FEASIBILITY OF SHRIMP AND TILAPIA POLY-CULTURE IN THE NORTH-WEST OF MEXICO, WITH SPECIAL REFERENCE TO AN ECONOMIC STUDY OF A HYPOTHETICAL POLY-CULTURE FARM.

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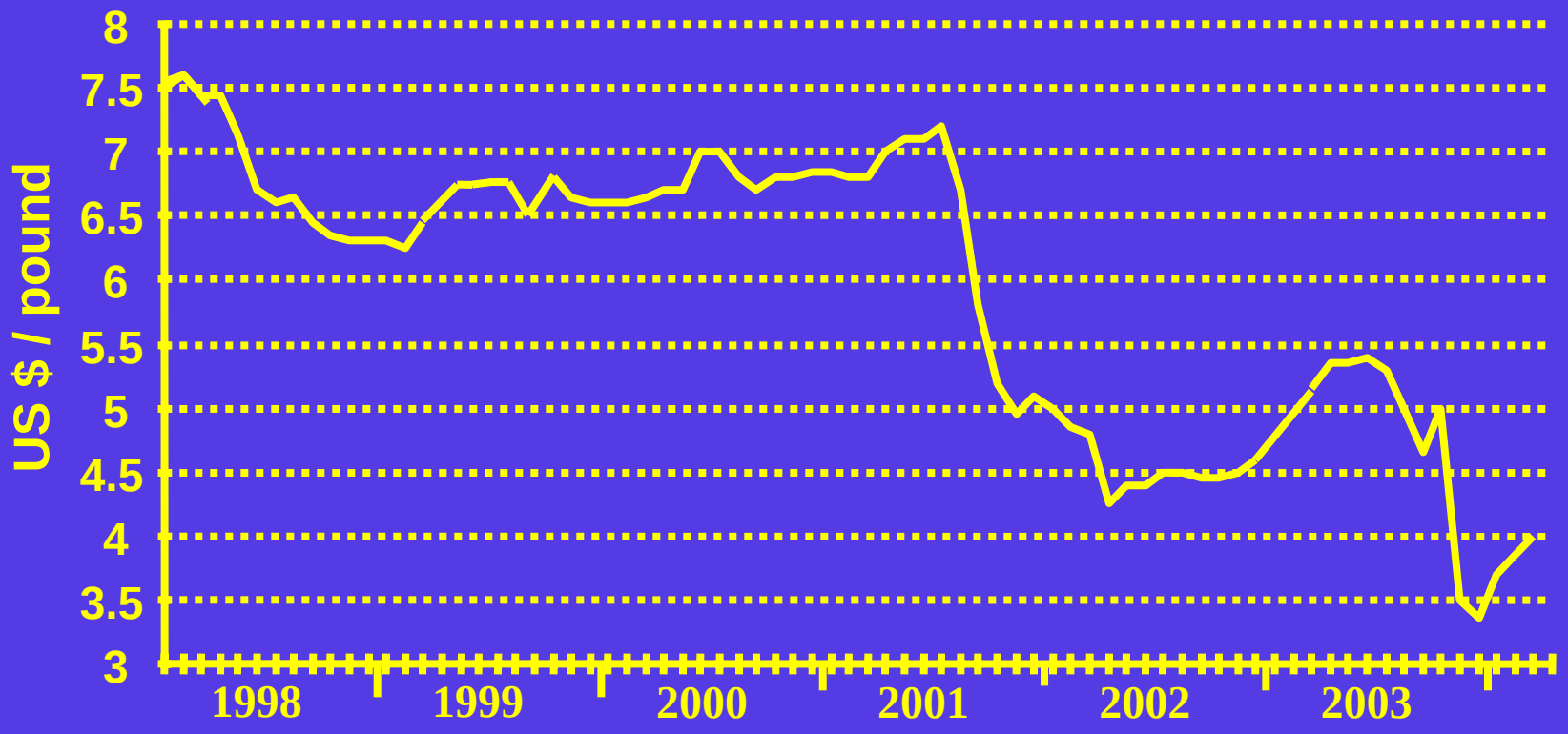
Shrimp ponds in Mexico.

- Shrimp-Tilapia polyculture.
  - Increased production.
  - Maintain or improve shrimp survival.
  - Remove disease carriers from system.
- Shrimp Farming Industry Problems.
  - Disease outbreaks
  - Pricing problems.

Disease problems
White spot syndrome virus (WSSV)

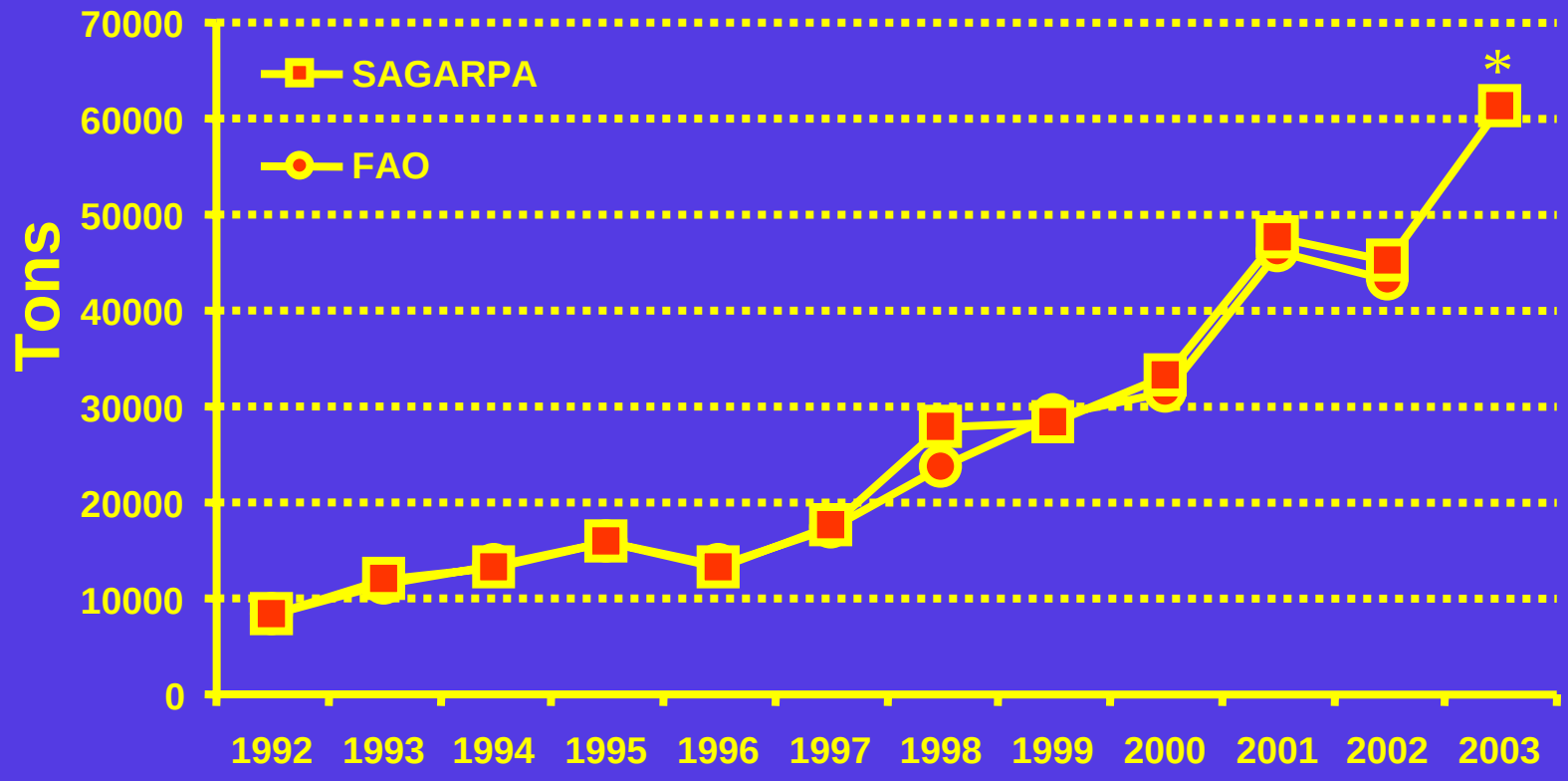
- Many disease problems.
- WSSV in Asia – 70,000 tons lost in Thailand in 1996 (Flegel and Alday-Sanz 1998)
- WSSV in Ecuador 31,000 tons of prodcution lost from 1999 to 2000 (Illingworth-G. 2001).
- WSSV diagnosed in Mexico in 1999
  - Joins a long list of diseases affecting the industry
  - Many farms report mortalities higher than normal

Pricing Problems



US MARKET AVERAGE PRICES LATIN AMERICAN AQUACULTURE, SHELL-ON SHRIMP – SIZE 26-30

Mexican shrimp industry production



* Preliminary data for 2003.

Disease problems

- Three point approach.
  - Monitoring.
  - Movement of disease.
  - More stable growing environment.

Disease problems
Monitoring of disease.

- Farms start monitoring programmes of health of shrimp during growing cycle.
  - Indicator number of laboratories offering diagnostics increases from 5 in 1999 to 18-23 in 2004.
- Monitoring by State committees.
  - Collect data on disease losses above normal.
  - Disseminate information on spread of disease.
  - Give advise on improving farm management.

Disease problems
Movement of disease.

- Industry uses only hatchery produced PL certified free from WSSV
  - Hatcheries close biological cycle and start genetic selection programs.
- All pond water filtered to less than 500µm.

Disease problems
Improved management practices.

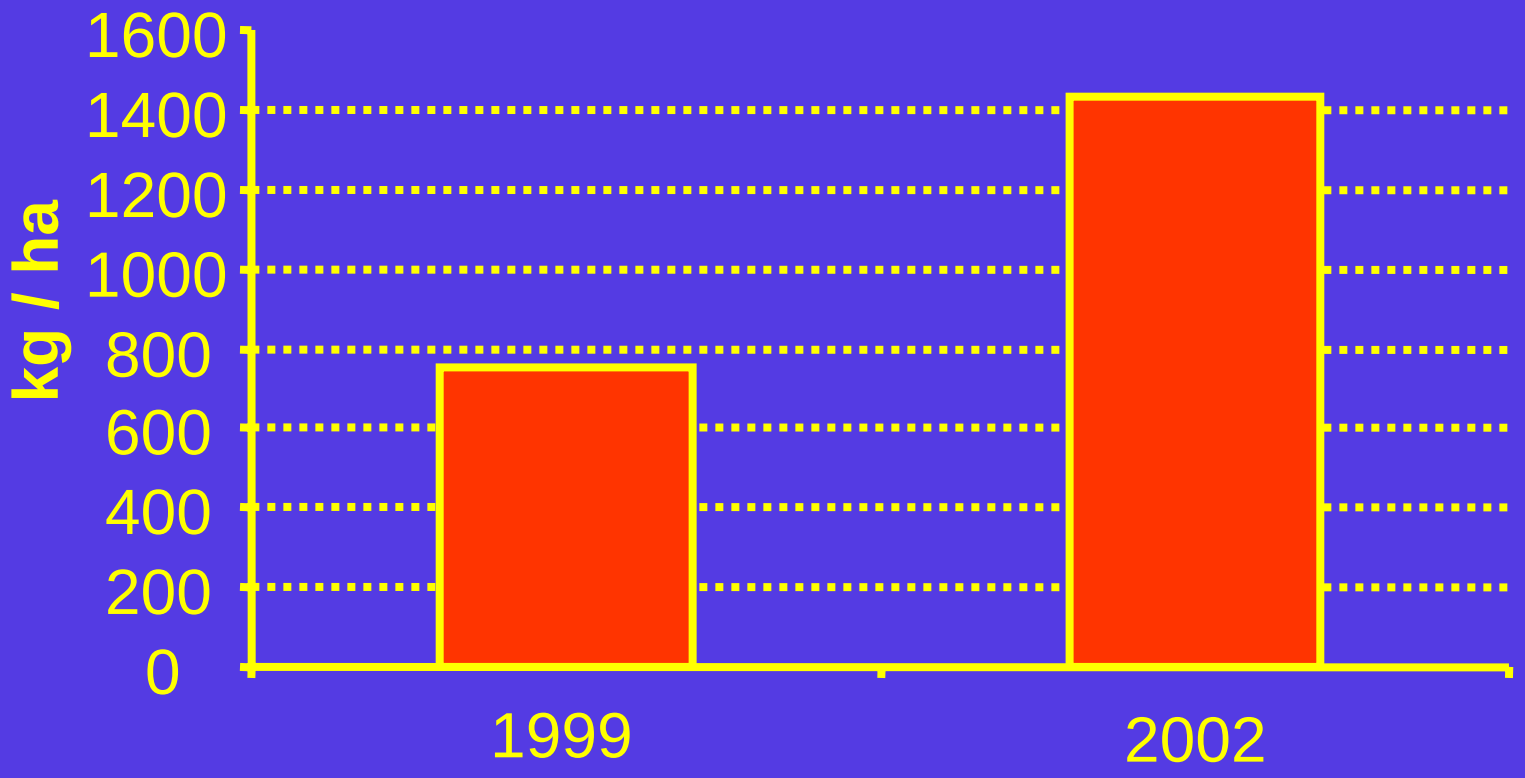
- Better pond preparation.
- Filtered water, < 500µm
- Less water changes or even no water changes (14%).
- Lower stocking levels from 13 PL/m^2 in 1999 to 11 PL/m^2 in 2002.
- Avoid autumn, not optimal growing conditions.
  - Problem seasonal production.

Price Problems

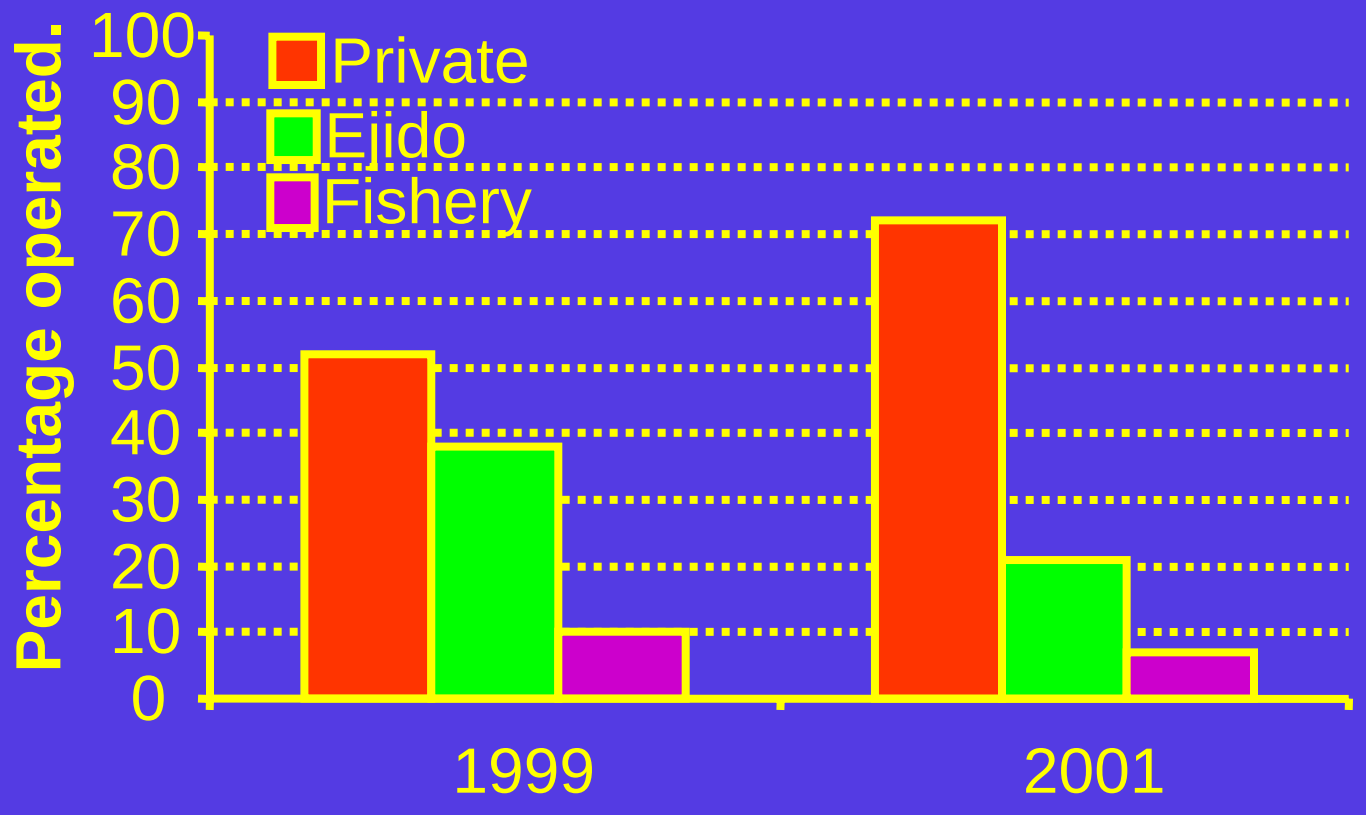
- Record amounts of farmed shrimp in markets, prices not expected to recover.

- Value added products.
  - Larger size.
  - Processing, remove head.

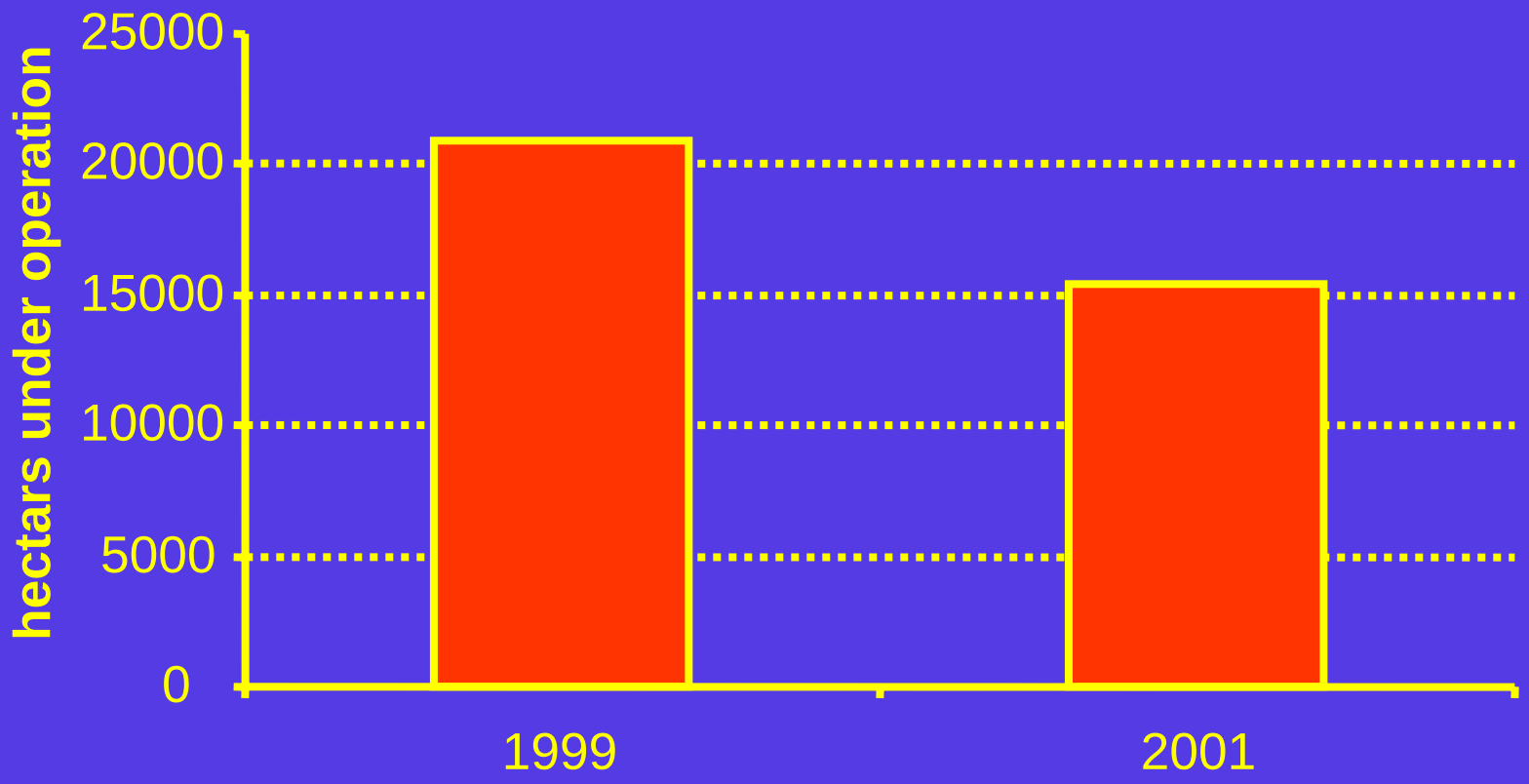
General effects on Industry. Average Yield.



General effects on Industry. Type of operator.



General effects on Industry. Area under operation.



Over 5000 hectars of shrimp ponds unused or abandoned.

Feasibility of shrimp tilapia poly-culture.

- Environmental.

- Economic.

Environmental Feasibility.

- Temperature range - 16 to 36 ^{o}C.
- Salinity range – normally 35 ppt, range 25 ppt to 45 ppt, extremes 15 to 60 ppt.
- Red tilapia hybrid (with *Oreochromis mossambicus*)
- Large tilapia industry in Mexico capable of supplying large volumes of red hybrids but red hybrids are NOT available now.

Economic Feasibility.

Francisco Martínez-Cordero

- Economic model
  - 100 hectar shrimp farm
- Capital and operation costs, and revenues obtained from shrimp farms operating in Sinaloa Mexico.
- Data for tilapia polyculture obtained from CRSP studies (Fitszimmons, Bolivar and Sugue; and Yi, Saelee, Naditrom and Fitzsimmons)

Economic Feasibility. Production cycle

- 1 Cycle per year.
- Pond preparation.
- 1 month acclimatisation and pre-ongrowing of tilapia.
- 6 month ongrowing poly-culture of shrimp and tilapia.
- Harvest.

Economic Feasibility. Shrimp Production Data

Seed price ($/1000 PL)	7.00
Final Survival Rate (%)	60
F.C.R.	1.80
Total pond area (Has.)	100
Growout cycles/year	1
Length growout cycle (months)	6
Stocking density (PL/m2)	15
Shrimp individual weight (head on) at harvest (gr)	22.62
Selling price head-off ($/kg)	10.00

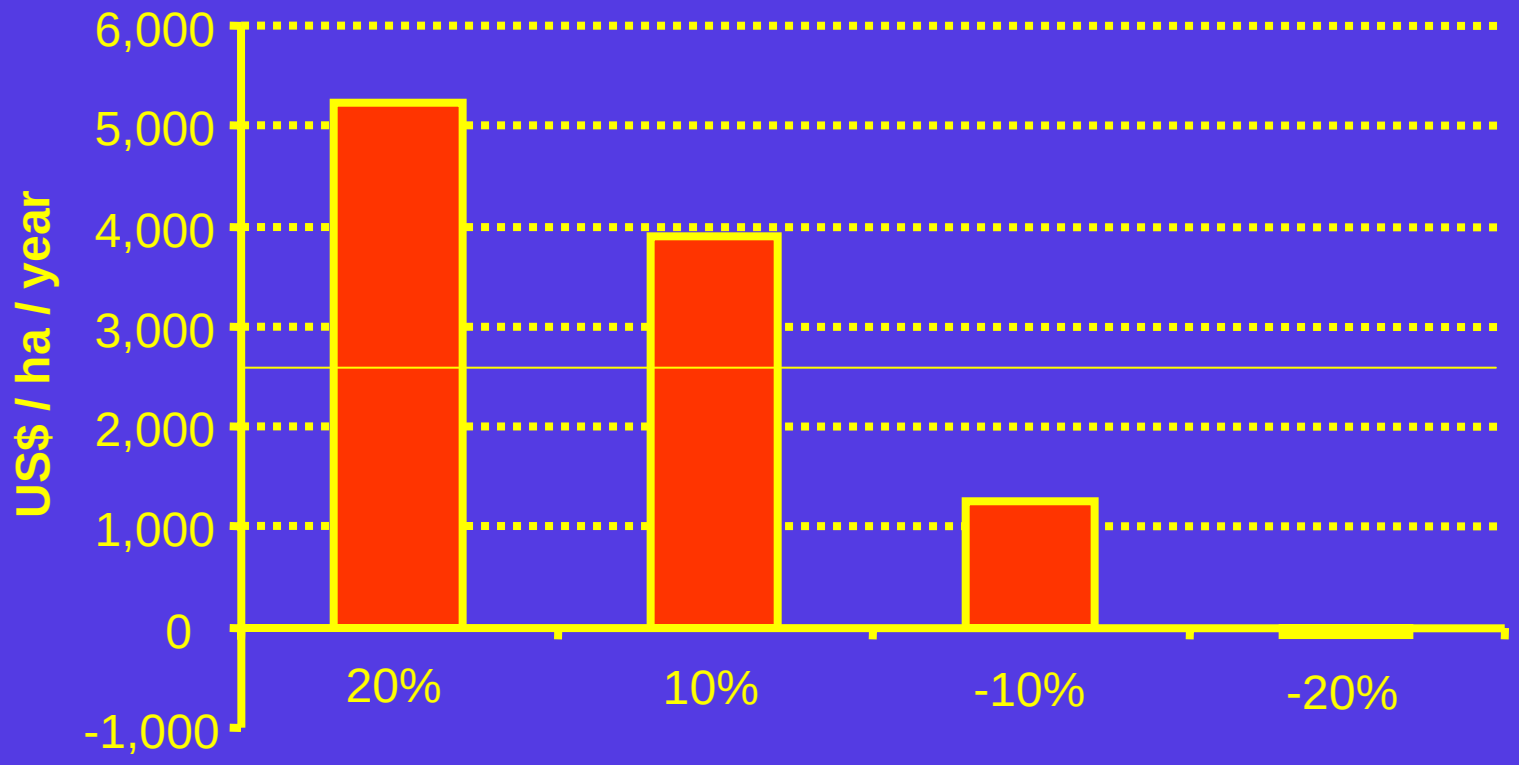
Economic Feasibility. Tilapia Production Data

Tilapia fry price ($/fingerling)	0.06
Final survival rate (%)	75
F.C.R. (growout)	1.69
Nursery time (months)	1
Growout cycles/year	1
Length growout cycle (months)	6
Stocking density growout (fingerling/m2)	0.5
Tilapia individual weight at harvest (gr)	500
Selling price ($/kg)	5.68

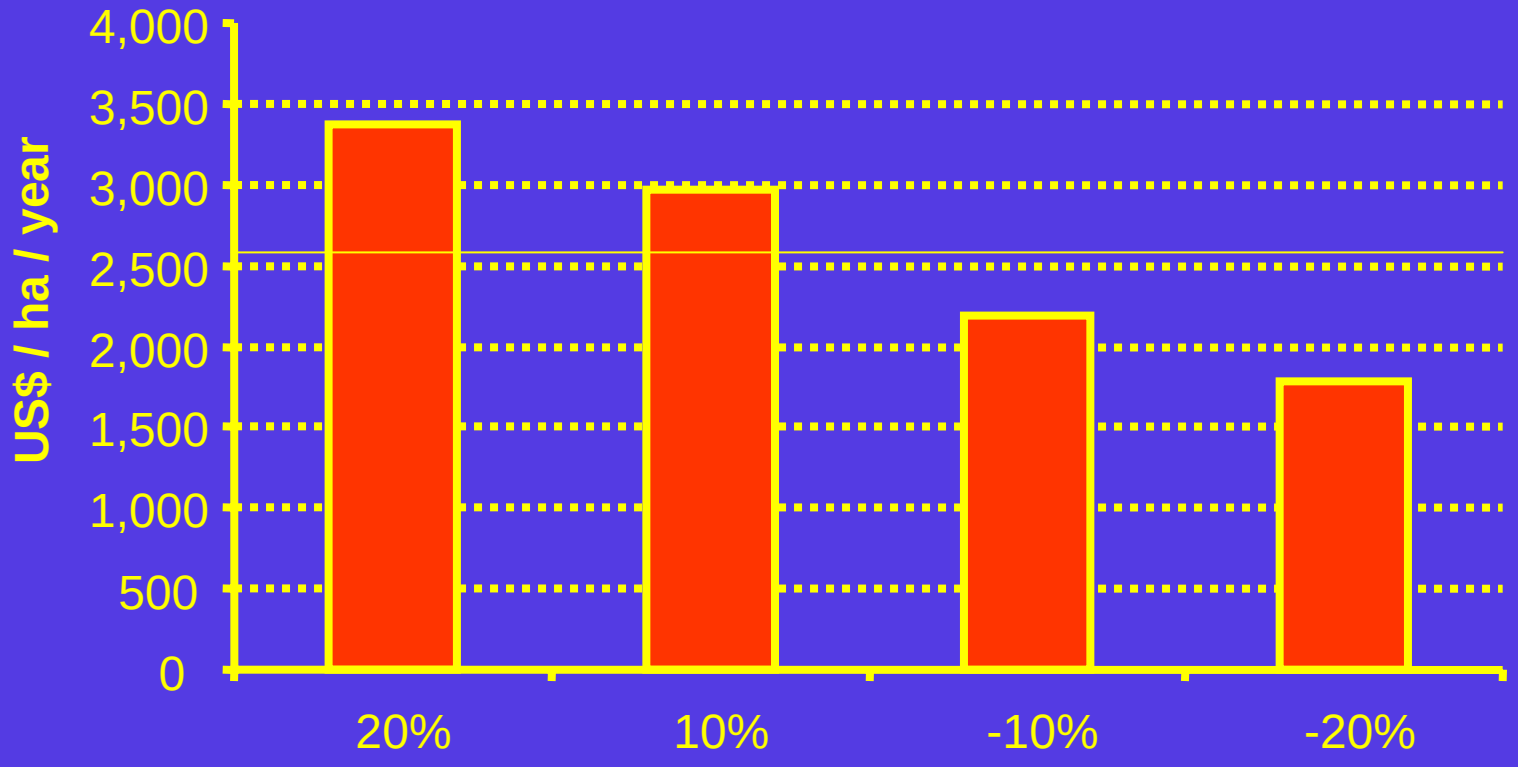
Economic Feasibility. **Profitability analysis.**

	Polyculture shrimp/tilapia	Shrimp monoculture
Annual operation costs	1,462,487	1,067,189
Total operation cost ($/ha/year)	14,625	10,672
Total Revenue	1,720,728	1,323,270
Total Profit	258,241	256,081
Operation costs/ revenues	0.85	0.806
Profit shrimp/kg shrimp	1.95	
Profit tilapia/kg tilapia (fillet)	0.03	
Profit/ha./year	2,582	2,561
Ratio fixed : variable costs	0.18	0.26
Return on variable costs	0.72	0.64
20-year IRR (%)	18.85%	19.18
NPV ($)	956,499	930,242

Economic Feasibility.
Sensitivity to shrimp price.



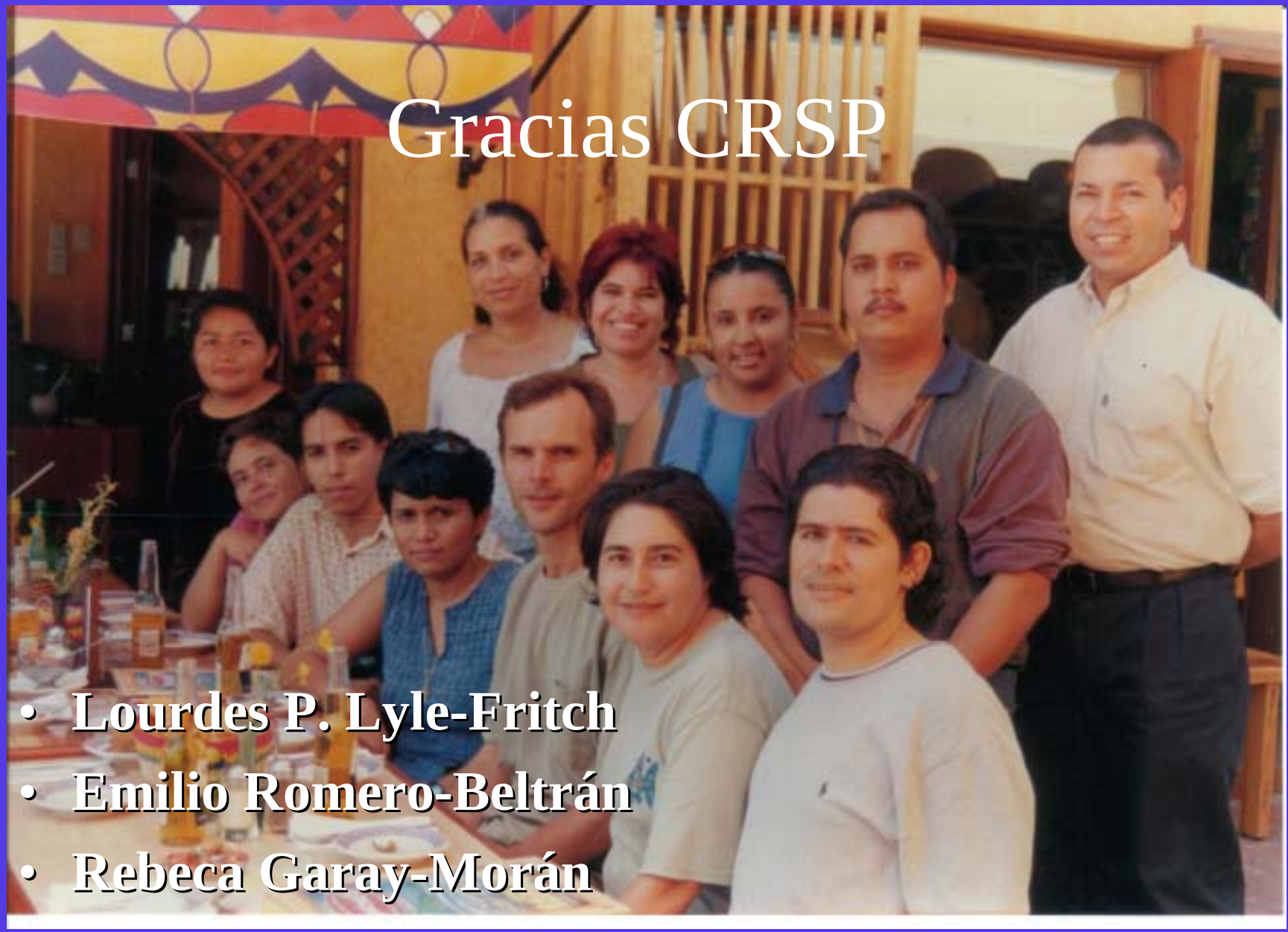
Economic Feasibility.
Sensitivity to tilapia price.



Conclusions

- Large areas of shrimp ponds available for rehabilitation.
- Environmentally shrimp-tilapia poly-culture appears to be feasible.
- Tilapia included into shrimp model without substantial increases in capital costs.
- Tilapia had a small effect on the profitability of shrimp-tilapia polyculture.
- Shrimp remained the more important component to the model strongly influencing profitability of the model.
- Improved tilapia production parameter required to make economic model profitable for shrimp-tilapia poly-culture.

Gracias CRSP



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