



SHILAT



AQUACULTURE DEVELOPMENT IN SISTAN-BALUCHESTAN 2005 - 2008

*Project financed by Italian Cooperation
Italian Ministry of Foreign Affairs*

STAKEHOLDER CONSULTATION

Chabahar, 6 August 2006

Executed by CIRSPE, Italy

ROME, OCTOBER 2006

FOREWORD

Any individuals group of people, institutions or firms that may have a significant interests in the success or failure with the project and the programme are defined as stakeholders. Either, implementers, facilitators beneficiaries or adversaries can be defined as stakeholders.

A basic premise behind stakeholder analysis is that different groups have different capacities and interests and that it is crucial to explicitly, understand and recognize these groups/interests, during the problem identification, objective setting and, above all, strategy identification and selection.

In order to maximize the social and institutional benefits of the project and minimize the negative impact, stakeholders must be identified.

The ultimate aim is to maximize the social, economic and institutional benefits of the project to target groups and ultimate beneficiaries and minimise its potential negative impacts, such as stakeholder conflicts.

According to the European Union Project Manual, the main steps involved in stakeholder analysis must include the identification of all those groups who have a significant interest in the project, their respective role, different interest relative power and capacity to participate.

Stakeholder consultation can be a very useful instrument also for project visibility and disseminating of results.

Apart from that the project staff itself can use the stakeholder consultations as a tool for checking and monitoring project activities to up to date both objectives, results and finally specific activities and methodology.

ABSTRACT

CONTENTS

FOREWORD	2
ABSTRACT	2
1. OPENING OF THE MEETING	4
2. INTRODUCTION AND PROJECT BACKGROUND	4
3. SHRIMP SECTOR IN IRAN	6
4. SHRIMP SECTOR IN SISTAN BALUCHESTAN	7
5. FIELD ACTIVITIES IN GOWATER SITE	8
5.1. Technical assistance/extension service	9
5.2. On job training	10
6. RECOMMENDATIONS	11
ANNEXES	13
Management proposed indicators (Task 2)	14
Stakeholders analysis approach (Task 2)	19
Shrimp fattening management (Task 2)	21
Nursery management (Task 2)	31
Shrimp feed management (Task 2)	35
Prevention of diseases (Task 2)	37
Shrimp rearing production prevision (Task 2)	39
Shrimp rearing preliminary recommendations (Task 2)	55
List of participants	61
REFERENCES	64

1. OPENING OF THE MEETING

The Stakeholder consultation on shrimp rearing activities was held in Chabahar on 6 August 2006 and was hosted by the SHILAT Iranian Fisheries Organisation of Jihad Ministry of Agriculture. The consultation was attended by the SHILAT staff/expert involved in the Project, by IFRO experts, by technicians and farmers of the private sector of Gowater site and finally by CIRSPE experts and staff.

Mr. Rezvani, SHILAT Aquaculture Deputy and NPD of the project “Aquaculture Development in Sistan Baluchestan”, welcomed the participants and underlined the importance of the stakeholder consultation within the context of project activities.

Mr. Rezvani thanked CIRSPE Italian experts for the effort done up till now in the sites of Gowater, where SHILAT and CIRSPE agreed to implement pilot productive activities with the aim to elaborate the development strategy for the sector.

Mr. Guerrieri, CIRSPE President gave his regards to Iranian partner, remarking that the technical meetings have to be organised such as project monitoring and disseminations of the results obtained and of the activities constrains.

Mr. Ugolini, Project manager for Italian counterpart described the context of the first Stakeholder consultation.

2. INTRODUCTION AND PROJECT BACKGROUND

The project and the reason of this Consultations goes back to the 2000, and the origins are strictly connected to the effort of the Italian Government for reinforcing political and economic relations with the Islamic Republic of Iran, in consideration of the reciprocal interest in the exploitation of Iran’s raw materials and for exporting Italian technology, industrial products and consumer goods.

Apart from that, Italy has always considered the importance of Iran in the context of Middle East such as crucial regional Country.

The Italian Government has always planned projects and initiatives with the purpose to develop the peace process in the Middle East area and, for this reason, is promoting development project and investing in local human resources in the area, supporting the civil society and economic productive processes.

In June 2000 the General Department of Development Cooperation of the Italian Ministry of Foreign Affairs and the Iranian Ministry of Foreign Affairs signed a “Meeting Memorandum” in which the Italian party expressed its intention to finance cooperation activities in the Province of Sistan Baluchestan, that is the poorest in the Republic of Iran (UNDP, 1999 “National Human Development Report”). The Province borders with Afghanistan and with Pakistan, having a strategic role for the central Government.

The topics relevant to the cooperation program were deeply studied during technical missions carried out by the General Department of Cooperation Development.

Priority was given to the development of aquaculture for the interesting prospects for the development of this sector. At this regard the zone of Chabahar, in the south-east of Iran, is suitable for the rearing of shrimp, where a large facility (about 1.200 hectares) has been constructed near the location of Gowater, roughly 110 km to the east of the city of Chabahar.

In the shrimp sector, limitations in terms of technology, service and marketing are evident. In short, along with the high potential, recognised by the central system, which continues to invest on structures and equipment, there are unmistakable problems of growth and consolidation strictly connected to the Marketing dynamic evolution and for the increasing of the cost of production.

The General Directorate of Development Cooperation/Italian Ministry of Foreign Affairs has approved for financing the project “Aquaculture development in Sistan Baluchestan” (act n.49; 24/6/2003; N. aid 6945.01.3),

The project consists of production initiatives with the results to be transferred to the private beneficiaries, supply of technology also has the purpose to demonstrate the worth of new production strategies and, finally, testing and proposing technical packages innovative and, at the same time, appropriate to the context.

Trainings are reserved for the technicians of the SHILAT/the Ministry of Agriculture, with forecasted fall-out on the private operations, given that the individuals trained are employed in the extension service;

The United Nations Development Programme (“UNDP”) has agreed to co-operate in the implementation of the project, with the modality of cost-sharing agreement to allocate the project budget in the beneficiary Country, that has a fund of “3.034.000.00 EURO” by grant.

On 25th of February 2004 The Italian Government/Ministry of Foreign Affairs signed the contract agreement with the United Nations Development Programme (“UNDP”).

UNDP has taken the duty to manage directly the budget related to the equipment that will be purchased on the base of identification by SHILAT and CIRSPE technical approval.

The Ministry of Jihad Agriculture – SHILAT Iranian Fisheries Organisation has been designated as the implementing agency. The CIRSPE (Italian Fisheries Research Centre-Rome) has been designated as the contractor for providing technical assistance and training for a total budget of 1.744.000 Euro, on the base of an agreement with SHILAT on February 2004.

The project wants to expand and reinforce aquaculture activities in terms of both production/technology and economic results; to raise the socio-economic level of the groups and populations involved.

Considering both the objective and the expected results, production strategies must be correlated to the market (species, sizes, period of sale, markets). The productive pilot activities in Gowater (Chabahar) are testing first of all different strategies based on the stocking density, feeding and fertilisation, nursery sector (two rearing cycle/year by pre-fattening) etc.

comparing the different results both from productive and economical point of view. Attention is given to prevent the diseases that in other region of the world and also in Iran are affecting the rearing, reducing the economical sustainability of this sector.

Technologies must be appropriate to the context and innovative technological packages shall be prepared for the shrimp rearing, for instance aerator system, water quality control.

Institutional capacity building for Ministry of Jihad Agriculture and professional growth on the part of the SHILAT-Iranian Fisheries Organisation are also crucial. In fact the development of the sector is strictly connected to the improving of the capacity of the public service; the reinforcement of the extension service has the aim to disseminate the technologies prepared during the project activities.

The main objective of this first Stakeholder Consultation was to analyze the activity done in Gowater site. CIRSPE staff prepared power point presentations illustrating the field activities, giving also the written contributions presented in this document.

3. SHRIMP SECTOR IN IRAN

Shrimp farming in Islamic Republic of Iran started about 13 years ago and this activity has been seen as a good way to develop unproductive coastal flats. The Iranian Fisheries Organization (SHILAT) has taken up the lead in promoting shrimp farming around the Maritime Provinces with its vast potential area. Out of the total coastline of 2500 km with Persian Gulf and Oman Sea in the south and Caspian Sea in north, presently more than 11.000 hectare are identified as suitable for coastal shrimp culture.

This shrimp farming started as a pilot with a production of 3.1 ton from 2.3 ha water spread area in 1992 and reached up to 7600 tons from 3618 ha water spread area in 2001.

Iranian farm- raised shrimp production is export oriented. Shrimp farming, particularly *Fenneropenaeus indicus* (sin. *Penaeus indicus*) is carried out in Khuzestan, Bushehr, Hormozgan and Sistan & Baluchestan Provinces.

Other shrimp species of *Metapenaeus* and *Penaeus* genera are also taken up recently as pilot shrimp culture projects by Shilat. It was seen before by farmers as a lucrative and highly profitable business. Good productions with less cost of production coupled with higher price of shrimps in the international market in the beginning periods of shrimp farming had made many big investors to go for culture on a large scale. But there is a gradual decrease in the overall production of shrimps from the last few years due to many factors such as:

- Production failure due to wide spread of WSSV.
- Decline in shrimp export value.
- Increasing cost of production.
- Less know-how of scientific culture.
- Only one major crop a year.

Shrimp farming in Iran is characterized by high pond water salinity and temperatures. Very high salinity (even up to 60 ppt) can be observed during the first month of rearing when pond water exchange is low. Only one crop per year is achieved in provinces located along the Persian Gulf due to low temperatures encountered between October and April.

However, two crops per year can be achieved in Balochistan where shrimp farming conditions are better in terms of pond water salinity and temperature most of the year except during months of January and February.

4. SHRIMP SECTOR IN SISTAN BALUCHESTAN

Presently, out of 10 shrimp farming complexes, Gowater Shrimp Farming Complex is one of the massive projects developed in S & B province. This is one of the good potential areas for shrimp aquaculture among all other complexes developed yet. Common facilities have been built up by Govt. of Iran to promote shrimp farming as an industry. Shrimp farming started in Gowater few years before with only 20 ha gross area.

Big efforts were taken every year to develop the shrimp culture as the production increased from few MT to near 2000 MT during 1995 to 2003. Then the growth rate of culture was reduced by virtue of poor profitability due to increased cost of production and diminishing trend in shrimp export values. From last year there is seen an increasing pattern in shrimp culture in Gowater w.r.t. culture area and production.

Indian White Shrimp (*Penaeus indicus*) is cultured on a commercial scale by private entrepreneurs in Gowater shrimp farming complex for past few years. But due to poor profitability, the interest of investors to carry on culture practices on an yearly basis is reducing. Some of the farms are seen lying vacant while some taken up by different investors on a lease basis.

Presently, this shrimp project complex is ready with virtually 1920 ha of total water spread area (WSA). The whole system is divided into two sub-complexes namely “north” and “south”.

The north-farming complex is divided into three units as per the feeder channels- C₁, C₂ and C₃, and farms are situated on both sides of each channel. The drainage channels have no connections with the inlet channels to avoid cross contamination during infections/out break of diseases. Each farm consists of 14 medium sized ponds of 1.1 ha each having total farm area of 20 ha. Each farm is allotted to private entrepreneurs.

The south-farming complex constitutes of four big farming units of water spread area (WSA) ranging from 45.5 ha (48 ponds) to 146.0 ha (136 ponds). All corporate units (F₁, F₂, F₃, F₄, F₀) consist of medium sized farms each having water spread area (WSA) of 16.8 ha. The shape of the cultured ponds were found rectangular with four different sizes i.e. 0.5 ha, 1.0 ha, 1.1 ha and 1.2 ha.

The soil profile is clay-silt and ponds are seepage proof, except few farms with sandy-silt profile. The main water intake of the complex consists of some dug-out earthen feeder channels connected to Bahukalat River (estuarine in nature) to make smooth flow of brackish water along with tidal influx of sea water.

Each main channel is mechanized with automatic shutter at the beginning point in such a way only to allow the water to come inside the site during high tide and can't return back during low tide. Water is pumped into each farming unit through flume connected to diesel generated

high power centrifugal/vertical pumps. Like wise, a number of sub-drainage channels are dug-out connecting to one main drainage channel, which empties into the Oman Sea at a distance of few kilometers from river mouth. The main drainage channel is also mechanized with automatic shutter with similar functions as that of main inlet but in opposite direction, where water can go out from drainage at low tide but can't enter inside at high tide which makes water exchange/harvesting much easier.

The climatic conditions in consortium with good water quality and high natural productivity of soil in this farming complex are more suitable compared to all other shrimp farming complexes till developed in Iran. More importantly, this complex possesses ideal climatic condition to carry out two crops annually but till date not tried/practiced.

Accessibility to the complex is well developed with pitch roads connected to the nearby city, Chabahar which is almost 140 km away. This motor able road is being laid to transport input materials and produce in front of each individual farm.

At present power is supplied from government by proper wearing to the complex, but by virtue of some constraints farmers were not able to avail it during current year. This may be solved shortly. But individual farmers have captive generated power for pumping and lighting. Telecommunication facility is yet to make progress, but mobile telephones are making things easier.

The site has quick accessibility to seven shrimp hatcheries, five processing plants for supply of post larvae for stocking and procurement of harvested shrimps respectively. Due to non-availability at the right time, some units stock seeds from hatcheries situated in other Provinces. General period of shrimp culture for only one crop a year starts from beginning of June to end of October. Farm operation and pond preparations starts one month before stocking of seeds. Every year one foreign technician is hired to boost scientific/technical inputs in shrimp farming activity in Gowater. Due to "White Spot" disease outbreaks in other provinces in previous years, recent/new Scientific Methods, Better Management Practices (BMP), Biosecurity Measures are needed to be followed accurately to prevent this killer disease from entering this Farming Complex.

5. FIELD ACTIVITIES IN GOWATER SITE

In order to make this aquaculture system sustainable and economically viable, a change in the total process need to happen. To come out from the above situations and reviving present shrimp culture status as that of older days, a breakthrough is being made recently in Gowater Shrimp Farming Complex, Chabahar by the introduction of three productive pilot experiences.

The results of these experiences will be transferred to the private sector with the aim to increase the economic income of the farms (cost of production, economic value of production, marketing approach).

The first Pilot productive activity deals with the collaboration of seven private farms (140 ha approx.) having a total water spread area (WSA) of 108 ha. Each of the seven farms has 14 no. of ponds (15.4 ha WSA) each of 1.10 ha area available for culture. All farms have an initial stocking of 180000 seeds per pond (16.36 post larvae/sq.m) and using local made (IRI) feed brand "Chineh".

The rearing cycle is from May to September.

The second pilot productive activity is designed in such a way to obtain higher size of shrimps at final harvest, increase in overall production using the same available resources without much elongation of the normal culture period. The experience 2 consists of three private farms (60 ha approx.) having a total water spread area (WSA) of 46.2 ha.

The stocking density is 240000 seeds per pond (21.81 post larvae/sq.m) and will under go partial harvesting.

Feed brand used is Le Gouessant (imported from France) in two farms while the other one is using same local made Chineh brand.

The third pilot productive activity deals with the use of nursery system to have a jump over the normal culture period and get a successful second crop before the onset of unfavourable climatic conditions, ultimately resulting in higher productions per year.

In the seven private farms of the first experience (140 ha approx.) two ponds in the middle (P-7/8) are kept empty for nurseries stage, used for pre-fattening of PL of the second cycle.

In these pond PL will be stocked at high density (just for a pre-fattening stage till the weigh of 2-3 gr. (from june/july to September).

In September these “little shrimp” will be harvest to be stocked at normal density in the fattening pond, from September to November for the second harvesting.

Successful completion of these projects will give a major revolution to shrimp culture systems in Gowater and IRI as a whole. The protocols will help each individual farmer to carry on either two crops or high stocking with high grammage in a single calendar year.

Farms have the same basic infrastructures i.e. total area, no of ponds, each pond dimensions, filtration unit, feeder channel, inlet/outlet/drainage, buildings, etc.

5.1. Technical assistance/extension service

Private farms are managed by local Iranian technicians with all more than 5 years of shrimp farming experience in Gowater.

All of them are either fishery graduates or post graduates having good know-how on shrimp farming.

Some of these technicians have more than one farm for management. All farms have six to seven workers till date for farm management, with one among them is considered as head worker (supervisor) for overall monitoring of farm duties. Farm owners, except one or two, are staying far away from the farm site.

CIRSPE proposed technical agreement with Iranian private company to execute the technical assistance on the field, according SHILAT indication, under CIRSPE control and supervision.

According to the contract between and Iranian company AFTM, one foreign aquaculture technician and two Iranian technicians have been engaged full-time at the project site in Gowater for the successful completion of the first two projects. Apart from this, an Aquaculture Consultant from India is deputed on a part-time basis to provide a systematic process and standardizing the protocols for nursery management experience and or harvesting and transferring for juvenile into fattening ponds.

CIRSPE and SHILAT planned the main activities on the fields are as follows:

a) Farm visits were done on a daily basis. Technical guidance, suggestion and recommendation are done for solving of problems and better farm management after a through check up of each pond related to:

1. Feed Management (Feed quality assessment codes/batch wise i.e. colour, crumble/pellet cutting, percentage of dust, water stability testing; Check tray feed measurement, monitoring and right time observation, daily feed ration adjustments, catwalk/lift net positioning; Feed stacking in store room)
2. Pond Management Practices (water exchanges/flow through schedules, water depth, bloom development and maintenance, pond bottom condition, toxic gases, water quality parameters monitoring two times daily, biometry measurements, application of chemicals/additives/probiotics in pond water/soil, liming, use of feed additives and supplements)
3. Shrimp Health Management which relates to monitoring/diagnosis and bio security and quarantine measures during infection/disease out-break.
4. Other related activities such as, regular assessment of pumping and filtration unit, record keeping, storeroom, collection of data, etc.

b) Data Analysis and Report making i.e. Daily, Weekly, Monthly and Intermediate (bimonthly) along with Techno-Economic Analysis of individual farms.

5.2. On job training

It is conducted for 2 hours (9.00-11.00 am) on a weekly basis regarding shrimp culture which was attended by farm technicians, Shilat technicians and farm supervisors. Till date, the following classes were taken up by the Technical Manager and the Part-Time Aquaculture Consultant from India:

- a) Pond preparation (part 1);
- b) Pond preparation (part 2);
- c) Seed selection and stocking;
- d) Nursery management;
- e) Water quality management part 2
- f) Aeration system

On an average, 15-20 participants attended the classes every week. The classes are conducted in English which is translated every time to Farsi by one of the Iranian Technician involved in the project.

A workshop was also conducted in Gowater Training Centre regarding Nursery Management and Harvesting Techniques by Dr. Krishna Murthy. It was attended by Farm Owners, Technicians, Supervisors of Gowater complex.

6. RECOMMENDATIONS

The first Stakeholder consultation of the Italian aquaculture project in Sistan Baluchestan concluded that it is crucial to organise other consultations between the all stakeholders of the project, considering the all stage of the shrimp sector, from the hatcheries to the ponds, to the processing plants. All these actors can benefit from an appropriate sector management aiming at increasing the income for the farms, to gain the economic value of the production in order to generate more employment in the project area.

As already remarked, different groups have different capacities and interests and it is crucial to consider correctly their participation in the decision making process, that is crucial for strategy identification and selection.

This approach aim at maximizing the social and project benefits and minimize the negative impact, avoiding/reducing stakeholder conflicts.

Also the Bank System, for instance, must be contacted, considering that it can give a real support to the private sector, both for investment and farm management.

Concerning the field activities in Gowater the consultation adopted a series of indication that can be summarized as follows:

- a) There is the need to increase the SHILAT effort in Gowater site for shrimp rearing, considering the Government priorities and the climate condition of the area, very suitable for shrimp culture.
- b) CIRSPE has to propose the technical indicators for Gowater management control (This contribution in the Annex of this document).
- c) CIRSPE has to propose a Stakeholder analysis approach, according to the importance stressed during the consultations (This contribution in the Annex of this document).
- d) SHILAT has to contribute to the next stakeholder consultations, contacting farmers, hatcheries, feeding plants and the bank system.
- e) Stakeholder consultation can be a very useful tool for the visibility of the project and disseminating results.
- f) The project staff (SHILAT and CIRSPE) can use stakeholder consultations as a source of check and monitoring of project activities to up to date both objectives, results and finally specific activities and methodology.

Finally SHILAT and CIRSPE staff consider this first Stakeholder consultation very useful for the next phase of the project. At the same time it is evident that there is the need to extend the

invitation for the next meetings to other sector actors (hatcheries, farmers, processing plants, feed plants, banking system) such as also to the UNDP and, finally, to Italian Embassy/Italian Cooperation such as Donor.

ANNEXES

Management proposed indicators (Task 2)

Roberto Ugolini
CIRSPE Project Manager

The Italian project consists of 2 initiatives in 2 zones of the province of Sistan Baluchestan. The project approach takes into consideration the two contexts of freshwater in Zabol area and marine water in Chabahr/Gowater site.

As You know, the Iranian Government is supporting agriculture and aquaculture in extreme arid area, above all if they are in the country boundaries, both for political and socio-economic reasons. This effort is very important and it must be considered such as crucial within the context of development policy; it can have the effect to reduce the migration from agriculture context to the metropolitan areas, giving to the local/rural people the possibility of employment, income and economic benefits in difficult economic contexts (illegal activities).

The shrimp rearing complex of Gowater has been constructed roughly 110 km east of the city of Chabahr, not far from the Pakistan boundaries, so it is evident the political and social-economic relevance of this complex.

The Italian project/aid consists of production initiatives with the results to be transferred to the private sector, giving the right importance to the extension service of the Shilat, and to the all activities that can joint the public sector (SHILAT) to the private one (Gowater farms, hatcheries, processing plants, feeding manufactories) and to the bank system (Agricultural Bank, Commercial Banks).

Training is reserved for the technicians of the Shilat/the Ministry of Agriculture, with forecast fall-out on the private operations, considering that the individuals trained should be employed in the extension service.

Supply of technology is also essential in order to improve the efficiency demonstrating the worth of the new production strategies and, finally, testing and proposing technical packages which are innovative but appropriate to the context.

The project approach intends to contribute for reducing the social imbalance while raising the income level of the local populations and communities in the Province of Sistan-Baluchestan through the reinforcement and dissemination of aquaculture activities.

It is useful to underline the specific project objectives:

- i) Identification of valid production strategies for aquaculture in Sistan-Baluchestan;
- ii) Identification of technologies that are appropriate for both the different contexts (fresh water and sea water);
- iii) Expansion of the production base and diversification of the product;
- iv) Professional growth on the part of the Shilat/Fishing Department.

The results to be achieved are

- a) Operating marketing strategies

Strategies correlated to the market (species, sizes, period of sale, markets) of shrimp raising (at least 2 strategies shall be drawn up) (2 stocking density cost and benefits)

b) Innovative technological packages

Technological packages shall be prepared for shrimp raising (at least 2 packages shall be prepared and tested) (aerators/fertilization/water control)

c) Expansion of the production base and diversification of production

Production diversification reduces the risks of business operations; (two cycles)

d) Synergies between public (Shilat)/private sectors

Improving the capacity of the public service necessary for the new responsibilities and assignments tied to a great dissemination of operations, with the training of personnel, especially in management and technical activities. Reinforcement of the extension service, with the undertaking of a clear-cut effort to disseminate the technologies prepared during the project activities. Specific initiatives (Internet, Newsletter, Seminars, Interviews) for the sake of visibility, both international and national, in part to contribute to bringing together supply and demand (technology and production).

In other words, this project wants to be strictly connected to the development strategy of Iranian Central Government; SHILAT has the priority to consolidate the shrimp rearing in Sistan Baluchestan.

Then it is clear that the productive activities in the Gowater complex must be monitored by using objective indicator year by year that can give a real picture of the growth of the private sector.

The following table proposes reliable indicators that can be monitored. These are catalogued according to the dimension (Institutional, technical, productive, economic, social and financial).

<i>Institutional dimension</i>	<i>Reliable indicators</i>	<i>Action tool</i>
Iran Government support	Official documents and budget	Development plan at Province level for shrimp rearing consolidation
<i>Technical dimension</i>	<i>Reliable indicators</i>	<i>Action tool</i>
Shilat field activities	Technical project n.	Study and implementation of field projects by Shilat
Shilat field activities	Technical project amount	Study and implementation of field projects by Shilat
Extension service	Technicians number	Consolidation of extension service
Gowater Infrastructure	Shilat amount/budget	Improvement of infrastructure for private sector
Gowater Training	Shilat trainings number	Development of trainings
Gowater Training	Shilat trainers number	Development of trainings
Gowater Training	Shilat amount	Development of trainings
International project	Number	Increase the international cooperation and development projects
International project	Amount	Increase the international cooperation and development projects
Gowater Stakeholders	Consultations	Increase the number of expert consultations for Gowater area
<i>Productive dimension</i>	<i>Reliable indicators</i>	<i>Action tool</i>
Hatchery	Active hatchery number	Bank support development public

		incentives. Shilat assistance
Hatchery	Closed hatchery number	SHILAT technical indication
Hatchery	New hatchery in the year	Bank support development. Public incentives. Shilat assistance
Hatchery	PL production number	Management indications
Gowater Rearing	Farm Number	Economic support for sector developing
Gowater Rearing	Closed farm	Economic support for sector developing
Gowater Rearing	Water ha used	Technical indications by Shilat
Gowater Rearing	Stocking density (min/max)	Technical indications by Shilat
Gowater PL	Total stocked	Technical indications by Shilat
Gowater Rearing	Total production	Technical indications by Shilat
Gowater Rearing	Production/ha	Technical indications by Shilat
Gowater Rearing	Total production 10 gr.	Technical indications by Shilat
Gowater Rearing	Total production 18 gr.	Technical indications by Shilat
Gowater Farm 2 cycle	Number	Technical indications by Shilat
Gowater Farm 2 cycle	Ha	Technical indications by Shilat
Feeding	Consumed tons	Technical indications by Shilat
Feeding	Conversions index	Technical indications by Shilat
Aerators	Farm number	Technical indications by Shilat
Aerators	Ha	Technical indications by Shilat
Aerators	Gowater n.	Technical indications by Shilat
Disease	Mortality kg	Pond management, technical manual, Better Practises.
Disease	Complex history disease report and treatment	Pond management, technical manual. Better Practises.
<i>Economic dimension</i>	<i>Reliable indicators</i>	<i>Action tool</i>
PL hatchery market	PL farm price	Economic indications for sector developing
Shrimp market	Shimp price (size 10gr)	Technical indications by Shilat
Shrimp market	Shimp price (size 18gr)	Technical indications by Shilat
PL economic value	Gross Income	Economic indications for sector developing
Shrimp economic value	Gross Income	Economic indications for sector developing
<i>Social dimension</i>	<i>Reliable indicators</i>	<i>Action tool</i>
Hatchery employments	people men/month	Economic support for sector developing
Gowater employments	People men/month	Economic support for sector developing
<i>Financial dimension</i>	<i>Reliable indicators</i>	<i>Action tool</i>
Bank credit	Financed project number	Technical indications by Shilat
Bank credit	Project amount Rials	Economic support for sector developing
Bank credit	Interest Agricultural Bank	Economic support for sector developing
Bank credit	Interest Commercial Bank	Economic support for sector developing

TABLE FOR ANNUAL DATA

<i>Institutional dimension</i>	<i>Reliable indicators</i>	2005	2006	2007	2008	2009
Iran Government support	Official documents/budget					
<i>Technical dimension</i>	<i>Reliable indicators</i>					
Shilat field activities	Technical project n.					
Shilat field activities	Technical project amount					
Extension service	Technicians number					
Gowater Infrastructure	Shilat amount/budget					
Gowater Training	Shilat trainings number					
Gowater Training	Shilat trainers number					
Gowater Training	Shilat amount					
International project	Number					
International project	Amount					
Gowater Stakeholders	Consultations					
<i>Productive dimension</i>	<i>Reliable indicators</i>					
Hatchery	Active hatchery number					
Hatchery	Closed hatchery number					
Hatchery	New hatchery in the year					
Hatchery	PL production number					
Gowater Rearing	Farm Number					
Gowater Rearing	Closed farm					
Gowater Rearing	Water ha used					
Gowater Rearing	Stocking density (min/max)					
Gowater PL	Total stocked					
Gowater Rearing	Total production					
Gowater Rearing	Production/ha					
Gowater Rearing	Total production 10 gr.					
Gowater Rearing	Total production 18 gr.					
Gowater Farm 2 cycle	Number					
Gowater Farm 2 cycle	Ha					
Feeding	Consumed tons					
Feeding	Conversions index					
Aerators	Farm number					
Aerators	Ha					
Aerators	Gowater n.					
Disease	Mortality kg					
Disease	Disease and treatment					
<i>Economic dimension</i>	<i>Reliable indicators</i>					
PL hatchery market	PL farm price					
Shrimp market	Shimp price (size 10gr)					
Shrimp market	Shimp price (size 18gr)					
PL economic value	Gross Income					
Shrimp economic value	Gross Income					
<i>Social dimension</i>	<i>Reliable indicators</i>					
Hatchery employments	people men/month					
Gowater employments	People men/month					
<i>Financial dimension</i>	<i>Reliable indicators</i>					
Bank credit	Financed project number					
Bank credit	Project amount Rials					
Bank credit	Interest Agricultural Bank					
Bank credit	Interest Commercial Bank					

Finally it is very important to stress again the project specific objective connected to development of the synergies between public (Shilat)/private sectors.

Improving the capacity of the public service necessary for the new responsibilities and assignments tied to a great dissemination of operations, with the training of personnel, especially in management and technical activities.

The reinforcement of the extension service is essential with the undertaking of a clear-cut effort to disseminate the technologies prepared during the project activities.

At this regard it is very important to organise “Stakeholder consultations” both during and at the end of the technical activities.

Specific initiatives (such as Internet and Newsletter) are also important for the sake of visibility, both international and national, in part to contribute to bringing together supply and demand (technology and production).

Stakeholders analysis approach (Task 2)

As specified in the Foreword of this document, any individuals groups of people, institutions or firms that may have a significant interests in the success or failure with the project and the programme are defined as stakeholders.

Stakeholders are, at the same time, implementers, facilitators beneficiaries or adversaries.

Different groups can be involved directly or indirectly, positively or negatively, affect or be affected by the project and they can have different capacities and interests.

It is now crucial to explicitly, understand and recognize these groups/interests clearly, during the Aquaculture Development in Sistan Baluchestan project, above all for and before “sector development strategy”.

As remarked in the Foreword, stakeholders must be identified in order to maximize the social and institutional benefits of the project and minimized the negative impact,

This approach intends to maximize the social, economic and institutional benefits of the project to target groups and ultimate beneficiaries, minimising the potential negative impacts, such as stakeholder conflicts.

At this regards it is important to remark that the beneficiaries of the project are those who benefit in whatever way from the implementation of the project as follows:

- a) target groups
the groups who will be directly positively affected by the project at the project purpose level. For instance the SHILAT staff (training and capacity building), the farmers of Gowater complex, the employed people.
- b) final beneficiaries
Those who benefit from the project in the long term at the level of the society or sector at large, such as the shrimp private sector in Sistan Baluchestan and also in Iran: hatchery, farmers, processing plant, shrimp feeding firms

According to the European Union Project Manual the main steps involved in stakeholder analysis must include the identification of all those groups who have a significant interest in the project, their respective role, different interest relative power and capacity to participate.

One tool that can be used to support stakeholders analysis is the “analysis matrix”.

The following table is the proposed matrix for the project “Aquaculture Development in Sistan Bauchestan”.

STAKEHOLDERS ANALYSY MATRIX			
Stakehoders basic characteristics	Interests/problems	Capacity/motivation	Actions to address stakeholders interests
Gowater private	• Increase Production	• Reduce production	• Technical assistance

sector 1.000 ha for rearing; low income; marketing constrains; low association level;	<ul style="list-style-type: none"> • Employments; • Disease control; • Market organisation 	<p>cost;</p> <ul style="list-style-type: none"> • Increase the profit • Feed quality/price • Market control 	<p>2 cycle, water quality aerators system, training.</p> <ul style="list-style-type: none"> • Shilat support • Bank system support • Farm Association
Hatchery farmers	<ul style="list-style-type: none"> • Increase production PL • Disease control • 	<ul style="list-style-type: none"> • Reduce production cost 	<ul style="list-style-type: none"> • Shilat support • Bank support • Association
Feed production	<ul style="list-style-type: none"> • Increase production • Employments; • Feed quality/price 	<ul style="list-style-type: none"> • Reduce production cost 	<ul style="list-style-type: none"> • Bank support • Association
Bank system	<ul style="list-style-type: none"> • Credits 	<ul style="list-style-type: none"> • Income 	<ul style="list-style-type: none"> • Sector technical analysis, development project, Shilat support
Shilat	<ul style="list-style-type: none"> • Sector development 	<ul style="list-style-type: none"> • Government budget • International budget 	<ul style="list-style-type: none"> • Development plan and strategies
Iranian government	<ul style="list-style-type: none"> • Rural area development • Employments 	<ul style="list-style-type: none"> • Province economy 	<ul style="list-style-type: none"> • Development plan and strategies

Shrimp fattening management (Task 2)

D. Patnaik

CIRSPE/AFTM Staff
Chabahar/ Project Task 2

The first productive experiences foresees seven private farms (140 ha approx.) having a total water spread area (WSA) of 108 ha. Each of the seven farms has 14 no. of ponds (15.4 ha WSA) each of 1.10 ha area available for culture. All farms have an initial stocking of 180000 seeds per pond (16.36 post larvae/sq.m) and using local made (IRI) feed brand “Chineh”. Farm details are given in the table no.1. Two ponds in the middle (P-7/8) are kept empty for nurseries in second crop.

Second pilot productive activity is designed in such a way to obtain higher grammage of shrimps at final harvest, increase in overall production utilizing the same available resources without much elongation of the normal culture period. The Project consists of three private farms (60 ha approx.) having a total water spread area (WSA) of 46.2 ha. with 240000 seeds per pond (21.81 post larvae/sq.m) and will under go partial harvesting.

Post larvae 10-15 are stocked in all farms phase wise. Seeds were brought from Abzi Parvar Chabahar, Konarak hatchery which is almost three hours from the farm site and stocking was done in night time. All batches stocked PL were found with good quality. One day prior to seed packing and transport, samples were taken from each tank in hatchery by Veterinary Organization (I.V.O.) for Polymerase chain reaction (PCR) testing to confirm the seeds to be virus free (White Spot Syndrome Virus) and all results were found PCR negative. So, accordingly, seeds were stocked in all the project ponds.

The seeds are acclimatized thoroughly in acclimatization tanks by adjusting pH, temperature and salinity of both pond and hatchery water inside the packets and released into water either through siphoning or gradual release from tanks. Random site counting was also followed to estimate the total seeds stocked in each pond. Formulated feed (St-1) was given from the DOC 1 of seed stocking. Hapa survival was also conducted in most of the ponds and found with good results.

CH/FR NO.	OWNER	TECHNICIAN	PL/ POND	TOTAL PL	DATE OF STOCKING	DOC 06/07/06	PUMPS	LABOURS
C2/3	OMIDVARI	KASHANI	1.8/12	21.6	20-23/04/06	75-78	01	06
C2/5	RABBANI	HOSEINI	1.8/12	21.6	21-29/04/06	71-77	02	06
C2/26	TABAN DARYA	HAJI ZADEH	1.8/12	21.6	19-29/04/06	74-79	01	06

C2/27	TABAN DARYA	HAJI ZADEH	1.8/12	21.6	20-26/04/06	72-79	01	06
C2/32 /31	TABA TABAEI	KASHANI	1.8/8 1.8/2	18.0	20-27/04/06	72-78	01	05
C3/7	RIGI	RAHAMDEL	1.8/12	21.6	23-27/04/06	70-75	01	07
C3/25	MOSTAFAEI	BAGIZADEH	1.8/12	21.6	20-27/04/06	70-78	01	06
C2/12	JALALI	ASDAIRY	2.4/14	33.6	28/04-08/05/06	59-69	02	06
C2/15	HAJ SEID JAVADI	HOSEINI	2.4/14	33.6	04-12/05/06	57-65	01	06
C2/21	TONDO	TONDRO	2.1/2 2.4/9	32.0	01-14/05/06	53-67	01	06

Pond management

The soil quality is clayey to silty loam with almost negligible water seepage.

Direct water is lifted from the main channels with salinities noted 37-40 ppt in the first month while 36-38 ppt in the second month of culture. pH of channel water normally found between 8.2-8.3 from beginning to till date.

Two types of pumping systems are in operation in the project farms- vertical and centrifugal type. All farms have the infrastructure for setting two pumps but most of them have only one for culture operation without any standby for emergencies.

No electrification is seen in any of the farms, but are using their diesel generators for lighting purposes. Freshwater is brought from the nearby town in tankers to carry out the day today activities.

Ideal climatic conditions were experienced expect for few days in first month with high temperature and hot winds blowing. Frequent dust storms were experienced every week making difficulties in effective farm visits, pond management is also affected.

The pond preparation was carried out before one month of post larvae stocking in project ponds. The following procedure was followed.

- a) General civil works i.e. repair of dykes, pond bottom slope, sluice gate, drainage, catwalk/lift net fixation, feeder channel, pumping and filtration unit, etc.
- b) Ploughing (15-20 cms with tractors) and kept maximum one week for sun drying.
- c) Trench making from inlet up to outlet in a single straight line.
- d) Application of powdered Calcium Oxide (CaO) @ 200-300 kg throughout the pond bottom.

- e) Pumping and Filtration Unit. Filtering done through framed screen nets/bag net (3 and 5 mm multiple framed net, 1 mm, 60 mesh) fitted in specific grooves of filtering unit – 3 stage filtration. Two screen nets each of 3 and 5 mm are also fitted to the flume situated in the main channel.
- f) Water filling up to 30-40 cms and kept for 1 day to stabilize the parameters, particularly pH, and solubility of excessive salt deposits if present before during pond drying.
- g) Water drainage.
- h) Sealing of sluice gate with 3 layered wooden shutters, mud in between the 2nd and 3rd layer (to prevent water leakage) and fixing of framed screen net at the bottom of 1st layer without wooden planks was done for following bottom water exchanges.
- i) Water filling up to 50-60 cms.
- l) Application of inorganic fertilizers done after one day of water filling with doses (urea and single super phosphate 4:1 max i.e. 15-20 kg : 4-5 kg) adjusted depending on the pond productivity and incoming water quality. Smaller doses of fertilizers were also used to develop stable bloom colour. Some ponds were seen with poor bloom colour, plankton crash and development of lablab due to improper fertilization.
- m) Refilling water up to 80-100 cms and refertilising with smaller doses (4-8 kg of urea and 1-2 kg of super phosphate) followed if bloom colour hasn't developed after the first dose.
- n) Application of Agricultural lime (CaCO₃) @ 50-100 kg/ha depending on the pH range in morning and afternoon readings.
- o) Application of pre-biotic media (fermented/brewed for 48 hrs with regular stirring):
 - Molasses - 15-20 kg
 - Rice Bran - 10-12 kg
 - Yeast - 300-400 Gms
- p) Stabilization of water quality parameters and bloom maintenance. This is considered a very important step for better pond management during culture period.

Anyway, some farms may not have followed the same step due to unavailability of required materials/stocking post larvae urgently before proper pond preparation / absence of individual farm technician.

For shrimp culture in IRI, particularly in Gowater, infrastructure related to water intake is inevitable. Two types of pumping systems are in operation in the project farms- vertical and centrifugal type. All farms have a separate pumping unit having infrastructure for the setting of two diesel operated pumps. But except two farms (C2-05 and C2-12), the rest of all have only one pump in operation till date without any stand by available in case of emergencies. The pumps are having delivery pipe of 12-14" diameter for water discharge into filtration unit.

Water exchange schedules and flow through were made for each farm depending on their pumping capacity and were followed accordingly.

All farms have a filtration unit for effective filtration of channel water for culture so as to eradicate predators (fishes), competitors (other crustacean spp.) and entry of WSSV carriers. The screening nets seen are of 3 and 5 mm multiple framed nets in the 1st stage, 1 mm in the 2nd stage and 60 mesh size (bag net) in the 3rd stage of filtration. Two screen nets of 3 and 5 mm are also fitted to the flume placed at the bottom in the main channel. The bag net of 60 mesh size is found removed in all farms after 60 DOC for better discharge of incoming water into feeder channel and culture

The pumping efficiency is described as follows:

FARM WISE PUMPING EFFICIENCY OF PILOT ACTIVITY 1 AND 2.

PILOT ACTIVITY 1

FARM NO.	NO. OF PUMPS	EFFICIENCY
C2-03	01	AVERAGE
C2-05	02	GOOD
C2-26	01	AVERAGE
C2-27	01	AVERAGE
C2-32/31	01	AVERAGE
C3-07	01	POOR
C3-25	01	GOOD

PILOT ACTIVITY 2

FARM NO.	NO. OF PUMPS	EFFICIENCY
C2-12	02	AVERAGE
C2-15	01	POOR
C2-21	01	POOR

Water quality

Water quality management is one of the most vital steps in getting a successful crop. Parameters like pH, temperature, transparency, salinity, alkalinity, dissolved oxygen level are very important in determining the water quality and affecting the shrimp health.

Up to 60 DOC:

Salinity was the only parameter checked in all farms but only once or twice a week while pH was checked in three farms (C2-3/32/C3-25) irregularly. Channel salinity was recorded between 37-40 ppt and pH between 8.2-8.3. Pond salinities found within 42-55 ppt and pH of 8.4-9.0. The reason for such high salinities recorded is due to either pumping system found out of order or feeder channel brakeage and water exchanges delayed. Water exchange schedules are made and followed to maintain the salinity within normal range and for better water and pond bottom management.

During first 45-50 DOC, frequency (once in 4-5 days) and the rate (10-15 cms) of water exchanges was lesser compared to after 60-70 DOC where minimum of 25-30 cms or more of water exchanges is being followed at one time in each pond.. Up to 30-35 DOC's, flow through of bottom water was recommended and followed in all project farms to minimize stress to the animal. It is also followed at higher DOC's when required i.e. high pH, plankton crash, presence of bacterial load, etc. During the early DOC's water transparency was found in some ponds well above 70 cms and development of lablab in sides/corners/around check trays was observed. Application of Agricultural Lime (CaCO₃) @ 35-50 kg/pond and use of fermented molasses @ 15-20 kg/pond was followed in regular intervals to maintain a stable bloom and stabilization of pH and alkalinity. Plankton bloom colour of light green, green, yellow green, golden yellow and reddish brown in some of the ponds while transparent to

blackish green to blue green algae colour in some was observed. Black soil was observed in some of the ponds. Bioluminescence in water was observed in few ponds during the first two months.

Due to the presence of a technical personnel from Shilat Research Centre, parameters i.e. pH and temperature are recorded 2 times daily pond wise for two farms a day. Salinity parameter is also checked by the technical team during their field visits on a daily basis.

Recommendations were made accordingly if any discrepancies observed from the normal range. Channel salinity and pH were found 36-38 ppt and 8.1-8.2 respectively. Bottom water exchanges were made more than 25-30 cms in most of the ponds to reduce the organic load at the pond bottom.

Liming (both CaCO₃ and CaO) along with fermented molasses applications were done on a regular basis. Lime doses are increased depending on the pond conditions. Bloom colour is stabilized in most of the ponds. Black soil in the feeding zone is observed in almost all farms. During the last 10 days there were frequent dust storms in Gowater which affected the maintenance of stable bloom colour. Most of the ponds were seen with turbid to transparent to light green in colour. Plankton crash was also experienced.

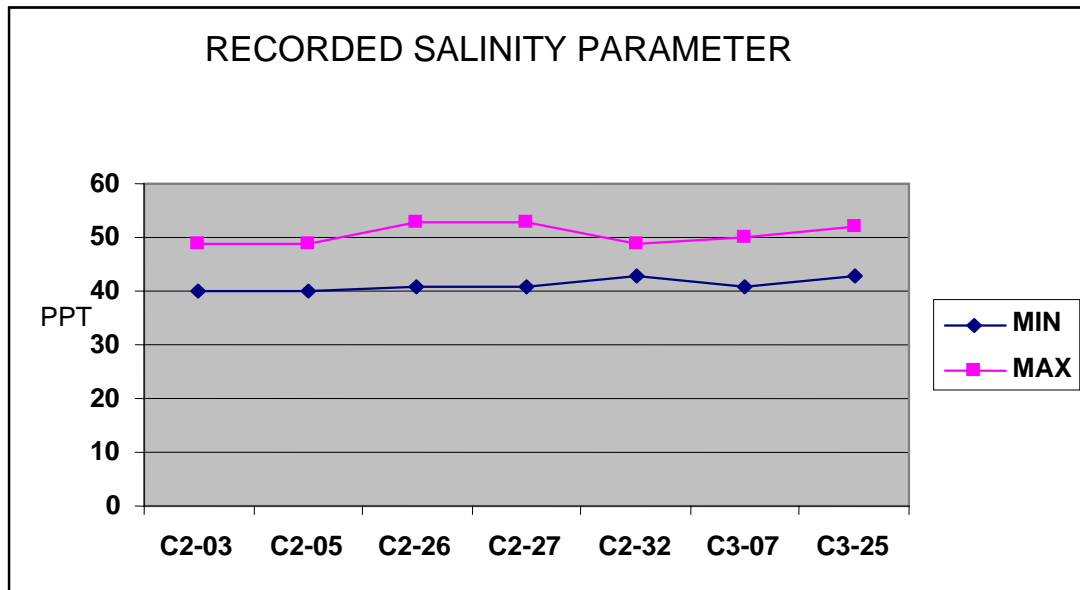
The following water quality parameters recorded till date in the project farms are as follows:

WATER QUALITY PARAMETERS

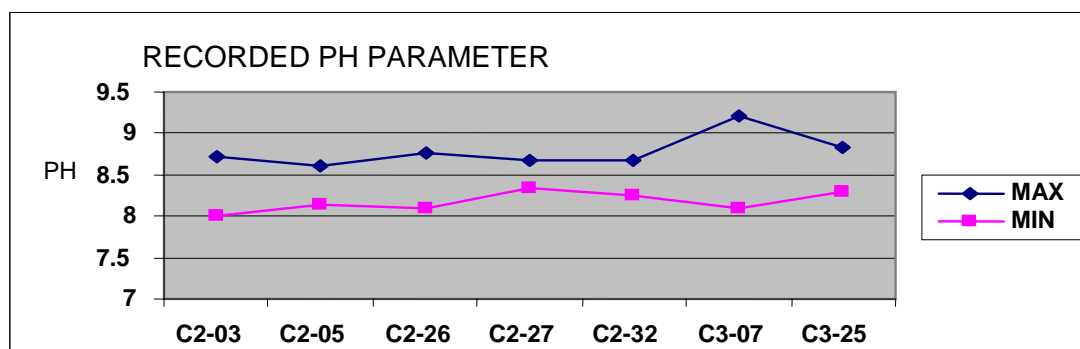
PARAMETERS	MINIMUM	MAXIMUM
SOURCE PH	8.0	8.4
POND PH	8.0	9.2*
TEMPERATURE	28	34
SOURCE SALINITY	36	40
POND SALINITY	40	55*

- Represents the water quality parameters have exceeded the normal range mainly due to no water exchanges for more than 10 days.

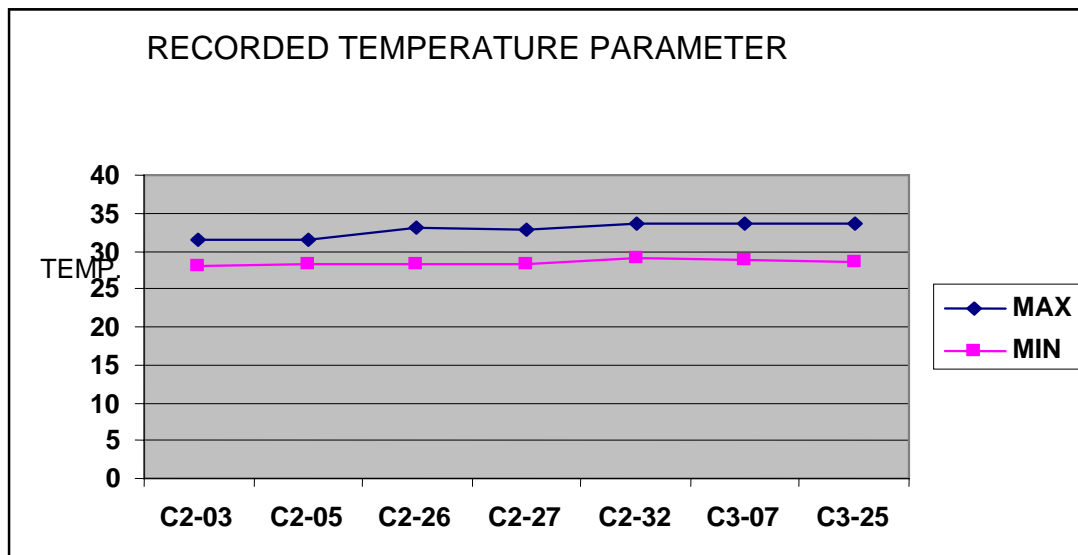
WATER QUALITY PILOT ACTIVITY N. 1



Note: The salinity in all farms reaching ≥ 50 ppt due to either pump out of order for at least 1 week or poor pump efficiency not suitable to manage effective water exchanges. The minimum salinity is recorded near 40 ppt in most of the farms reaching almost near to the source salinity of 36-40 ppt due to increase in the water exchange rate after 60 DOC's. Still then, some farms have irregular pump damages i.e. C2-32/C3-25 and accordingly salinity was found in between 40-45 ppt (normal range).

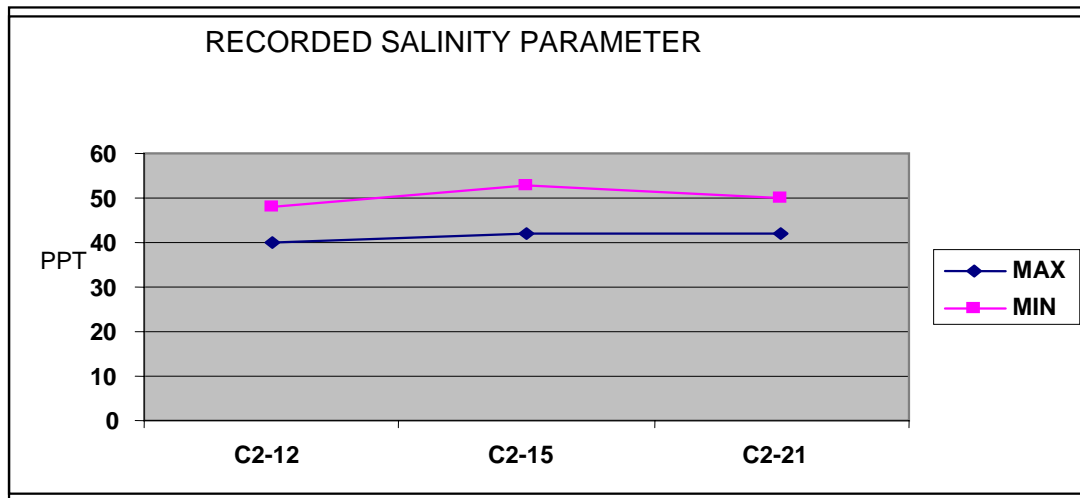


Note: All farms pH is found within normal range except P-13 of C3-07 which had no bloom (transparent), presence of dinoflagellates and organic load at bottom due to no exchanges for more than 10 days. The pH varies from farm to farm due to different management practices.

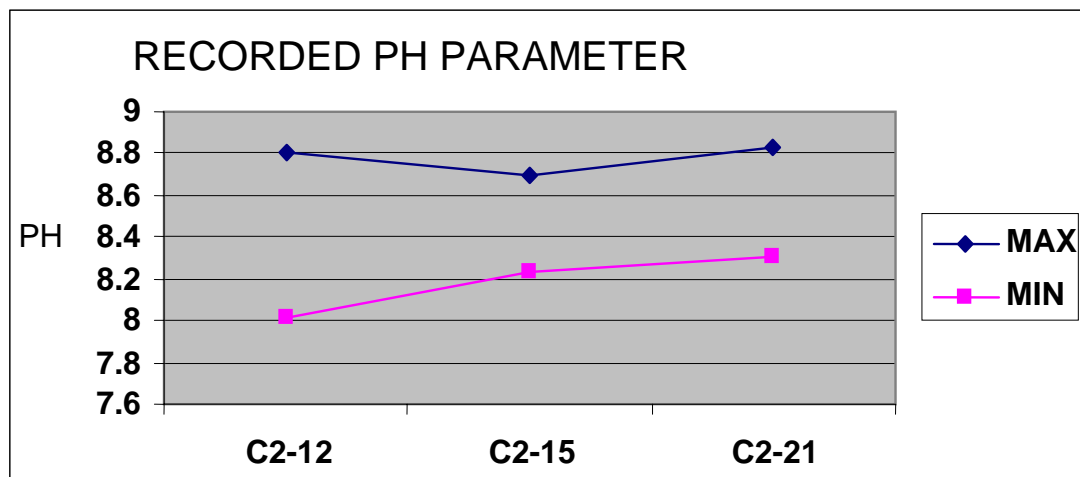


Note: The maximum temperature recorded in C2-03 and C2-05 is below 32 degree centigrade due to the presence of maximum water level (above 125-130 cms) in afternoon almost every time. The minimum temperatures in all farms are within 28-29 degree centigrade.

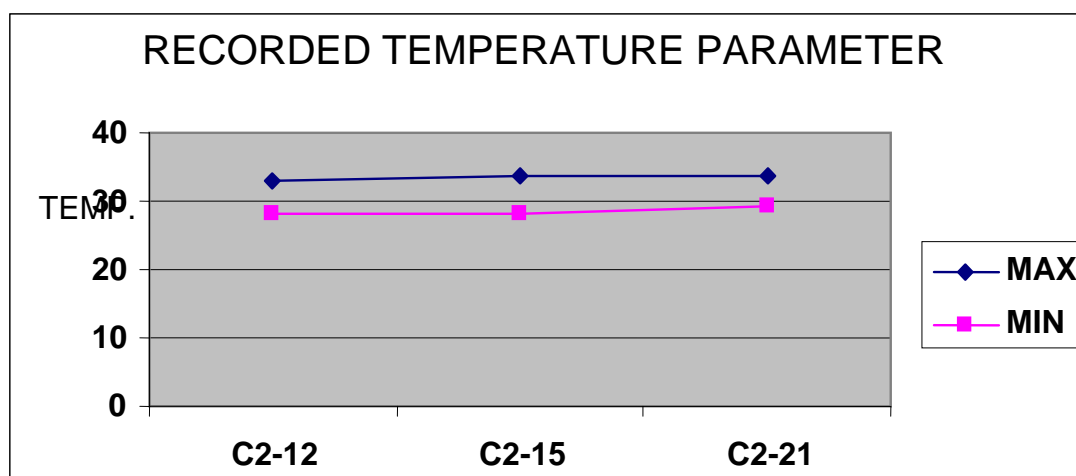
WATER QUALITY PILOT ACTIVITY N. 2



Note: The salinity parameter of C2-15 and C2-21 are higher touching 50 ppt and above because of poor pump efficiency of only one pump managing the total farm.



Note: All the farms recorded pH was within normal range. Farm C2-12 found with wide fluctuation in pH with minimum pH reaching almost 8 due to high water exchanges every time.



Note: The minimum temperatures are within normal range while the maximum temperature for all farms is above 33 degree centigrade.

Fertilization management

The following are some of the inorganic fertilizers, lime, sanitizers, pond water and aqua feed supplements/additives recommended/used so far in the project farms:

LIST OF SUPPLEMENTS AND CHEMICALS USED TILL DATE

FERTILISERS	FARM NO.	DOSES APPLIED
UREA	ALL	3-16 KG/HA
TRIPLE SUPER PHOSPHATE	ALL	1-4 KG/HA
LIME		
AGRICULTURAL LIME (CACO ₃)		
- POND PREPARATION	NA	100-400 KG/HA
- DURING CULTURE	ALL	35-70 KG/HA
INDUSTRIAL LIME (CAO)		
- POND PREPARATION	ALL	200-300 KG/HA
- DURING CULTURE	ALL	30-100 KG/HA
SLAKED LIME CA(OH) ₂	C2-31/32	70-80 KG/HA
DOLOMITE	NA	50-70 KG/HA

PRE-BIOTIC MEDIA (BREWING NEEDED)

COMPOLSORY MIXING

- MOLASSES	ALL	15-20 KG/HA
- RICE BRAN	ALL	7-12 KG/HA
- BAKER'S YEAST	ALL	300-500 GM/HA
OPTIONAL MIXING		
- CURD (YOGURT)	NA	0.5-1.0 KG/HA
- FEED (NO FUNGUS)	C3-07	1.0-2.0 KG/HA
SANITISERS/CHEMICALS	FARM NO.	DOSES APPLIED
IODINE (ACTIVE 10%)	C2-12	4.0-5.0 LIT/HA
POTASSIUM PERMANGANATE	C2-12	2.0-2.5 KG/HA
CITRIC ACID	C2-12	250 ML/LIT OF IODINE
ALUMINIUM SULPHATE (ALUM) C3-07		10-22 KG/HA
AQUA FEED ADDITIVES		
EGG ALBUMIN	C2-12/15/32	1.0 EGG/KG OF FEED
YOGURT	C2-12/15/32	10-15 ML/KG OF FEED
MOLASSES	NA	10-15 ML/KG OF FEED
ASCORBIC ACID (VIT.-C)	NA	5-10 GM/KG OF FEED

Nursery management (Task 2)

D. K. Murty

CIRSPE/AFTM Staff
Chabahar/ Project Task 2

Although shrimps farming in Iran started recently in early 90s, it expanded rapidly as is considered highly profitable with an enormous scope for foreign exchange and also to provide lot of employment opportunity for the locals. However, many farmers in Iran are not fully happy to go ahead with international market 2) agro-climatic conditions not favoring 2 crops a year and 3) the fear of disease problem. Therefore, in order to make shrimp farming economically more viable, farmers need to go in for 2 crops a year. This needs to be tried at least in few farms where agro-climatic conditions are somewhat favorable like in Baluchestan province. To achieve this, farmers need to go in for nursery system.

Advantages of nursery system:

1. It reduces the DOC in the grow-out ponds in the 2nd crop, thereby allowing to go for 2nd crop.
2. Ensures good survival as shrimps are transferred at a bigger size.
3. Increases control over stock assessment.
4. Can have better control on feeding, thus on FCR.
5. Helps in reducing pressure on limited hatchery supplies.
6. When used appropriately, it can reduce the risk of diseases as post larvae can be effectively quarantined during the nursery phase.

Protocols for the pond preparation and stocking were distributed to all the seven farms coming under the nurseries project. Pond preparation for the nurseries has just started 10 days back.

The basic steps i.e. liming with CaO, horizontal ploughing, widening of trenches, feeder channel and inlet repair, water depth measurement scale repositioning, sluice gate restructuring and construction were followed in a rapid pace. Some ponds are getting ready for water filling for the second crop to start very soon.

Technical have been organised for the farms for giving guidelines in each individual farms for starting of nursery shrimp management. A workshop was also conducted in this regard at Shilat training Centre, Gowater, Chabahar.

Considering the local conditions, the following protocol has been developed for Gowater farming complex. The same protocol may be adopted in other localities as well as giving due consideration for the climatic conditions prevailing in the locality.

Pond preparation:

- a). Pond preparation is the same as that of grow-out pond. Special attention is need to be given to have good slope & also a central trench in order to harvest all shrimps in live condition.

- b) Fix complete screen in the first 2 grooves (see the table). No soil seal. To stop leakage from the sluice gate (monk), use saw dust (waste from carpentry shop / saw mill) or use plastic sheet.
- c) Fix the depth scale at the outlet, instead of fixing it in the centre of the pond. This will allow checking the exact level of water to be exchanged.
- d) Do not use urea & phosphate for at least 2 days before stocking. If necessary, use molasses.

Fry selection & Stocking

a) Select only PL which passes through both PCR & Stress test (salinity stress). PCR result can be obtained from IVO.

b) Stress test (Salinity stress):

It can be performed at PL12. For this, take 100 PL in a beaker & reduce the salinity to 2 ppm for 30 minutes. Then, raise the salinity back to hatchery salinity for another 30 minutes. Now check the survival. If it is more than 80%, then the PL batch has passed the test.

If the batch fails the stress test at P112 (i.e. survival is less than 80%), perform the same test at PL15 & check the survival. If it is more than 90%, then the PL can be stocked the same day.

If the stress test fails at PL 15 (i.e. survival less than 90%), perform the same test at PL18 & check the survival. If it is more than 90% the seeds can be stocked. If the stress test fails the 3rd time, the seeds should not be stocked.

NOTE: It is advisable to stock PL15. Try to avoid PL above 18.

PL Stocking:

a) Acclimatize PL to pond conditions (mainly for salinity & temperature) before releasing them into the nursery pond.

b) For better acclimatization, put all PL in to a 500 liter capacity tank (or 2 pcs of 250 liter capacity tanks).

Fill the pond water into another tank of same capacity kept at an elevated level.

c) Now slowly add pond water from the tank in to PL tank until salinity & temperature are equalized.

d). Turn the water in the PL tank & siphon out PL in to the pond from sides of the PL tank.

f) Do not stock the dead & weak PL which accumulate at the centre of the PL tank.

g) Better use Oxygenation (using oxygen cylinders) for better survival.

h) Normal time for acclimatization is 10 minutes for every 1 ppt / 1 °C difference but, do not delay too long.

Feeding Schedule for 1.4 million stocking in Nursery

Since the survival and the growth during nursery phase of shrimp farming cannot be ascertained properly, the following feeding schedule is given based on experience under practical conditions. This table serves only as a base & may need to be slightly altered based on observations made on pond-to-pond conditions, and based on number of shrimps coming to check trays from 20 DOC onwards. Check trays should be installed by 10 DOC.

FEEDING CHART FOR NURSERY

DOC	FEED TYPE	AV.PELLET SIZE (MM)	QUANTITY OF FEED (KG)	NO. OF FEEDINGS
1 – 7	PL FEED / ST.1	0.4	20.0	4
8 – 14	ST.1 / ST 2	0.4 / 0.9	36.0	4
15 – 21	ST. 2	0.9	45.0	4
22 – 28	ST.2	0.9	54.0	4
29 – 35	ST.2 + 3	0.9 + 1.2	63.0	4
36 – 42	ST.3	1.2	70.0	4

43 – 49	ST. 3	1.2	80.0	4
---------	-------	-----	------	---

Note:

1. The ideal size for transfer is 1.2 – 1.5 gm & preferably not > 3.0 gm. Quantity of feed may be altered based on the size to be obtained before transfer.
2. Since the feed size differs from brand to brand, the feed type (i.e. St. 1, 2, 3) has to be decided based on pellet size.

Water Exchange Schedule for Nursery pond with 1.4 million stocking

WATER EXCHANGE SCHEDULES

DOC	WATER EXCHANGE	MESH SIZE	
		1 ST GROOVE	2 ND GROOVE
1 - 7	NO WE, BUT TOP-UP WATER LOSS	MESH # 20	MESH # 20
8 – 14	3 CM	MESH # 20	MESH # 20
15 – 21	5CM	MESH # 20	MESH # 20
22 – 28	8CM	3 MM	MESH # 20
29 – 35	12CM	3 MM	MESH # 20/3MM
36 – HARVEST	15CM	3 MM	3 MM

Note:

- Water Exchange should be done preferably by draining the bottom water without putting mud between the slabs. Slight leakage may be allowed or it can be stopped by using plastic / polythene sheets. Rate of water exchange should be increased based on DO reading (6 am & 3 pm) Mesh size can be changed based on ABW obtained.

Requirements for Nursery Transfer

REQUIREMENTS FOR NURSERY TRANSFER

BAG NET	1 NO.
BASKET WITH NETTINO	6 NOS.
WEIGHING SCALE (FOR QUANTITY)	1 NO.
SMALL GENERATOR (FOR LIGHTING SYSTEM)	1 NO.
50/100 LIT DRUMS (OR 250 LIT TANKS – 4 NOS)	10 NOS.
PICK-UP CAR	2 NOS.
SURVIVAL NET WITH RODS(15*10 MT)	1 OR 2 PCS.
HAPAS (3 PER POND)	18 NOS. + 18 NOS.
O ₂ CYLINDER WITH REGULATOR	2 NOS.
FEED BAGS/GUNNY BAGS	15-20 NOS.
DO METER	1 NO.
½ HP / 1 HP PUMP (FILLING TANKS / TUBS)	1 NO.

Procedure for juvenile transfer

1. Perform pre-hapa test 2 days before transfer. For this keep 100 juveniles in each of 3 hapas fixed in the pond into which juveniles to be transferred. Survival should be more than 90% after 2 days. If not, check water quality & correct it.
2. Check moulting. It should be less than 10%. If it is more postpone transfer.
3. Keep all materials ready.

4. Start transfer by 4 – 5 pm.
5. Check DO every 30 minutes. DO should not be < 2 ppm.
6. Take ABW at every 50 / 100 kg transferred.
7. Perform post-hapa test.
8. Weigh the dead shrimps in the survival net next day.
9. Calculate the actual number stocked (transferred) & record it.

Stocking Density (1.4 million / pond) is calculated as follows

In Direct stocking method

If 180,000 PL per pond (1.1 ha) are stocked:

At 80% survival, the no. of shrimps to be harvested = 144,000.

i.e. the density at the time of harvest = 144,000 / 7 ponds = 13.1 / m².

In nursery system

If 1.4 million PL are stocked:

At 80% survival, no. of juveniles to be transferred = 1,120,000.

i.e. no. of juveniles to be transferred per pond = 1120,000 / 7 ponds = 160,000.

We can expect 90% survival from juveniles to harvest size.

Therefore, the no. of shrimps to be harvested per pond = 144,000.

i.e. the density at the time of harvest = 144,000 / 11000m² = 13.1 / m².

Therefore, if 1.4 PL are stocked per nursery, the density by harvest is almost the same as that of the present crop.

Shrimp feed management (Task 2)

M. Esmaeili, D. Patnaik.

CIRSPE/AFTM Staff
Chabahar/ Project Task 2

Three feed brands were used in all the project farms and is shown below:

BRAND NAME	ORIGIN	FARM NO.
CHINEH	IRI	C2-3/5/26/27/32, C3-25 (Project 1) C2-21 (Project 2)
HAVORRASH	IRI	C3-07 (Project 1)
LE GOUESSANT	FRANCE	C2-12/15 (Project 2)

The overall feed quality is physical verified (water stability checked at laboratory conditions and during check tray observations) with the feeds available till date in the site and is shown as below:

COMPARATIVE STUDY OF FEEDS IN PILOT ACTIVITY 1 & 2

PARAMETERS	CHINEH	HAVORRASH	LE GOUESSANT
PROTEIN %	39	39-42	42
MOISTURE %	12	10	10
FAT %	07	06-09	06
COLOUR	BROWN	BROWN	BLACKISH GREEN
SMELL	FISH MEAL	OTHER	FISH MEAL
DUST %	0.5	0.7	0.3
WATER STABILITY	>2 HRS	>2HRS	>4HRS
PELLET SIZE (GR-1)	HIGHLY UNEVEN	UNEVEN	UNIFORM

(Some batches were examined for water stability, dust percentage and pellet size)

Depending on the average body weight (ABW) cultured shrimp, there are specific crumble/pellet sizes and different percentages of their use are followed which are as follows:

FEED CODES PERCENTAGE REQUIREMENT

ABW	CODES	% REQUIRED	SHAPE	SIZE (MM DIA)
≤0.45	STARTER-1	1.5	CRUMBLE	0.6-0.8
0.45-2.0	STARTER-2	7.5	CRUMBLE	0.8-1.2
2.0-4.0	STARTER-3	13	CRUMBLE	1.2-1.5
4-8.6.0	GROWER-1	38	PELLET	1.8-2.0
8.6-14.5	GROWER-2	40	PELLET	2.0-2.2
14.5-17.5	FINISHER	-	PELLET	2.2-2.5

Agreement and total feed requirement with code projections was done by each farm owners with the concerned feed companies much before the starting of the project.

All feed brands are showing the average normal growths as required in respective farms on DOC and stocking density. Feeding frequencies has been increased to five times a day and check tray observation is done for two bigger meals i.e. morning and evening. Accordingly daily feed rations were calculated.

Regular biometry or in other words sampling is followed in each farm pond wise in a gap of 7 or 10 days interval starting from 35-40 DOC's. Initially up to 40-45 DOC, average body weight (ABW) was assessed by check trays due to smaller sizes of the cultured species. Cast net biometry is followed in all project farms once the shrimps reached above 4 gms in ABW. Depending on the biometric results obtained, survival percentage, biomass, feed conversion ratio (FCR) and other related growth parameters are calculated pond wise. Accordingly, changes are made in feeding and pond management if required.

Data record is done on a daily basis in all the project farms in separate formats supplied to them by AFTM in the starting of the project. It is checked and properly monitored during the field visits. The records are as follows:

- a) water quality parameter record
- b) feed management record
- c) biometry record

Rough note books are available for giving instructions related to the quantity of feed per meal per day, application of pond additives and daily work assignments, etc. These note books are also cross checked some times with the main record to nullify any mistakes..

Prevention of diseases (Task 2)

M. Esmaili, D.K. Murty, D. Patnaik, U.S. Sethi,

CIRSPE/AFTM Staff
Chabahr/ Project Task 2

Regular shrimp health monitoring and assessment is done pond wise during check tray observations. Cast net observations are made in case of emergencies for better diagnosis of the problem. Water quality parameters, bloom colour, pond bottom, water exchange schedules and daily feeding patterns are studied before proper treatment. Previous crop history of that particular pond/farm was also taken into consideration. Water exchanges and application of chemicals and other related additives are recommended depending on the farm situation. However, the details were reported in all weekly reports.

The following are some of the parameters associated with shrimp health that is encountered till date in all the project farms:

- a) Plancton crash, lab lab and black soil;
- b) High pH, and high salinity;
- c) Turbidity and alkalinity;
- d) Toxix gases (ammonia);
- e) Feeding reducing and no consumption;
- f) Dinoflagellates;
- g) Bacteria, vibrio load at pond bottom;
- h) Pond history disease;
- i) Dissolved oxygen shortages (*)

* Represents the situation has occurred with high mortality of shrimps in one of the pond of project farm not included in the project (pond size-0.35 ha; stocking density-29 pcs/m²).

The symptoms observed in shrimps are as follows:

- a) Loss of appetite, poor growth
- b) White muscle; swollen gut; empty/partial gut; antennae cut, rough and brittle; colour and size of faecal matter; bacterial contamination;
- c) Hepatopancrease/liver affected (yellowish fluid)
- d) Gill choke and swollen;
- e) Delayed/partial moulting;
- f) Delayed moulting recovery;
- g) Loose shell syndrome;
- h) Soft shell syndrome;
- i) Size variation and cannibalism.
- l) Bioluminescence and vibriosis
- m) Shrimp coming to side and surfacing.

All of the above situations are recovered after right diagnosis and treatment and the ponds are running smoothly till date.

The problems of individual farm and the corrective measures adopted are all discussed in the next chapter.

Shrimp rearing production prevision (Task 2)

Esmaeili

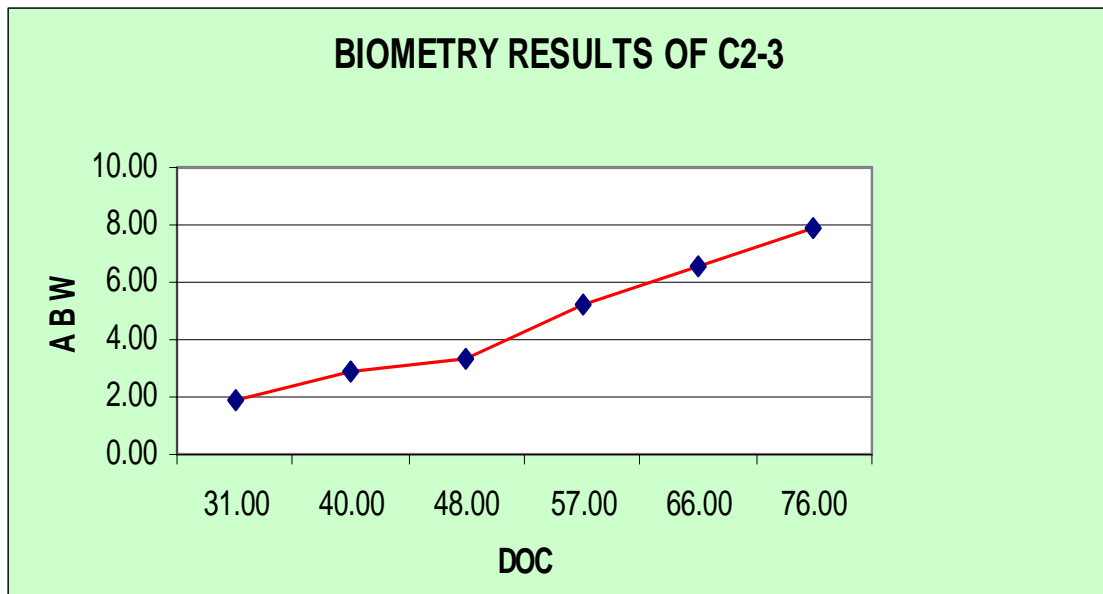
CIRSPE/AFTM Staff
Chabahar/ Project Task 2

The growth parameters i.e. survival percentage, biomass and feed conversion ratio (FCR) are studied pond wise for all farms coming under both the projects to estimate the result of final harvest before hand.

These estimations are based on the maximum daily feed consumed. The Average Body Weight (ABW) of each pond is obtained from the Biometry results obtained during cast net sampling. The growth parameters of each farms are as follows:

FARM PERFORMANCE IN C2-03					
POND NO.	DOC	ABW (GM)	SURVIVAL %	BIOMASS (KG)	FCR
1	77	9.0	87.8	1406	1.05
2	77	7.5	92.6	1250	1.19
3	77	8.5	89.1	1364	1.09
4	77	8.1	90.8	1324	1.13
5	76	7.8	91.6	1286	1.14
6	76	8.6	88.1	1364	1.07
7	NURSERY	.....	.....	.....	.....
8	NURSERY	.....	.....	.....	.....
9	76	8.0	92.0	1274	1.12
10	76	7.5	92.6	1250	1.11
11	74	7.7	92.7	1169	1.18
12	74	7.5	92.6	1217	1.17
13	74	7.0	85.6	1214	1.14
14	74	7.3	86.4	1135	1.21
TOTAL & AVEARAGE	76	7.9	90	15251	1.13

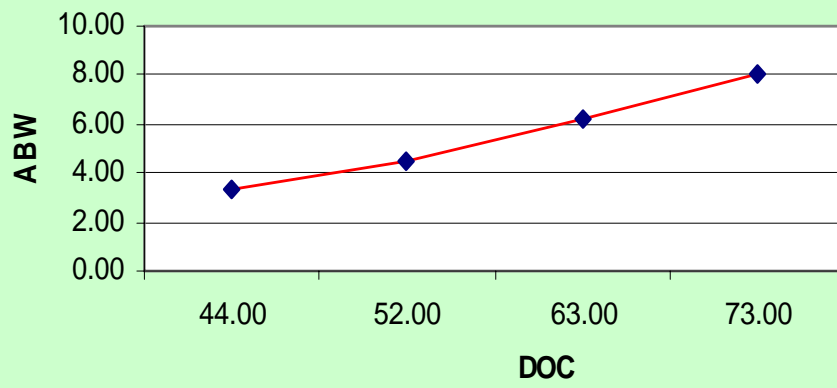
GROWTH CURVE OF C2-03



FARM PERFORMANCE IN C2-05					
POND NO.	DOC	ABW	SURVIVAL %	BIOMASS (KG)	FCR
1	76	8.0	87.1	1254	1.23
2	76	8.1	80.7	1176	1.29
3	75	8.4	78.3	1176	1.31
4	75	8.3	78.8	1176	1.29
5	75	8.5	82.4	1254	1.23
6	75	8.3	79.2	1176	1.30
7	NURSERY	.....	.....	.....	.....
8	NURSERY	.....	.....	.....	.....
9	72	8.1	80.7	1176	1.17
10	72	8.0	87.1	1254	1.15
11	70	7.9	66.7	943	1.30
12	70	7.8	88.1	1229	1.11
13	69	7.4	89.0	1178	1.17
14	70	7.5	65.8	889	1.36
TOTAL & AVERAGE	73	8.0	80	13882	1.24

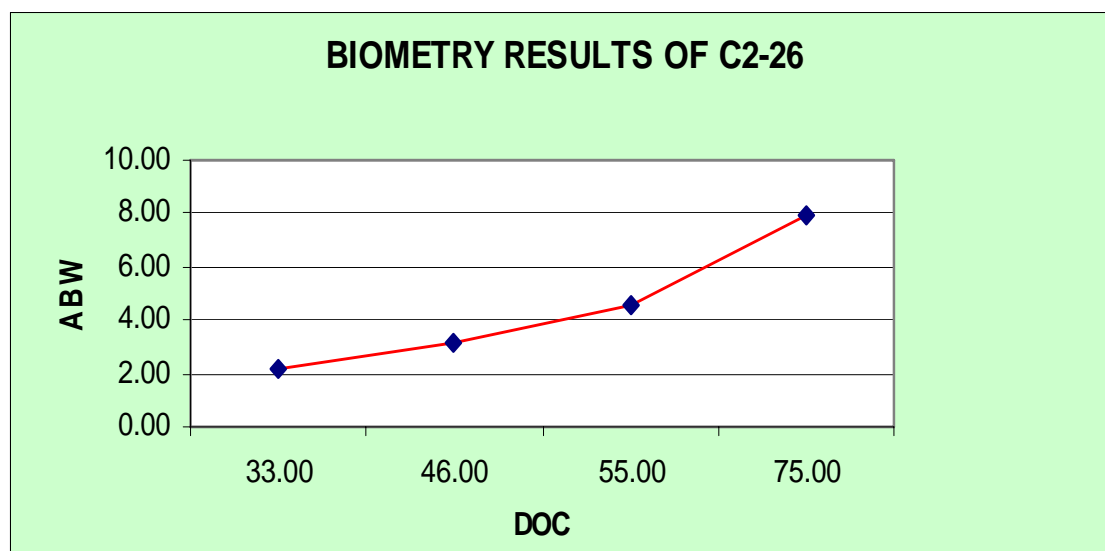
FIGURE NO. 8: GROWTH CURVE OF C2-05

BIOMETRY RESULTS OF C2-5



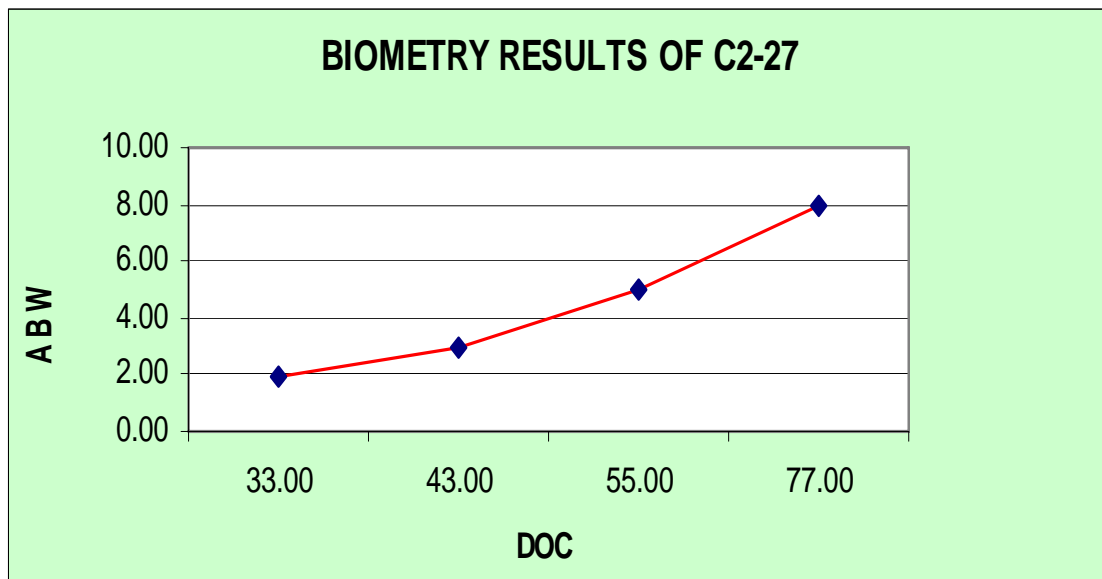
FARM PERFORMANCE IN C2-26					
POND NO.	DOC	ABW (GM)	SURVIVAL %	BIOMASS (KG)	FCR
1	77	9.0	86.8	1406	1.05
2	77	7.5	92.6	1250	1.19
3	77	8.5	89.1	1364	1.09
4	77	8.1	90.8	1323	1.13
5	76	7.8	91.6	1286	1.14
6	76	8.6	88.1	1364	1.07
7	NURSERY	.....	.....	.....	.....
8	NURSERY	.....	.....	.....	.....
9	76	8.0	91.9	1274	1.12
10	76	7.5	92.6	1250	1.11
11	74	7.7	92.8	1169	1.18
12	74	7.5	92.6	1217	1.17
13	74	7.0	85.6	1214	1.14
14	74	7.3	86.4	1135	1.21
TOTAL & AVEARAGE	76	7.9	88	15251	1.13

GROWTH CURVE OF C2-26



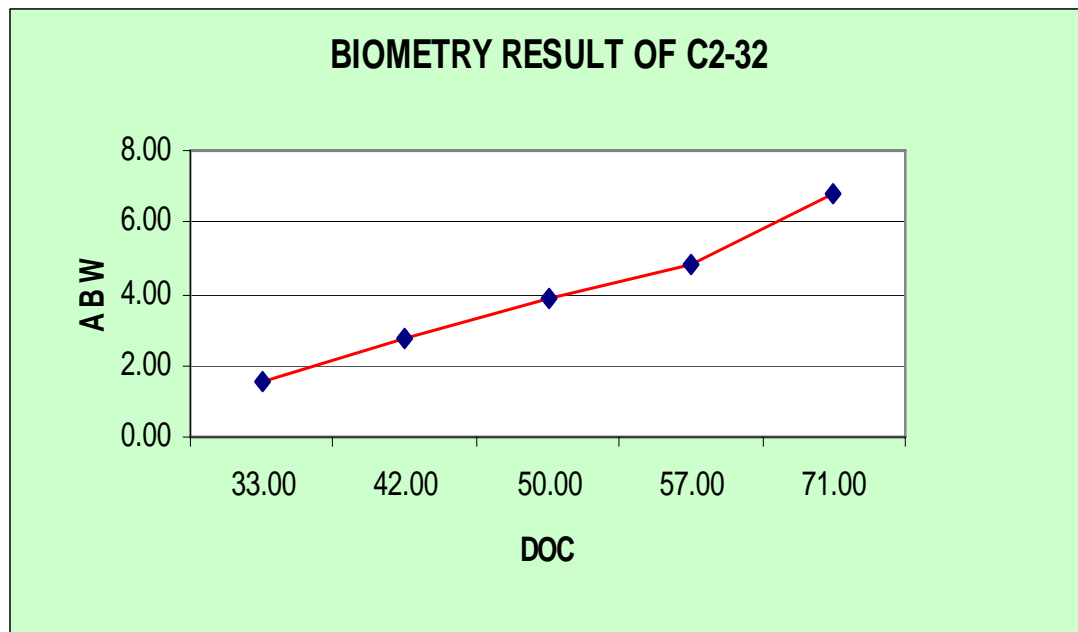
FARM PERFORMANCE IN C2-27					
POND NO.	DOC	ABW	SURVIVAL %	BIOMASS (KG)	FCR
1	81	7.1	84.7	1079	1.27
2	81	7.0	85.6	1079	1.32
3	80	8.2	87.7	1294	1.20
4	81	9.0	84.9	1375	1.10
5	79	7.7	92.8	1286	1.23
6	79	8.0	90.6	1304	1.19
7	NURSERY	.....	.....	.....	.....
8	NURSERY	.....	.....	.....	.....
9	75	8.4	89.4	1343	1.00
10	75	8.2	65.9	971	1.16
11	74	7.7	78.3	1086	1.25
12	75	8.0	80.5	1159	1.24
13	74	8.3	85.8	1283	1.03
14	74	8.5	89.1	1364	1.07
TOTAL & AVERAGE	77	8.0	82	14623	1.16

GROWTH CURVE OF C2-27



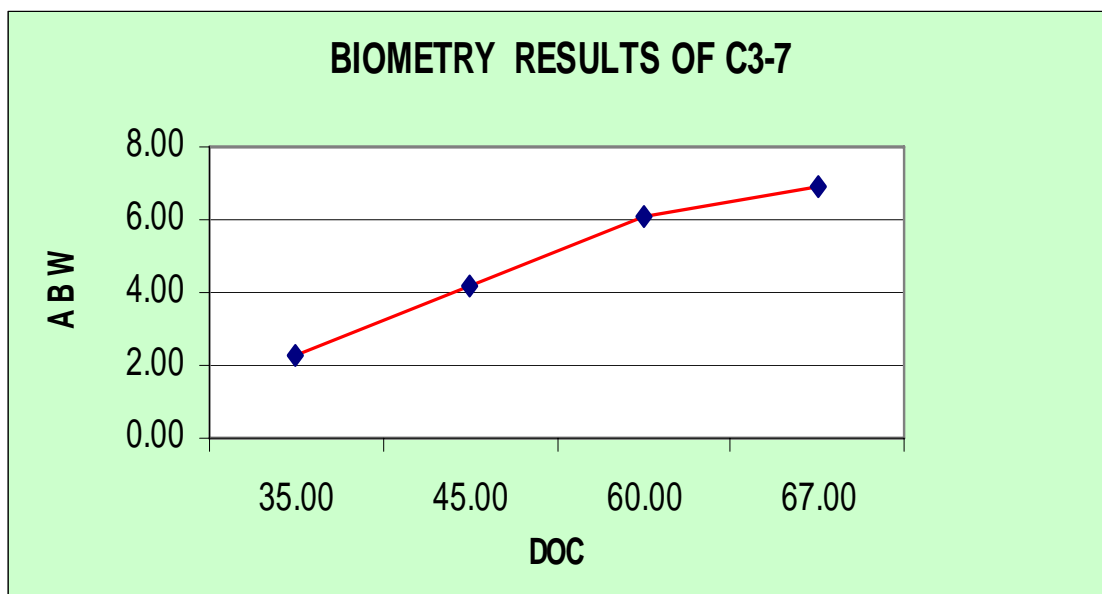
FARM PERFORMANCE IN C2-32					
POND NO.	DOC	ABW (GM)	SURVIVAL %	BIOMASS (KG)	FCR
1	69	7.1	65.4	1278	0.94
2	69	6.9	63.3	1242	0.88
3	69	7.1	61.2	1278	0.84
4	69	6.6	61.0	1188	0.96
5	70	6.5	61.2	1170	1.00
6	71	6.1	69.3	1098	0.98
7	71	5.5	78.3	990	1.18
8	71	6.8	62.5	1224	0.94
9	75	7.5	74.1	1350	1.07
10	75	7.6	82.0	1368	1.10
TOTAL & AVEARAGE	71	6.8	69	12186	1.00

GROWTH CURVE OF C2-32



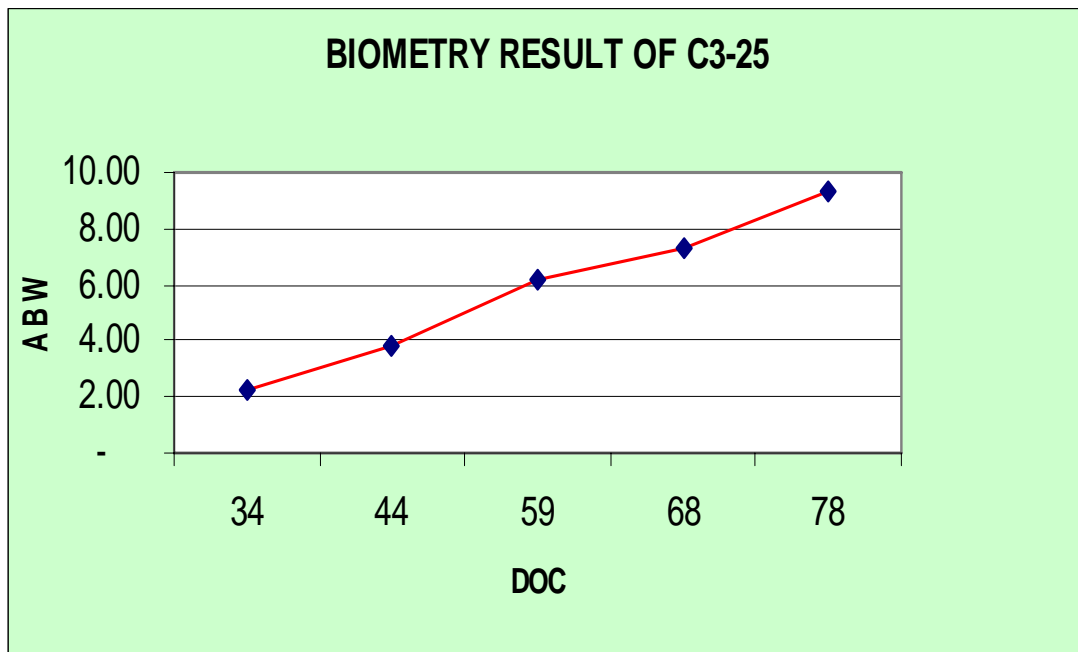
FARM PERFORMANCE IN C3-07					
POND NO.	DOC	ABW (GM)	SURVIVAL %	BIOMASS (KG)	FCR
1	69	7.2	87.7	1135	1.12
2	69	7.3	86.4	1135	1.12
3	69	8.1	85.2	1235	1.03
4	69	7.3	86.4	1135	1.12
5	69	7.5	86.3	1167	1.09
6	69	6.7	89.0	1077	1.18
7	NURSERY	...	...	...	...
8	NURSERY	...	...	...	...
9	66	7.5	77.3	1041	1.16
10	66	6.8	79.6	974	1.24
11	66	6.5	82.9	974	1.24
12	66	6.7	81.2	974	1.24
13	65	6.3	88.3	1000	1.18
14	65	6.4	84.1	974	1.24
TOTAL & AVEARAGE	67	7.0	87	14140	1.17

GROWTH CURVE OF C3-7



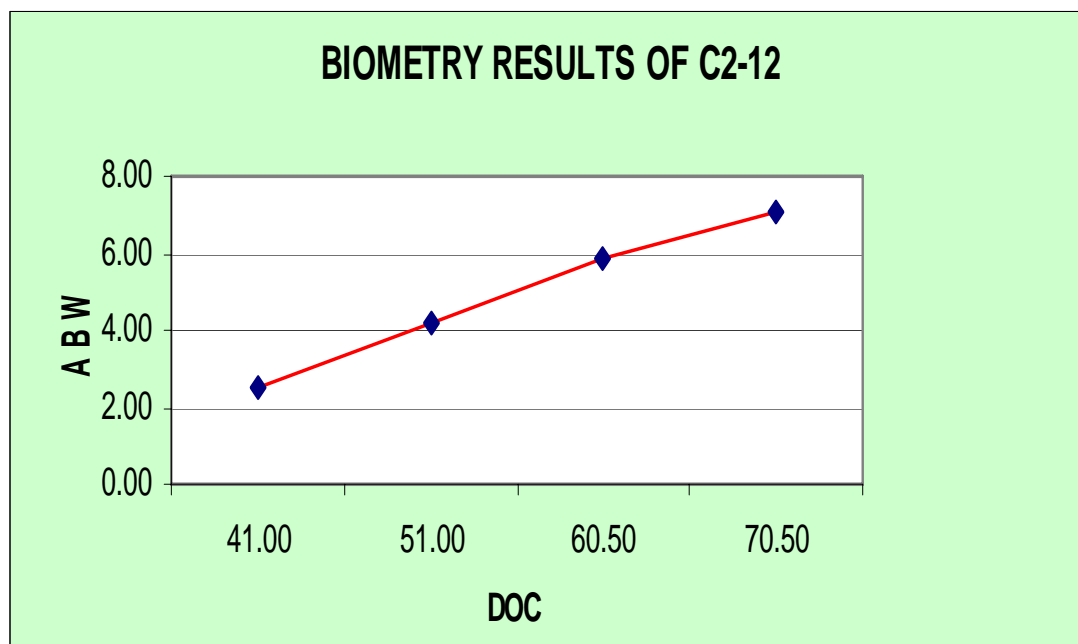
FARM PERFORMANCE IN C3-25					
POND NO.	DOC	ABW	SURVIVAL %	BIOMASS (KG)	FCR
1	81	9.4	80.4	1355	0.99
2	81	9.7	74.8	1311	1.08
3	81	10.1	72.1	1317	1.16
4	81	9.3	75.5	1270	1.00
5	78	10.2	73.9	1356	1.07
6	78	9.2	75.9	1250	1.26
7	NURSERY	...	...	...	...
8	NURSERY	...	...	...	...
9	78	9.1	72.4	1188	1.08
10	78	9.2	75.7	1254	1.17
11	77	9.3	72.2	1206	1.22
12	77	9.1	82.8	1359	1.12
13	74	7.8	69.2	971	1.22
14	74	9.1	80.2	1313	1.15
TOTAL & AVERAGE	78	9.3	75	13795	1.14

GROWTH CURVE OF C2-25



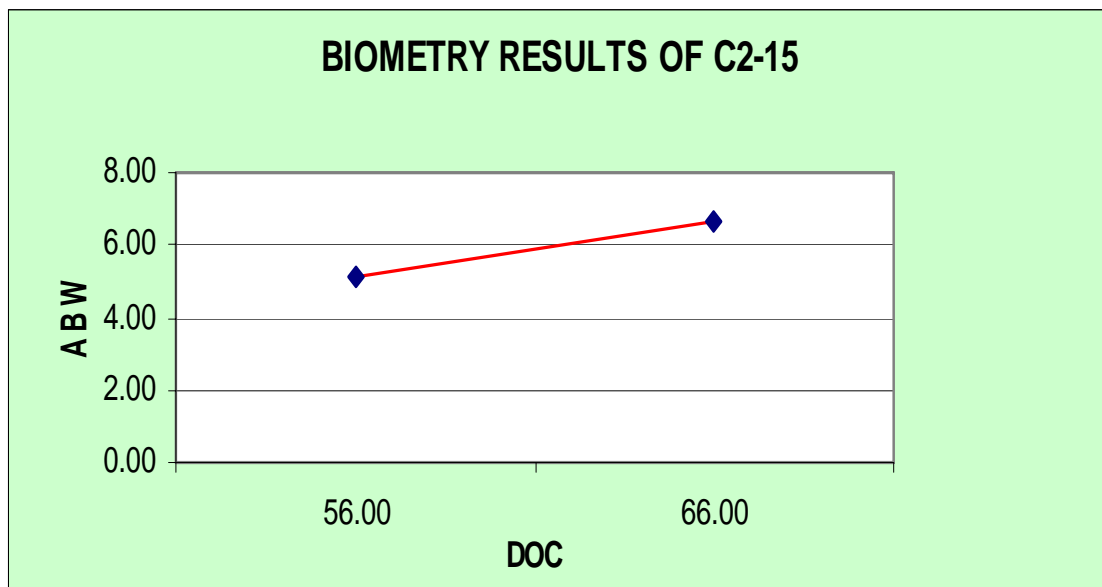
FARM PERFORMANCE IN C2-12					
POND NO.	DOC	ABW	SURVIVAL %	BIOMASS (KG)	FCR
1	65	6.4	81.4	1250	1.12
2	65	7.0	78.3	1316	1.07
3	66	6.8	60.5	987	1.28
4	66	7.9	60.3	1143	1.22
5	70	7.7	74.2	1371	1.17
6	70	7.0	56.4	947	1.18
7	70	7.1	78.0	1329	1.22
8	71	7.3	77.9	1365	1.18
9	73	7.1	80.3	1368	1.28
10	73	7.0	81.5	1368	1.28
11	74	6.9	82.6	1368	1.29
12	74	6.9	82.6	1368	1.29
13	75	7.0	81.5	1368	1.31
14	75	6.9	82.6	1368	1.22
TOTAL & AVERAGE	70	7.0	76	17919	1.23

GROWTH CURVE OF C2-12



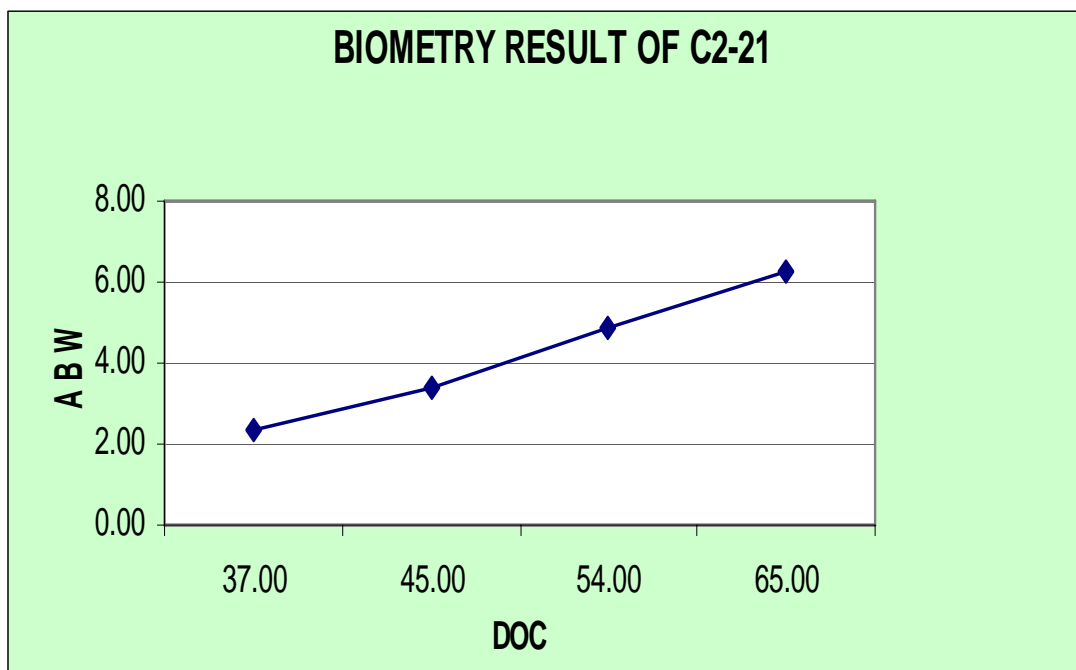
FARM PERFORMANCE IN C2-15					
POND NO.	DOC	ABW (GM)	SURVIVAL %	BIOMASS (KG)	FCR
1	62	5.5	82.4	1095	1.21
2	62	6.0	74.5	1073	1.27
3	64	6.5	76.0	1180	1.20
4	64	7.0	72.1	1211	1.10
5	65	6.2	73.9	1100	1.25
6	64	6.3	66.1	1000	1.25
7	67	7.4	77.1	1370	1.21
8	67	6.6	80.2	1260	1.07
9	67	6.3	83.3	1250	1.32
10	67	6.7	79.7	1282	1.26
11	67	6.2	84.0	1250	1.33
12	70	7.3	71.8	1250	1.34
13	70	7.5	75.1	1351	1.29
14	70	7.7	76.7	1408	1.21
TOTAL & AVEARAGE	66	6.6	77	17080	1.24

GROWTH CURVE OF C2-15



FARM PERFORMANCE IN C2-21					
POND NO.	DOC	ABW (GM)	SURVIVAL %	BIOMASS (KG)	FCR
1	70	6.3	79.2	1250	1.22
2	70	6.6	70.3	1154	1.35
3	70	8.1	64.5	1304	1.06
4	70	8.0	64.1	1286	1.15
5	69	6.7	68.9	1154	1.22
6	69	6.9	68.9	1184	1.17
7	65	6.1	85.9	1100	1.24
8	65	7.3	66.8	1205	1.17
9	64	5.3	82.9	1011	1.34
10	65	5.9	90.9	1122	1.25
11	61	4.9	85.2	967	1.27
12	64	4.4	99.0	958	1.56
13	56	5.4	89.8	1035	1.09
14	56	6.0	84.4	1073	1.05
TOTAL & AVERAGE	65	6.3	79	15805	1.22

GROWTH CURVE OF C2-12



Growth performance of all project farms was studied taking the last biometric results into consideration. The calculations are done based on the maximum daily feed ration given to each pond. The farms coming under PROJECT 1 are found with survival percentage crossing 80.00 except two farms C2-31/32 and C2-25 with 69 and 75 percent respectively. The main reason for the above survival percentage can be correlated with mortality of post larvae due to very poor pond management during 1st month of culture in C2-31/32 and the survival found within that limit starting from the beginning in C3-25. Improper acclimatization and stocking, poor pond condition (lab lab, black soil, unstable bloom) can be taken in to account for less survival in C3-25. The average survival is found within 82 percent at average DOC of 74.

The farms coming under PROJECT 2 are found with survival percentage within 75-80. The farms feeding Le Gouessant Feed brand (C2-12/15) are found with less survival compared to C2-21 using Chineh Feed. The growth is degrading as seen in the graph for C2-21 due to poor management and less feeding than required due to poor pump efficiency of only one pump in use while lime and molasses not applied till date (unavailability in the farm). The average survival is found as 78 percent at average DOC of 67.

The average ABW of each farm of PROJECT 1 is found within normal range of 7.0-9.3 gm at DOC 67-78 except C2-31/32 found with 6.8 gm in 67 DOC. The average ABW is 7.8 gm at average DOC of 74.

The average ABW of the each individual farm of PROJECT 2 is found within normal range of 6.3-7.1 gm at DOC 65-71. These figures are coming under normal range considering to their high initial stocking.

The average FCR of each farm of PROJECT 1 is found below 1.2 except C2-05 whose average FCR is 1.24 which can be correlated with the survival percentage that may be higher than estimated.

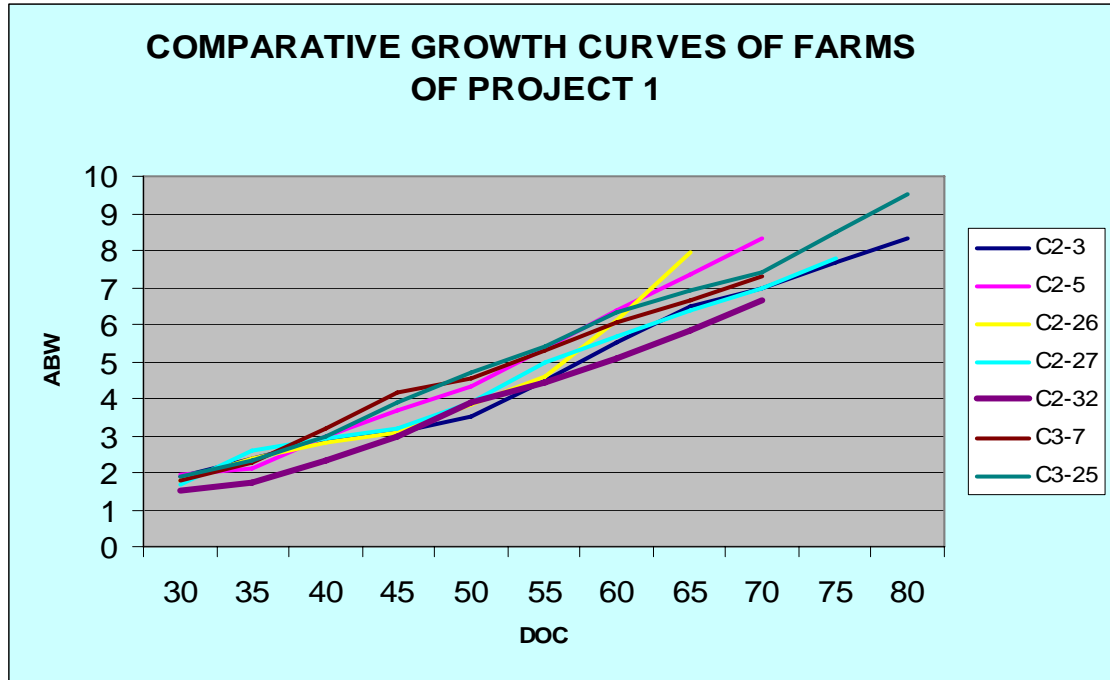
The average FCR of all the farms is 1.14 at average DOC of 74.

The average FCR of farms of PROJECT 2 is found in between 1.20-1.25 with survival below 80 percent. This can be correlated with poor feed consumption of Starters of Le Gouessant brand in the two farms i.e. C2-12/15 in the initial period, high stocking and some ponds with less ABW than required. The average FCR of all the farms is 1.23 at average DOC of 67.

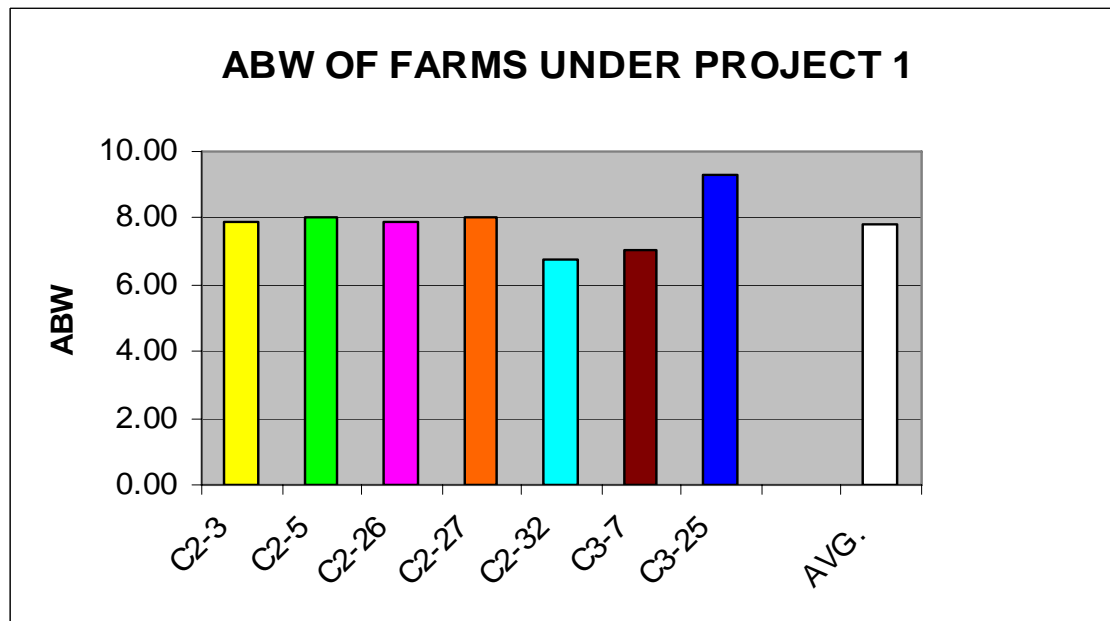
COMPARATIVE FIGURE OF FARMS OF PROJECT 1

FARM NO.	DOC	SURVIVAL %	ABW	FCR
C2-03	76	90	7.9	1.13
C2-05	73	80	8.0	1.24
C2-26	75	88	7.9	1.17
C2-27	77	82	8.0	1.16
C2-31/32	71	69	6.8	1.00
C3-07	67	87	7.0	1.16
C3-25	78	75	9.3	1.13
AVERAGE	74	82	7.8	1.14

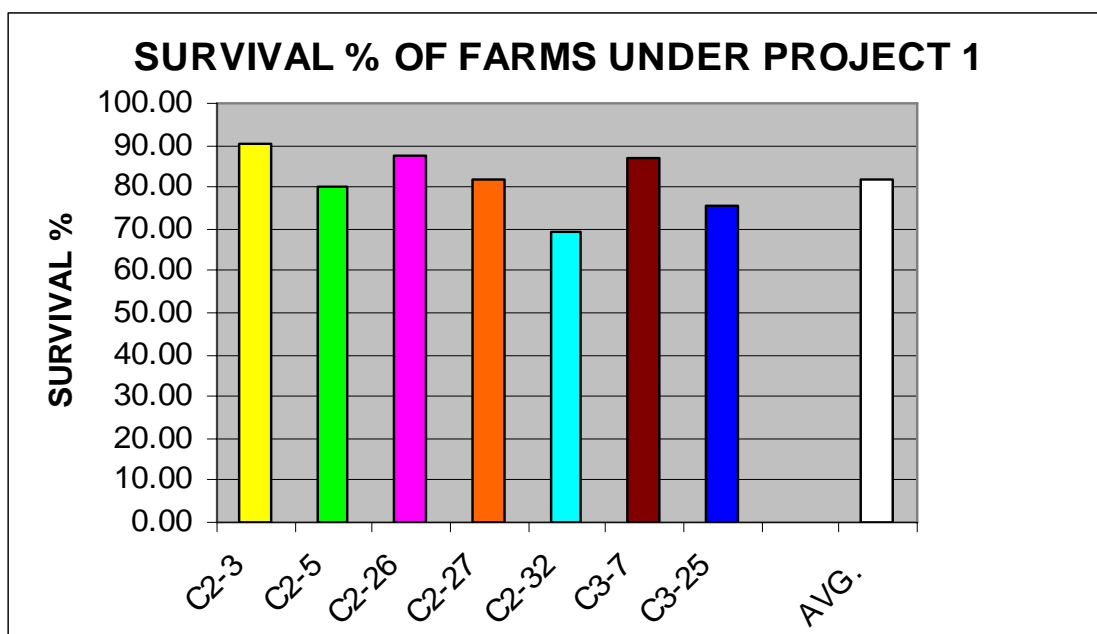
COMPARATIVE GROWTH CURVES OF PROJECT 1 FARMS



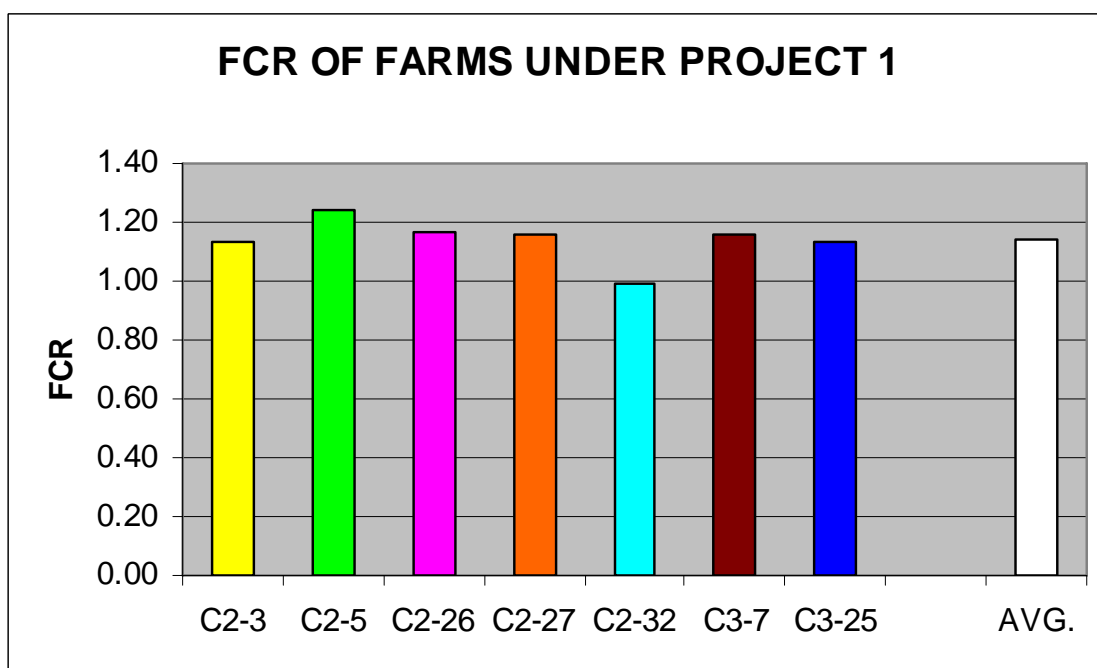
AVERAGE BODY WEIGHT OF FARMS OF PROJECT 1



SURVIVAL PERCENTAGE OF FARMS OF PROJECT 1



FEEED CONVERSION RATIO OF FARMS OF PROJECT 1



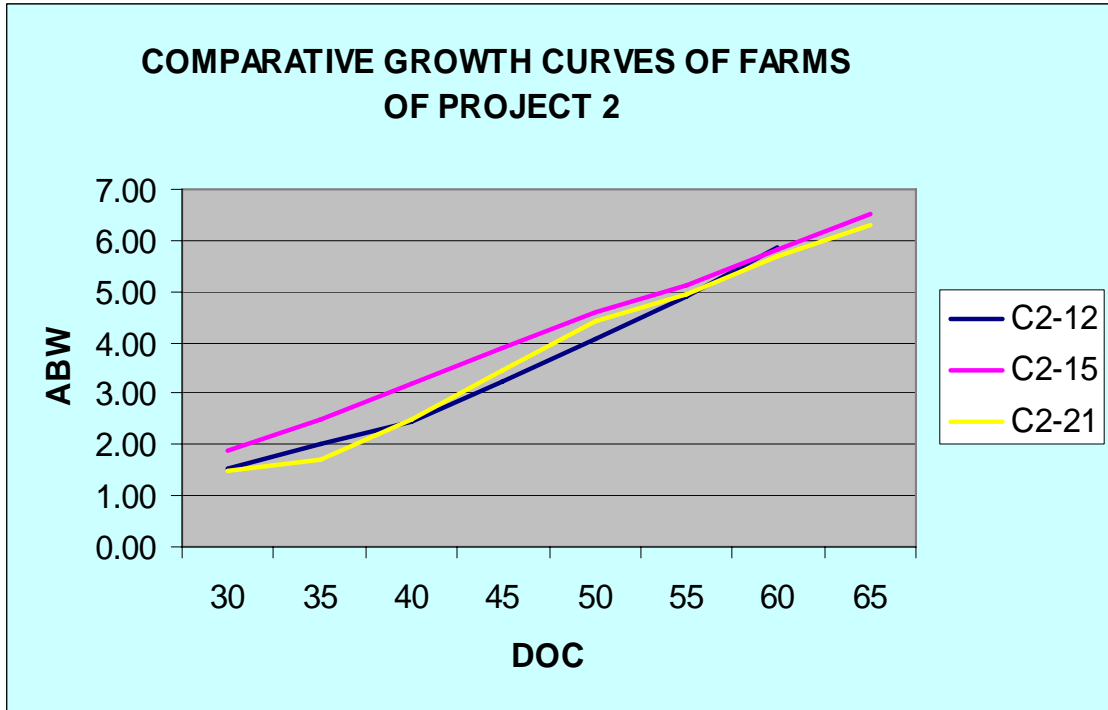
Note: There are differences observed in ABW for different farms due to different average DOC's. Still then, the growth curve shows C2-26 had good growth with survivability at 88 percent on DOC while C2-32's growth is lower than others w.r.t. growth and survival percentage but FCR is at 1.00, much better compared to others. C3-07 shows a gradual decrease in growth during the last biometry due to poor management related to water exchanges. A steady increase in growth is observed in C3-25, but with survival lesser than 80 percent.

COMPARATIVE FIGURE OF FARMS OF PROJECT 1

FARM NO.	DOC	SURVIVAL %	ABW	FCR
----------	-----	------------	-----	-----

C2-12	71	76	7.1	1.23
C2-15	66	77	6.6	1.24
C2-21	65	79	6.3	1.22
AVERAGE	67	78	6.7	1.23

FIGURE NO.21: COMPARATIVE GROWTH CURVES OF PROJECT 2 FARMS



AVERAGE BODY WEIGHT OF FARMS OF PROJECT 2

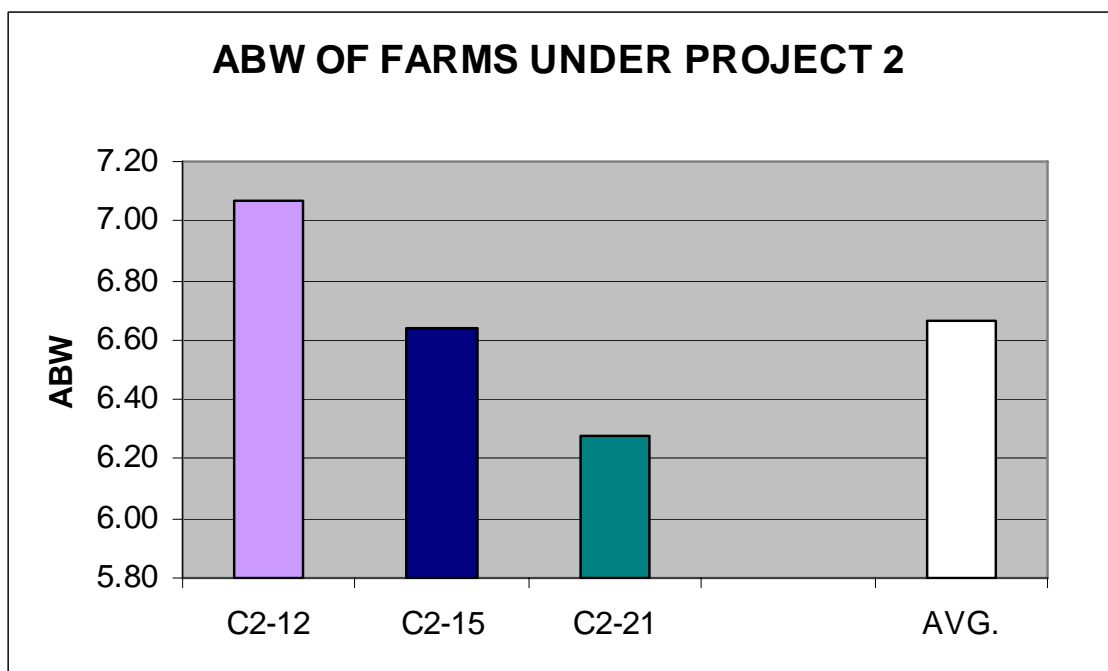
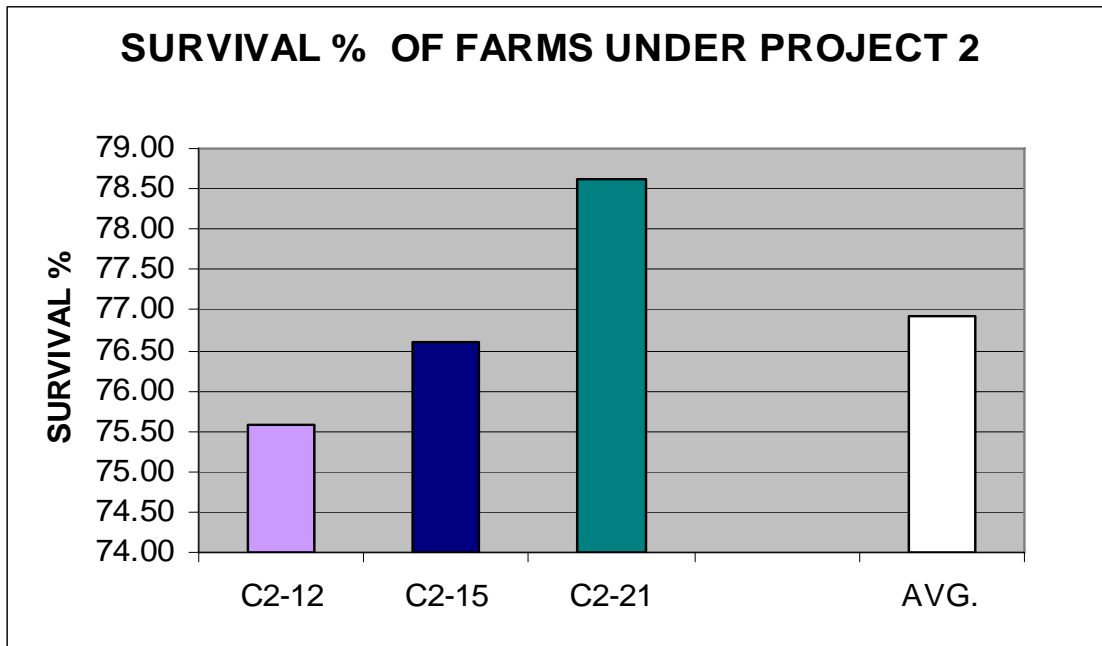
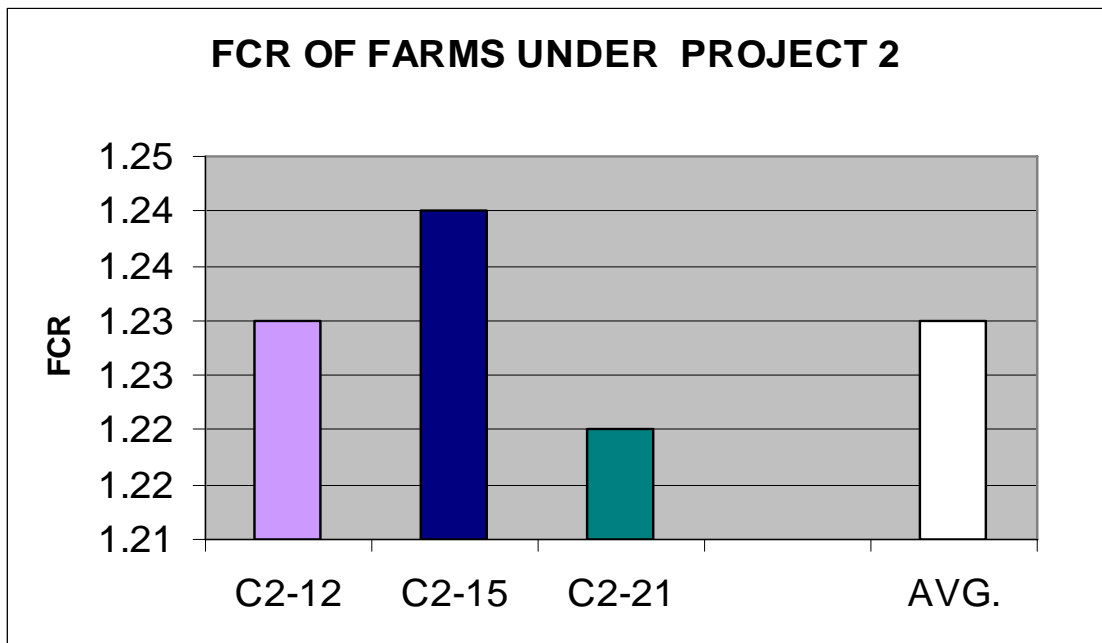


FIGURE NO. 23: SURVIVAL PERCENTAGE OF FARMS OF PROJECT 2



FEEED CONVERSION RATIO OF FARMS OF PROJECT 2



Note: The figures showed that there is a gradual decrease in growth with increase in survival percentage and all farms with FCR within 1.22-1.24 and DOC within 65-71. C2-21 showed better survival and growth in DOC lesser than others using Chinch Feed while the other two farms (C2-12/15) using Le Gouessant Brand.

Shrimp rearing preliminary recommendations (Task 2)

R. Ugolini, M. Esmaeili, D.K. Murty, U.S. Sethi, D. Patnaik

CIRSPE/AFTM Staff
Chabahr/ Project Task 2

The following preliminary recommendations are made for Better Management Practices (BMP) in all the project farms in Gowater Shrimp Culture complex which will help other farmers to follow these guidelines in future crops.

Ideal shrimp health condition can be maintained if all the important parameters i.e. pond preparation, water quality management, feed management, etc. are followed efficiently.

Nevertheless, the quality of the post larvae stocked from the hatchery is considered very important in assessing the overall shrimp health.

It is also important to remark that in case of two rearing cycles, the nursery units have to be taken same care as that of grow-out ponds, but due to high stocking densities per square meter, ideal water quality and feeding management parameters need to be maintained throughout the culture period.

POND PREPARATION

Since the farms are doing cultures for more than 5 to 6 years, the pond bottom nutritive value has come down; there are every chances of the presence of bacterial spores and organic load. Due to improper sterilization processes (only use of Calcium Oxide that to not at right doses) followed along with ploughing, there is revival of bacterial infections in the same pond earlier affected with vibrio spp. After the harvesting of a single pond, it is left vacant untouched up to the starting of the next crop season. The high organic load at the pond bottom along with black soil and bacterial population remained in the same pond. The presence of toxic gases i.e. ammonia and black soil during early DOC's in the feeding zone is mainly due to poor pond preparation. Ineffective or no water cultures (bloom development) before stocking of seeds leads to development of lablab, filamentous algae, black soil and other fluctuation in water quality parameters which ultimately affect the shrimp health.

Recommendations:

- Scrapping of the pond bottom soil to minimum 4 inches at least once in every 3 years. But proper slope elevation has to be maintained for easy draining during harvest.
- Leveling of the feeding zone.
- Proper slope maintenance of the dykes to avoid direct sunlight penetration.
- Immediate flushing of the pond bottom after harvest.
- Application of sterilizers at right doses for reducing the bacterial load in soil and water; elimination of competitors, predators and WSSV carriers.
- Water culture at least one week before stocking to stabilize the parameters and the pond bloom.
- The quality of the lime materials to be used is to be assessed before application at pond bottom for disinfection and maintaining standard soil pH.

WATER INTAKE AND FILTRATION

Water filling and exchanges is an integral part of shrimp culture in Iran mainly to maintain high salinity and temperature. Good water is found best among all culture sites related to these water quality parameters. Water exchange is considered as the universal medicine for majority of the problems faced during culture till now. It is not at all to be neglected which can affect the total farm management process and ultimately leads to crop failure. Unwanted species are seen in many ponds in spite of filtration unit present in each farm. Special care has to be taken to prevent WSSV carriers and competitors.

Recommendations:

- Stand by pumping unit is utmost necessary to control 14 no. of ponds in one farm. Proper water pumping efficiency to be maintained for each pump for quick water filling into ponds.
- Presence of a full time skilled mechanic in the farm is very much needed to handle casualties/emergencies. Spare parts are needed to be available at farm site.
- Bag net (60 mesh) to be used up to end of crop. Double layered net with bottom end opening and tied to a rope is good to prevent entry of very minute organisms, eggs, larvae, other species, etc. Regular cleaning is necessary.
- Use of even 80 meshes net if possible at the inlet for maximum filtration.
- Regular cleaning and disinfecting the nets with lime/bleaching powder/ KMnO_4 solution.
- Regular cleaning of feeder channel to eliminate sediments, algal growths, etc.

STOCKING.

Regarding stocking, differential sizes are seen in cultured ponds either due to different post larval sizes mixed from different tanks in the hatcheries, or incorrect blind feeding followed from the beginning. Survival percentage is calculated here based on the daily demand feeding ration. An error of maximum 3-5% is observed most of the times. Since, *Fenneropenaeus indicus* is not always evenly distributed in the pond bottom (sometimes found in shoals), feeding based on check tray observations and the survival percentage calculated every time has an increasing tendency. Still then, decrease in survival percentage can be correlated with several parameters i.e. mortality during transportation, error in site counting, improper acclimatization w.r.t pH, temperature and salinity, feed shortages, hapa survivability, poor pond management during first month, etc. It is strictly recommended to go for PCR testing of post larvae at the hatchery level before stocking since they are considered as the vertical carrier of white spot virus.

Recommendations:

- Control on the hatchery post larval size before packing to avoid size variation.
- Check for PCR negative seeds (free from WSSV) and stress tests.
- Proper acclimatization before release PL into ponds.
- Check hapa survival in culture ponds.
- Feeding to start from day 1, based on blind feeding programme up to 20-25 DOC.
- Survival percentage calculated based on maximum daily feed is to be cross checked with cast net survival percentage estimated at the time of Biometry.

WATER QUALITY MANAGEMENT.

Stable bloom maintenance before and after stocking can solve majority of the water quality problems during early DOC's. Due to the non-availability of readymade formulated probiotics, use of domesticated prebiotic (molasses) mixtures with rice bran and baker's yeast is considered very important for regular use in shrimp culture as:

- It acts as food for helpful Gm +Ve natural bacteria fauna (endemic probiotic) due to its carbohydrate content.
- It also acts as manure (rice bran) which helps to improve the water quality with stable healthy bloom (diatoms).
- It reduces harmful Gm -Ve bacteria from water as well as soil.
- Most importantly, it is very cheap to use regularly through out the culture period.

The dial fluctuation in pH and DO was experienced in wide ranges is mainly due to unstable phytoplankton bloom and poor pond bottom condition (uneaten feed, faecal matter, toxic gases, etc.).The lime materials used, particularly Calcium Oxide (CaO) in most of the farms are not found with good results may be due to improper storage or due to supply of poor quality.

Recommendations:

- Proper pond preparation and stable bloom development to be carried out before stocking. Sterilization chemicals can be used if required.
- Use of smaller doses of inorganic fertilizers based on the transparency (35-55 cm) during the first month of culture. Regular recording transparency readings.
- Regular application of fermented molasses at fixed intervals (every 7 days) during the first month of culture.
- Lime (CaCO₃ and Dolomite) applications at regular intervals and CaO and Ca(OH)₂ to be used whenever required.
- Proper storage facilities for lime material (away from moisture and temperature) and other aqua supplements in well ventilated store rooms to be done.
- Water exchange schedules to be maintained according to DOC.
- Maintaining maximum water depth (120-130 cm) up to the end of crop.
- Use of sanitizers if necessary without delay to control infections.
- Recording of water quality parameters pond wise to be practiced as a daily habit for efficient farm management.

FEED MANAGEMENT

A well qualified experienced farm technician has to follow effective feed management processes so as to maintain survival percentage at the maximum level and FCR at the minimum level at the end of the crop to obtain higher profits. Feed quality plays a major role in deciding the FCR and biomass. Problems related to feed are needed to be openly discussed for improvement in quality. The price of feed has also to be taken in to consideration.

Recommendations:

- Correct feed projections and stock keeping for minimum 10 days in advance.
- The number of feed boys to be increased i.e. 1 feed boy for max. 2 ponds for better management of ponds.
- The regular changing of feed brands (including feed codes) in culture ponds to be avoided. It affects the growth directly as they take some times 1-2 days time to adjust to the new feed for better consumption.
- Thorough knowledge on Check tray management required to estimate correct daily feed. The cost of production particularly depends on FCR values.
- Catwalks are needed to be installed in the ponds having lift nets, in the second crop for effective check tray observations.
- Boat feeding to introduce along with dyke feeding after 30 DOC so as to evenly distribute feed along the feeding zone for maximum utilization of feed and to avoid size variations in shrimps.
- Split feeding for differential sizes is to be adopted so that bigger shrimps will consume the feed first and go inside while the 2nd time feeding will be always available for the smaller sized shrimps. Mixed code feeding also gives the same results if the size differences are minimal.
- Regular assessing the feed quality (water stability and biometry) and giving feedback to the factory for any modifications if required.
- Six times feeding frequency needed in the last month of culture to maintain FCR.
- Proper stacking of feed bags in rakes away from moisture/humidity and chemicals. Sufficient ventilation to be provided.

List of participants

SHILAT/IFO

Sohrab Rezvani Gilkolaei
Deputy for aquaculture
Iranian Fisheries Organisation/SHILAT
Add. N.250 Dr. Fatemi Ave, Tehran.
Tel.0098.21.66941671
E-mail rezvani@ifro.ir; rezvani@iranfisheries.net

Mohebali SISTANI
Aquaculture Deputy
Iranian Fisheries Organisation SHILAT Chabahar
Tel. 0098.9153416058
E-mail mohebali971@yahoo.com

Medhi SHAKURI
Director Manager Shrimp division
Iranian Fisheries Organisation/SHILAT
Add. N.250 Dr. Fatemi Ave, Tehran.
Tel. 0098.9121084176
E-mail mehdishakori@yahoo.com

Behrouz HOSSEINKHANI
Shrimp expert private sector Chabahar
Tel. 0098.9123968585
E-mail bhosseinkhani@yahoo.com

Ghasem ZOLGHADR
Iranian Fisheries Organisation SHILAT Chabahar
Training section
Tel. 0098.5452221951
E-mail ghasem_zollghadr@yahoo.com

Vahid TOBIGHI
Iranian Fisheries Organisation SHILAT Chabahar

Behraz TAYEBI
Iranian Fisheries Organisation SHILAT Chabahar

Rahaman PARSA
Iranian Fisheries Organisation SHILAT Chabahar

Ali HASHEMI
Iranian Fisheries Organisation SHILAT Chabahar

Ghasem ZDGHADI
Iranian Fisheries Organisation SHILAT Chabahar

Udaya Sankar SETHI
AFTM Consultant Chabahar
Asian Fisheries Technology & Management Co (Ltd)
n.23 St Alvand St Arjantin Sq. Teheran
Tel. 0098.21.88792192
Fax. 0098.21.88784837
E-mail meesameili@yahoo.com

Ahamad RAHIMI
CIRSPE/AFTM
AFTM Chabahar
Asian Fisheries Technology & Management Co (Ltd)
n.23 St Alvand St Arjantin Sq. Teheran
Tel. 0098.21.88792192
Fax. 0098.21.88784837
E-mail meesameili@yahoo.com

M.E. ESMAEILI
CIRSPE/AFTM
Asian Fisheries Technology & Management Co (Ltd)
n.23 St Alvand St Arjantin Sq. Teheran
Tel. 0098.21.88792192
Fax. 0098.21.88784837
E-mail meesameili@yahoo.com

Krishna MURTY
CIRSPE/AFTM
AFTM Chabahar
Asian Fisheries Technology & Management Co (Ltd)
n.23 St Alvand St Arjantin Sq. Teheran
Tel. 0098.21.88792192
Fax. 0098.21.88784837
E-mail meesameili@yahoo.com

Deepak PATNAIK
CIRSPE/AFTM
AFTM Chabahar
Asian Fisheries Technology & Management Co (Ltd)
n.23 St Alvand St Arjantin Sq. Teheran
Tel. 0098.21.88792192
Fax. 0098.21.88784837
E-mail meesameili@yahoo.com

Arya VAZURZADER
CIRSPE/AFTM
AFTM Chabahar
Asian Fisheries Technology & Management Co (Ltd)
n.23 St Alvand St Arjantin Sq. Teheran

Tel. 0098.21.88792192
Fax. 0098.21.88784837
E-mail meesameili@yahoo.com

PRIVATE SECTOR

Vahid SAYEDJAVADI
Farmer Chabahar
Tel. 0098.9111180490

Saeed OMIDVAR
Private farmer Chabahar
Tel. 0098.9121875986

CIRSPE
Massimo GUERRIERI
CIRSPE
Via De' Gigli d'Oro 21, 00186 Roma
Tel.0039.06.6869400
Fax 0039.06.6875184
E-mail guerrierimax@tiscali.it

Roberto UGOLINI
CIRSPE
Via De' Gigli d'Oro 21, 00186 Roma
Tel.0039.06.6869400
Fax 0039.06.6875184
Email rugini@cirspe.it

Ali SABA
CIRSPE Teheran office
Addn.4 Alvand Alley, Ghaem Magham Farahani DSt., Teheran
Tel.0098.21.88841202
Fax 0098.21.88304965

REFERENCES

Cataudella, S.; Massa, F.; Crosetti, D.; (eds) “Interactions between aquaculture and capture fisheries: a methodological perspectives”.

Studies and Reviews. General Fisheries Commission for the Mediterranean No.78. Rome, FAO.2005.229p.

European Commission. “Project cycle management”.

Aid delivery methods, European Commission, Bruxelles.2004.158p.

NACA Network of aquaculture centres in Asia-Pacific “Emergency technical assistance to limit the impact of white spot disease in Busher Province, IR Iran.