Delivering better quality tilapia seed to farmers

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Scope of the presentation

- Strategies that result in high quality seed
 - becoming and then...
 - remaining available to farmers
- Perceptions of quality
- Approaches to upgrading quality of seed
- Important roles in the process towards better seed
- Centralized or more decentralized seed production
- Issues around promoting mono-sex/mixed sex seed

When does seed quality become an issue?

- Satisfied with current quality?
- Improving quality...no end point...a process
- Delivery of seedthe key issues
- When demand profile changes







Impacts of poor seed quality

- Poorer production i.e. lower survival or slower growth
- High proportion of harvest not reaching optimal marketable size
- Less fish to sell or eat
- Poorer appearance-fewer customers

Resulting in....

- Reluctance to risk further investment
- Reduced interest in continuing aquaculture
- Higher production costs leading to...
- higher prices for consumers

Technical options...Rhetoric or reality?

- Review of research suggests a range of attractive approaches
- What actually works and who can adopt what methods and where?
- Different contexts require different solutions
- What directions is tilapia culture going?
- What constraints mean new ideas remain ideas?

Leaps v increments improving quality

- One -off actions or incremental?
- Ones-offs e.g. hybridisation, SRT or GMT
- Incremental through improved management, selective breeding
- In practice-an integrated approach



Quality - a matter of perception?

- <u>Hatchery operator</u>: high survival few abnormal first-feeding fry;
- <u>Nursery operator</u>: low mortalities to predation and cannibalism
- <u>Trader</u>: fry/fingerlings that tolerate stress during handling/transport
- Food fish farmer: fish that survive well and give harvest of predictable value
- <u>Processor</u>: high fillet percentage
- <u>Retailer</u>: retain colour on ice
- <u>Consumer</u>: fish that have desirable colour, shape, texture and taste

Trade-offs?

- Hatchery need for high seed output/female
- Grower requirement for sex control
- Working from the consumer backwards
- Tilapia seed needs change over time

Broiler chicken as a model?

- Fast growing strains responsive to intensive management and feeding
- Urban demand led
- Value -addition



Vertical integration

- An important, and rapidly growing part of tilapia production globally
- Model most appropriate where local consumption of freshwater fish is low
- Trends towards other traits-colour, fillet yield, tolerance to intensification, late maturation

Where fish is everyday food

- Small freshwater fish are everyday food <u>not</u> feast food
- Lower trophic feeding niche of tilapia compared to chicken
- Tilapias may be established or have high potential





Diverse production systems

- Compared to trends in broiler chicken
 - Less intensive and more diverse production systems will remain important
 - Demand will be less driven by urban and export markets
- This has implications for seed strategies



Genetic improvements

Transfers

- Immediate and radical (e.g. Thailand, Brazil)
- intermediate (e.g. Philippines and Vietnam)
- Constrained (e.g. Bangladesh)
- Transfers alone insufficient to ensure sustained availability of quality seed

Institutional supportcontext

- Formal e.g. Thailand
 - sustained delivery of high quality *Chitralada* strain of Nile tilapia
 - Central repository of high quality fish
 - Sustained crowding out of poorer strains
- Informal
- eg local organisationsthe church





Private-public linkages

No official support

- E.g. Kolkata, West Bengal
- Transfers by competitive, mobile private sector
- Brazil and elsewhere
 - Private sector research organisation collaboration





Application of technologies

- Hybridisation
- Selective breeding
- Genetic manipulation
- Major issue -are the 'improved' fish available ?



Hybridisation

- Little gain through heterosis
- Benefits through combinations of positive characteristics
 e.g. O.aureus/O.niloticus that
 enhanced cold tolerance
- GIFT
- Problems maintaining separate lines
- Hatchery benefit-intraspecific hybrids e.g. Chitralada x GIFT

Genetic manipulation

- Tested 'in the market' GMT
- Over a decade but practical constraints
 - Performs poorly compared to SRT
 - Lack of availability
- Management complexity
 - Cost of tagging
 - Organic fish market????

Selective breeding

- Early attempts undermined by low genetic variability of introduced stocks
- GIFT- enhancing the 'poor' mans fish
- Synthetic strain to base national breeding programmes

Uptake and adoption

- Successful.. but uneven success
- Uptake at institutional-NARS level high
- Availability to private sector very variable
- Should the poor wait for 'better' strains?

Little difference in performance between 3 strains



Dan and Little, 2000

Ag for two Replicates in Growth Trials of 4 Q rildicus strains in Chiang Nai





Access to improved fish seed

- Fish produced in 'centres'
- Impacts of multiplication
- Local breeding programmes-untested on a wider scale for tilapia
- Opportunities for cross-sectoral learning



Non-genetic issues

- How
 - changing demand
 - management of production and delivery

can affect seed quality

Seasonality

- Mismatches in supply and demand
- High demand for seed following hot season with poor seed production
- Disease incidence
- High seed inventorieslow demand-prolonged holding
- Can't keep eggs in the fridge!



Overwintering

- Cool season followed by high demand
- Overwinter
 - broodstock for early seed production or
 - juveniles
- Impacts on farmers' production?



New Season Seed



Dan and Little, 2000

Over-wintered



Dan and Little, 2000

Improved strains? Mono-sex?

- Young, mixed sex fish of a quality strain can perform well, especially in intensive systems
- Ex-hatchery management is often more important than strain or mono/mix
- Mono-sex contributes other benefits, especially size consistency and predictability

Husbandry

- Batch production for same age, same sizecritical for SRT
- Continuous production

 implications for
 productivity and
 quality of seed
- Grading
- Level, quality of feeding
- Water quality





Increasing availability of improved tilapias

- Pond-based systems suffer from low output and contamination
- commercialising hapa-based systems
- egg removal and
- 2-stage incubation







Transportation

 Tilapia producers reliant on seed produced around HCM City have poorer results than those nearer the source of production

Alcocer-Hartley, 2002

- Poor post transportation survival, especially larger seed,
- Open rather closed systems?



Monitoring quality Stress challenge tests

- Developed for MT tilapia
- Salinity test 24 ppt, cheap, practical
- 2HPM strongly correlated to total length
- Can identify 'weak' batches
- Used for improving marketing decisions

%mortality after 2 hours



Mean length (cm)

Monitoring quality Effects of underfeeding/overstocking

 2HPM closely related to feeding rate, especially at high density



Note: 30, 18, 9 refer to feeding rates (% of biomass)

Bourhill, 2000

Monitoring quality -behavioural indicators

For pre/post transportation quality:

Feeding response to small ration &
72-hr post transportation survival

are the best indicators of overall quality!

(Hartley-Alcocer, 2001)

Causes of poor quality-complex and dynamic

- lack of institutional capacity to service entrepreneurs and adapt to change
- producer organizations
- information exchange
- research and development agendas

Improving quality-the role of promoters

- Increasing private sector role
- Large commercial hatcheriesincreasing independence
- Role of Gov. to maintain and upgrade stocks varies





Government support

- Towards larger players, export promotion
- Driven by high demand in export markets
- Relative advantage? Globally competitive?
- Needs of domestic market?
- Linkages with all sectors?
- Regulation-certification of quality?
- What impacts can improved strains and mono-sex have?





Local nursing

- Local advanced nursing in hapa-inponds
- Increased benefits to hatcheries and local nurseries
- Improved access to high quality seed for dispersed farmers





Local Seed Production G G G G H & N G G G G Ρ **Promoter** G G G G H & N •Brood stock? G G On-going support G G

Ricefields for decentralised seed

- Small numbers of GIFT broodfish stocked in spring irrigated ricefields
- Promoted as part of farmer field schools
- Follow-up analysis of adoption and benefits





Large seed

- Large size of seed
- Produced at the right time
- Close to farmers wanting to purchase
- Reducing risk to traders buying and selling



Promoting ideas through TRIAL COMMUNITY + Bahagili (2) 1 - North Bahagili (2) 2 - South Bahagili (2) 3 - West Bahagili (2) 3 - West Bahagili (2)

- 3 years after 4 farmers in one village received 16 fish each
- 120 farmers in 20 communities



How the approach is developing

- Role of the better off and traders
 - Better-off have more perennial waterbroodfish suppliers
 - Traders move brood, seed and knowledge
- Works best where tubewell water abundant and alternative cash orientated activities undeveloped
- Measurable benefits to producer, trader and consumer livelihoods

Challenges

- Servicing highly dispersed seed producers-new germplasm
- Reducing deterioration in quality
- Learning lessons from other sectors

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