Small-scale Aquaculture in Rural Development

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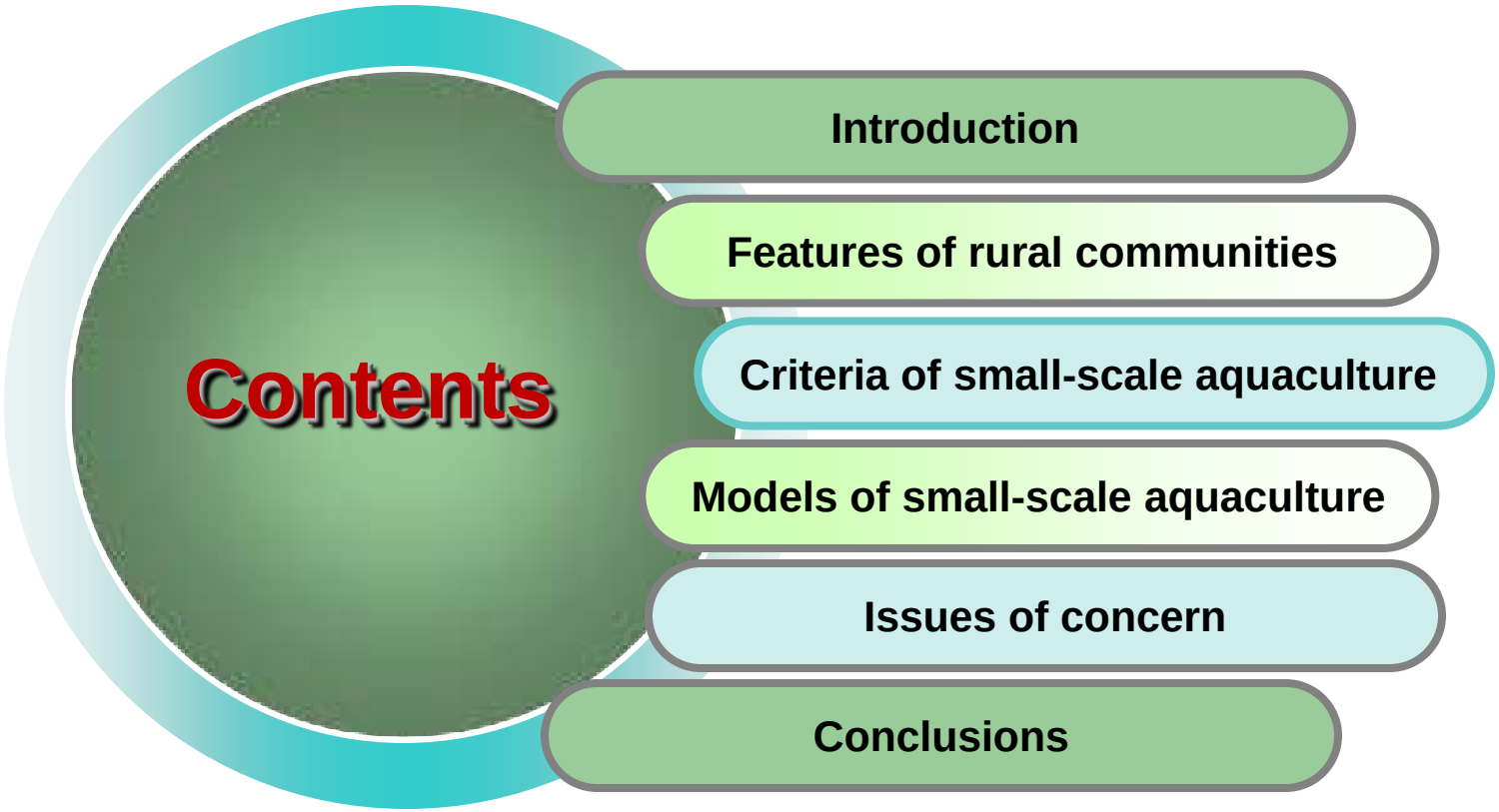


Introduction

- Commercial aquaculture is and -will remain- the principal producing systems (in tonnage)
- Some social elements are usually overlooked in commercial aquaculture (nutrition, employment, gender)
- Quality fish at affordable prices will always be needed in rural areas where income is usually low and fish at high demand
- Over-looked issues could be addressed in small-scale aquaculture

Introduction

- There are successful models of small-scale aquaculture (e.g. backyard hatchery for freshwater prawn in Thailand- during 1980s).
- Promoting family aquaculture is justifiable for incorporating fish as good source of animal protein in family meals.
- Aquaculture has been incorporated in rural development programs either as a sole activity or integrated with other agricultural activities.

General features of rural communities & target beneficiaries

Returns from fish farming are seasonal, while low-income people generally require more immediate income

Low income people may not be able to afford cash expenses even in small amounts. When this is coupled with difficulties in accessing credits, this can be a solid barrier to sustaining aquaculture

Sharing physical labor among farmers is a means to overcome cash problems

When sites are not accessible by machinery

Vulnerability of small-scale beneficiaries

Small holders in rural areas are usually vulnerable in many aspects:

- Limited access to natural resources and often lose competition
- Limited capacity to cope with crisis situations and risks
- Mostly prefer livelihood opportunities with less perceived risks
- Limited ability to meet specific requirements for technology adoption
- Hesitant to try but may apply what was found successful in their neighborhood
- Limited access to aid programs which could have been designed for them (e.g. credit)

Criteria and features: (small-scale aquaculture)

Definitions of rural aquaculture although vary, they still tend to be:

- Simple with social dimensions
- Caring more about low income communities
- Family carry out most of farming practices
- Some (especially women) can work in family projects **but will not accept** to work for others
- Family demand of produced fish is met while **extra fish** is sold. If this is not the case, social problems must be there

Family managed

Promoting small-scale aquaculture
Ensuring initial success

Choose the appropriate technology

Set criteria for target beneficiaries

Select target beneficiaries and upgrade their skills

Choose the right species of fish

Consider all production related issues (e.g. marketing)

Ensure that activities meet existing regulations (e.g. environment, food safety)

Develop a special credit line for the project

Plan for project sustainability

Criteria and definitions: (family or small-scale aquaculture) – (Philippines)

Fish hatchery

- Production is **less than 30,000** fingerlings/month
- Surface area of the project is **less than 1000 m^2**
- No ability to nursing fry
- Incomplete security regarding the area under utilization (via lease, partnerships and others)
- Vulnerability of the hatchery to the risk of flood or draught
- Meeting three of the above, the hatchery**=**small one.

Criteria and definitions: (family or small-scale aquaculture) – (Philippines)

Pond/ pen/cage farms:

- **Earthen farm**: the size of each pond is **less than 1000 $m^{2.}$** in less than 1-ha farm. In regard to pens, the area is also **less than 1000 m^2**.
- In regard to cages, the area is **less than 200 m^2**
- Financial resources are **not sufficient**. (no access to formal credit)
- **Quantity sold in cash does not exceed 30%** of fish produced
- Ownerships (lease/utilization) of land producers lack stability
- Water resources are either insufficient or seasonal
- Meeting **three of the five criteria** = small-scale farm

Criteria and definitions: (family or small-scale aquaculture) – (Malawi)

Integrating of aquaculture in agriculture systems (IAA). Most of criteria classifying small-scale farms included:

- Small landholding
- Low land productivity
- External inputs (such as new varieties, fertilizers and pesticides) are limited
- Credit is generally unavailable
- Fish production from family farms is a must

Criteria for Donor-funded small-scale Aquaculture Development Project (cage culture in Ghana)

1. **Low input / low operating costs**: a production system that is not dependent on high-cost inputs has better chance to survive in case of market problems or losses due to theft or mortality.
2. Production methods tailored for small-scale operators must be reproducible by farming families who have minimal access to capital or operating funds.
3. Farm product is to be accessible to all. This criteria may be overlooked if the other two criteria are met. This is because high-value product generates higher revenues for the family or the community while the product would still be available at low or no cost for this group. However, if the other two criteria are not met and the product is of high value, the target beneficiaries of poor are not directly benefiting from the project.

Notes

- Set criteria for small-scale beneficiaries which are considered in a country may not have the same weight or irrelevant in another country (e.g. flood, draught, etc.)
- This requires site/country-specific criteria
- Based on their activities, financial institutions may have a different definitions to small or very small aquaculture projects

Species criteria for small-scale aquaculture

Farmers can deal with in ease

Do not require neither exceptional skills or sophisticated husbandry arrangements

For quick turn over, it is preferred to use fish species that have short generation

Above all the species should be widely accepted by growers and target consumers

People like it

Species criteria – Preferably native species

Advantages

- Do not pose environmental threats; they are already an integral part of the natural ecosystem. This implies no introduction of disease agents
- Local people mostly prefer native species which they are familiar with
- Broodstock and sometimes fingerlings can be obtained from natural waters
- Assuming, its reproduction and husbandry is known at local level

Disadvantages

Unfortunately, native species did not receive enough attention from NARS. This led to:

–Reproduction and mass production of its seed is often not well developed

–No genetic programs and so selected strains do not exist

–Absence of reliable data on its performance under different farming conditions

Small aquaculture projects (lease term)

These projects should not be treated as commercial ones in regard to lease fees or lease terms

Securing access and tenure rights to land and water are critical for the sustainability of small-scale aquaculture

Short term lease and high fees could represent a financial barrier for entry into aquaculture projects

The insecurity and interrupted operation can result in loss of investment **that the poor cannot recover**.

Setting success indicators and identify requirements

Success indicators

- The sustainability of the projects beyond the end of the development programs is the most important indicator
- More reproductions of original projects
- Upgrading incidences beyond small-scale criteria

Requirements

Careful planning for the project, having in considerations:

- Small-scale beneficiaries do not have access to consultancy services (they may run simple assessment)
- Extension service is highly required
- If they lose trust, there may not be a second chance

Careful planning and securing project requirements eliminate unpleasant outcomes (examples will follow)

Women (producers) and extension agent

Rural aquaculture (models)

- Rice – fish culture
- Manure systems (ducks – chicken)
- Cages

Rice – fish Aquaculture

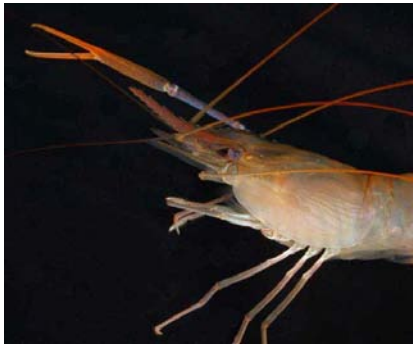
Introduction

- Started as an old practice in China 1700-2000 years ago
- Got global recognition as a means to address malnutrition and poverty for a long time
- Rice farming is the job of many farmers in rural communities

Rice-fish aquaculture – (rationality)

- A way to magnify the benefits
- Harvested fish when **consumed by farmers & families** can improve their nutritional status
- Requires low inputs if any

Major fish species in rice-fish aquaculture (based on food habits)



Major fish species in rice-fish aquaculture
(based on the compatibility with the system)

Air-breathing fish

Readily adopted to swamp-like conditions

Rice - fish aquaculture

Benefits

Support family nutrition

Increases of rice production with an average between 5-15%

Higher revenue due to fish sale and saving on pesticides and fertilizers

Challenges

Harmonization of fish and rice production calendars

Strains of high-yield & short growing season rice implies:

- Shorter growing period for fish
- Possible heavy use of pesticides and fertilizers

Realizing that rice is the main crop, fish has to cope with rice requirements and practices (e.g. stocking size, species, external grow-out)

Fish-duck farming (historic background)

Historic background

Has expanded rapidly in Central Europe after World War II to offset the shortage in animal protein.

Afterwards, the practice has expanded to Asia.

Suits rural development where ducks are traditionally consumed

Ducks are left on water surface for most of the day and sheltered during night

Applications

In Germany, carp production increased by 100 kg/ha with 300 ducks/ha of fish pond

In Hong Kong; ducks are stocked at 2500-3500/ha/yr to yield 5 to 6 t/ha of meat and 2750-5640 kg/ha of fish. What is the leading crop?

30 ducks are Required to fertilize 1000-m^2 pond

14-m^2 duck shelter

Fish-duck farming

Benefits

Fertilize water (non-labor manuring machines)

Suppress the undesirable aquatic vegetation

Water aeration through swimming (biological aerators)

Pond water provides about 25% of duck's diet (plants, insects, aquatic larvae, and earthworms)

Loosen pond bottom and release soil nutrients (phosphorous)

Challenges

Compatibility between warm-blooded birds and cold-blooded fish (system)

Less value where ducks are not traditionally eaten

Ducklings have to be grown somewhere else till they can swim

Fish-chicken farming **(Not water birds)**

Chicken when raised in a shelter (0.5m above water level):

- Maximize the use of space
- Saves manuring labor **OR**

Adjacent to the ponds; poultry excreta are recycled to fertilize the fishponds.

No observed differences in growth or egg production (land – over the ponds).

Fish-chicken farming

Considerations

One-day chicks are nursed for 14 days before used in this system

Each broiler requires 1.5 ft^2 floor area; each layer requires 3 ft^2

Enough cross ventilation should be maintained

Floors should have 1 cm gap, to allow excreta to fall into the pond, but not to trap the chicken's feet.

Challenges

If water turns deep green due to plankton blooms, dissolved oxygen may get drop and could cause fish kill

If this happens, plastic sheets are placed below the chicken shelter to prevent chicken excreta from reaching water

Fish feeding may be suspended for enough time

Refresh the pond with freshwater whenever possible

Cage aquaculture

Benefits

Ideal for landless people who get an access to water resources

Could be used to produce table fish or fingerlings

Investment cost is usually low

Women can have an active role especially in feed preparation

Ease of handling and harvesting

Challenges

Compatibility with environmental standards

Vulnerability to pouching if not properly secured

Integration concept

If Done Properly:

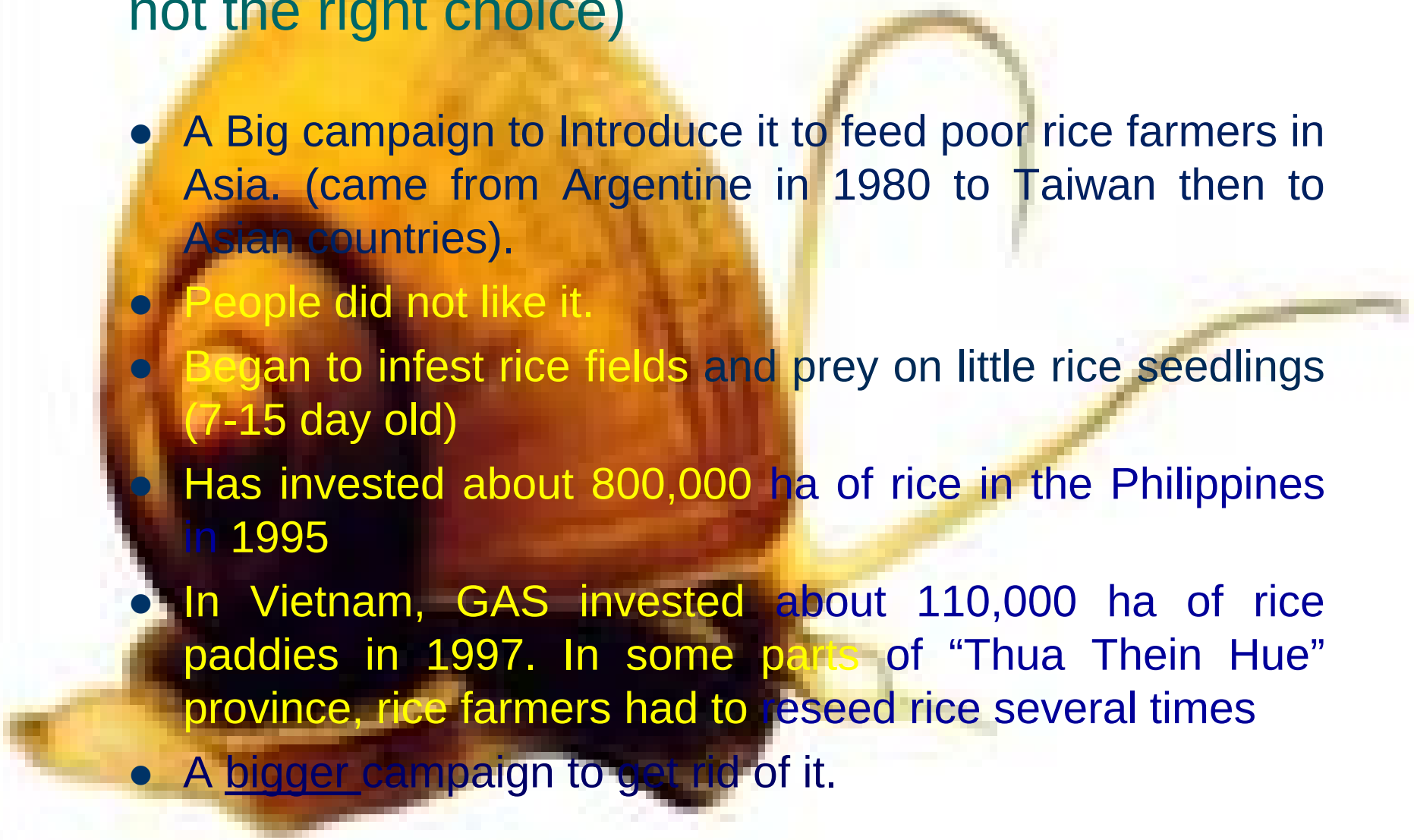
Better use of natural resources (more crop per drop)

Diversify farm products

Win-win affects as mentioned in previous models

If done wrong: could lead to disaster (example golden apple snail)

Golden apple snail in rice paddies (was not the right choice)



- A Big campaign to Introduce it to feed poor rice farmers in Asia. (came from Argentine in 1980 to Taiwan then to Asian countries).
- People did not like it.
- Began to infest rice fields and prey on little rice seedlings (7-15 day old)
- Has invested about 800,000 ha of rice in the Philippines in 1995
- In Vietnam, GAS invested about 110,000 ha of rice paddies in 1997. In some parts of “Thua Thein Hue” province, rice farmers had to reseed rice several times
- A bigger campaign to get rid of it.

Potential threat & risk assessment

Fish cages in Kaptai Lake (Bangladesh)

Project: Promotion of fish cage farming of carps at Kaptai Lake

Disaster: cyclones damaged fish cages, surviving cages experienced poor fish growth, and operators did not repair or replace damaged cages.

Careful planning including risk assessment for similar projects is absolutely required.

The analysis of stakeholders' willingness and capacity to face such risks will be also needed.

Fish pens and cages in Laguna de Bay (Philippines)

Project: Promotion of fish pens and cages in Laguna de Bay

Project aim: improve the socioeconomic conditions of small-scale fish farmers.

Disaster: In 1986 and 1987 the site was hit by two typhoons that damaged 95% of the fish pens and cages in the bay. The disaster left behind heavy losses and debt burdens on project beneficiaries.

Source: Asian Development Bank, 2004, Special evaluation study on small-scale freshwater rural aquaculture development for poverty reduction.

Issues to Consider

Feed and small-scale aquaculture

Types of feed

Ranges from natural food (high in protein), to:

– Supplemental feed (low cost & high in energy), to:

– Specialized feed if technically and economically justified.

Cost of feed will remain an important issue to consider in promoting rural aquaculture

Feed and small-scale aquaculture

Some of farm byproducts could be used while others **should not** be used

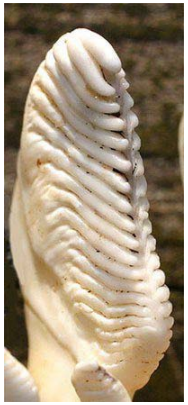
Most farmed fish have difficulty in digesting plant materials

The use of external feed should be an option especially when economically feasible

Many farmers do not use artificial feed due to its high cost without economic evaluation

If artificial feed is used, feed storage will be needed or batch supply should be followed

Compost or silage improves plant material's quality, digestibility and subsequent use safety



Water hyacinth

Water hyacinth is an example of plants that have nutritional imbalance or carries possible toxicity. It may be good for other usages but **NOT** feed.

Fish seed and small-scale aquaculture

Good quality fry = good harvest

No attempt should be taken to give up the quality of fry for the sake of reducing production costs

Fry costs are usually marginal when compared to other production inputs

Small-scale aquaculture can use the best quality seed available

Credit and small-scale aquaculture

In many cases, small-scale aquaculture projects could be implemented without external loans, because of:

- its small size
- lack of collaterals (rural families are not familiar with banking systems and often they do not enjoy credit history).

Some producers do not prefer bank credit or interests for personal believes

Social dimension is the responsibility of governments and not commercial banks

Credit accessibility (target and actual beneficiaries)

Small-scale farmers do not/ cannot borrow from banks because of inflexible requirements for collateral and various loan requirements; some of which are very difficult or unrealistic

Bank requirements are frequently not in favor of the landless and small-scale farmers

Instead of banks, farmers may rely on informal credit from other sources, including suppliers' credit. Such informal credit may carry higher interest than bank loans

Supplier's credit made fish farmers to accept a modest quality fish feed while they are aware about that

In Nepal and during 1980s, the small-scale farmers were unable to lease water bodies for fish farming. They were unable to acquire credit without timely access to water bodies or fulfill collateral requirements.

Larger and wealthier farmers were, however, ready and qualified to receive project services

Credit for small-scale projects (Egypt)

A credit line has launched in mid 1990s to provide soft loans to agricultural sectors including aquaculture

Small/medium projects have been the immediate target to such credit line

Target groups: not familiar with banking system, lack collaterals and no credit history

Credit officers in collaborating banks were not familiar with aquaculture activities which were in their views a risky business

Commercial companies were well-prepared for benefitting from the credit line

Educating bankers

Simplicity and sustainability of small-scale aquaculture

Simple **but productive** projects are favored

Insisting to use poor quality farm inputs may lead to unsustainable projects

Simplicity concept is still based on scientific information and established technology

2 million tilapia fry

Small-scale aquaculture- size of projects

Increasing number of beneficiaries although is a noble approach, this could threaten the sustainability of small-scale projects

Beneficiaries may lose interest in case of under-sized projects (e.g.1-cage project)

It is more valuable to have fewer productive projects than more of abandoned ones

Common problems of small-scale aquaculture projects

When feed requirements cannot be always met (fertilization or artificial feed)

When there is a lack of cash along with difficulties in accessing credit

When accidental losses occur which are **hard to recover**

Losing out when there is conflicting interests in the use of the water bodies whereas others usually win

Small-scale projects deserve some sort of support – HOW?

Subsidies and support - Conflicting opinions

Free production inputs

Fish seed are the common free or subsidized inputs (e.g. fry of sea bass in Thailand and common carp in Sri Lanka and Egypt)

Production of ornamental fish for export has replaced food fish project in Sri Lanka

Case studies showed that many aquaculture projects stopped immediately when subsidies discontinued (Thailand and Egypt)

Source: Asian Development Bank, 2004, Special evaluation study on small-scale freshwater rural aquaculture development for poverty reduction.

Technical/ economic tools

Training is important for project success

Courses should be carried out in centers; **only** parts on project site

Technical and extension services are required for project sustainability

Governments can provide various packages to support these projects (e.g. lease-taxation)

In the launching phase, subsidy may be required. This should be done for a fixed period. Beneficiaries should know that

Poaching

Although it is a sad incidence, it happens

Incidences increase as fish ponds or cages are far from farmers' households

Security arrangements may be needed (e.g. clustering operations or planting sticks)

Guarding arrangements among producers is found effective

Anti-theft arrangement!!

Conclusion

Integrating aquaculture in rural development programs through family farms could generate significant social benefits when carried out properly.

Simplicity concept of small-scale projects means simple operation but never simple planning

Improper or easy planning was behind the failure and the non adoption of these projects as been hoped.

Earlier studies have indicated that small-scale farmers can potentially benefit from the advances of research. GIFT tilapia performed well enough when disseminated in some Asian countries.

Conclusion

Although rural aquaculture, implies simple practices and modest outcomes, there should be some room for development

Although the social dimension in rural aquaculture is of top importance, the economics of these projects determines its sustainability

Social nature of these projects should not come into a conflict with environmentally measures or quality standards

Total dependence on external assistance threatens the sustainability of these projects. Subsidies and support should be temporarily

Thanks for your time. I hope you have found in this presentation some of what you were looking for

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If you have any comment about this presentation or you need clarification or elaboration, I would welcome your contact via my email address

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