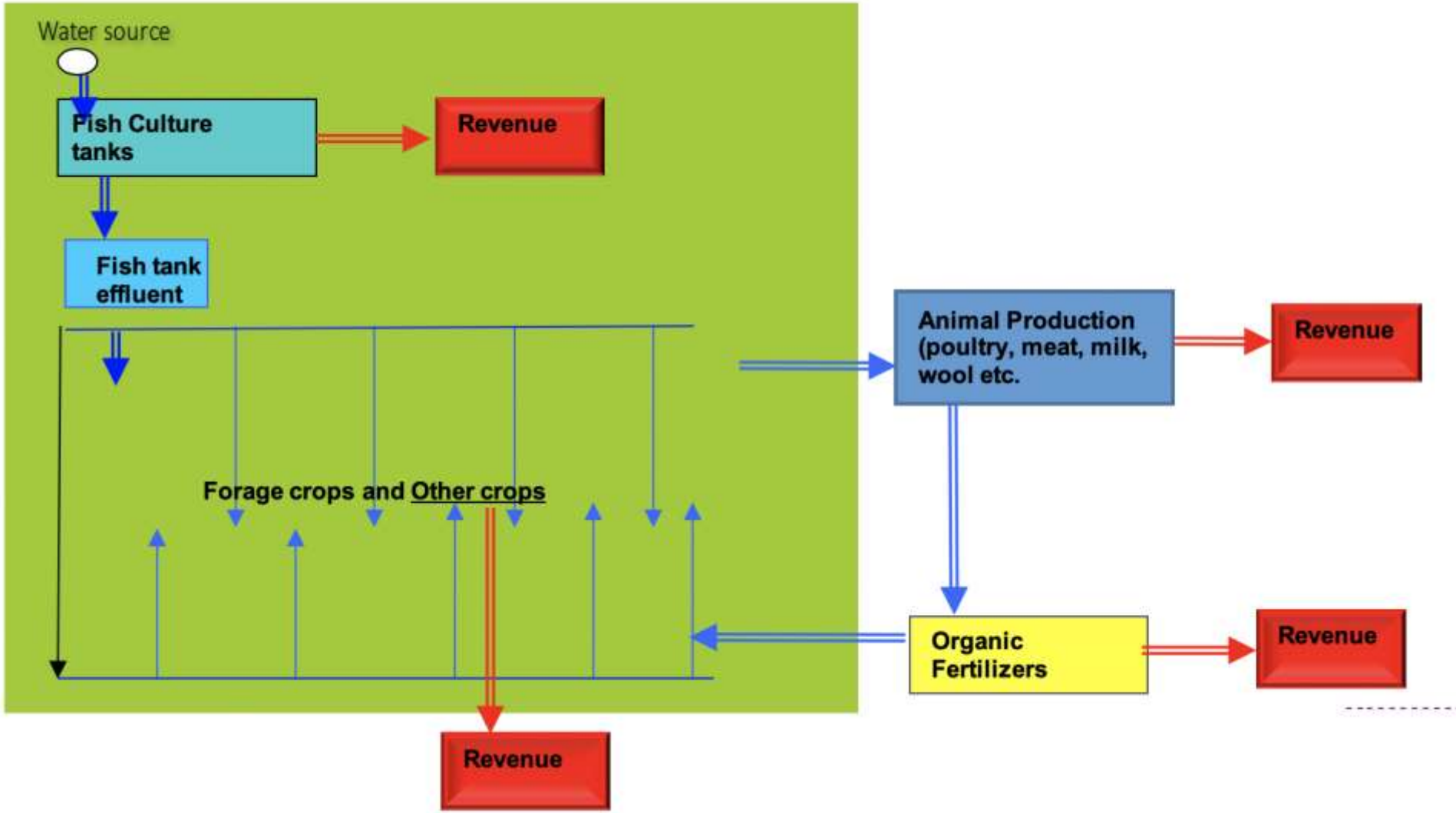
Revenue stream with integration



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Selection for Feed Efficient (FE) tilapia?

- Improving feed efficiency (FE) key to reducing production costs and achieving sustainability.
- Only 5-15% of the nutrient input in fertilizer only pond systems is converted to harvestable products (Schroeder et al., 1990; Edwards,1993).
- To improve the overall nutrient use efficiency of fish in fertilized ponds and reduce cost of production, efficient breeding programs are crucial
- High heritability for fish reared in low input conditions (Charo-Karisa et al., 2006)
- The 9th generation of the Abbassa tilapia strain + BMP helped reduce lifecycle environmental impacts with up to 36% (Henrikson et al., 2016).

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Global outreach of Africa Aquaculture Research and Training Center, Abbassa, Egypt

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www.worldfishcenter.org

In partnership with

Food and Agriculture Organization of the United Nations

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Conclusions

- Integrating agriculture and aquaculture realizes higher economic efficiency than each component separately
- Integrating fishponds with crops unlocks nutrients from the sediments leading to better nutrient use efficiency
- Lowers use of fertilizers

Use of genetically improved strains and awareness of limits in use of feeds and fertilizers empowers farmers, lowers production costs and increases overall water and nutrient use efficiency

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Thank you!

Thank You