SHILAT

AQUACULTURE DEVELOPMENT IN SISTAN-BALUCHESTAN 2005 - 2008

Project financed by Italian Cooperation
Italian Ministry of Foreign Affairs

SHRIMP REARING STAKEHOLDER CONSULTATION

GOWATER, 13 SEPTEMBER 2006

EXECUTED BY CIRSPE, ITALY

ROME, OCTOBER 2006

AQUACULTURE DEVELOPMENT IN SISTAN-BALUCHESTAN 2005-2008

PROJECT FINANCED BY

ITALIAN MINISTRY OF FOREIGN AFFAIRS

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UNDP
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SHILAT
IRANIAN FISHERIES ORGANISATION

CIRSPE
ITALIAN RESEARCH AND STUDY CENTRE FOR THE FISHERY

SHRIMP REARING STAKEHOLDER CONSULTATION

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FOREWORD

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

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 of 3.034.000 Euro in the beneficiary Country.

The Italian Government/Ministry of Foreign Affairs signed the contract agreement with the United Nations Development Programme ("UNDP") on 25th of February 2004.
The project begun on May 2005; after more than one year activities UNDP took the decision to have an inspection on Chabahar project site.

This has been one occasion to have meetings in Chabahar and Gowater project site and to organise a technical survey in the shrimp farming complex.

This last meeting have had the characteristic of Stakeholder consultation for checking and monitoring project activities.

From this point of view it is shared opinion that consultations between all stakeholders of the project are very important and useful, considering that the overall level of the shrimp sector (hatcheries, ponds rearing, feeding plants, processing plants) are strictly connected. The whole actors concerning the sector can benefit from an appropriate development strategy 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.

Rome, 30 October 2006

Roberto Ugolini
Project Manager

ACKNOWLEDGEMENTS

Special thanks are due to Mr. Mohebali SISTANI , Medhi SHAKURI and Ali TABATABAI
(Iranian Fisheries Organisation SHILAT Teheran/Chabahar) for the organisation of the consultation.

ABSTRACT

The Stakeholder Consultation on Shrimp rearing was held in Gowater on September 13 2006, hosted by SHILAT Iranian Fisheries Organisation of Jihad Ministry of Agriculture.

The Italian cooperation project goes back to the 2000, connected to the effort of the Italian Government in order to reinforce political and economic relations with the Islamic Republic of Iran, crucial regional Country in the context of Middle East. The Italian Government has planned projects and initiatives in order to develop the peace process in the Middle East area and, for this reason, it is promoting development projects, investing in local human resources, supporting the civil society and economic productive processes.

The Iranian central system took the decision to develop shrimp rearing since 1992 in the Country and since 1999 in Gowater site. Production in Iran reached 8.930 tons in 2004 and in Gowater 2.114 tons for about 1000 ha of water on 2003.

Presently, Gowater shrimp project complex has 1.920 ha of total water area but the interest of investors in shrimp business is reducing due to poor profitability caused by the increasing of the cost of production and decreasing of market prices. Apart from that, limitations in terms of technology, service and marketing are evident; anyway Iranian Institution are continuing to invest on structures and equipment trying to solve problems of growth and consolidation connected to the marketing dynamic evolution.

The Italian Cooperation project aims at expanding and reinforcing aquaculture activities in terms of both production/technology and economic results, to raise the socio-economic level of the groups and populations involved, considering properly the increasing of the cost of production and technical management aspects (diseases, stocking density, feeding, technology).

The project initial phases have been dedicated to context analysis to up to date the project activities according to SHILAT new exigency and needs. From march 2006, three productive pilot experiences have been carried out in Gowater complex. The results 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 main objectives of this Stakeholder Consultation (the second for the project) have been to make deeper analysis of the shrimp rearing basing it, above all, on practical productive experiences carried out by the Italian project directly in the farms in Gowater site.

UNDP experts participated to this consultation which also included technical surveys on ponds to show some of the practical activities planned within the context of the Italian project.

The experts agreed to complete the project approach considering not only the technical solutions (two crops/year, technical management; aerators) but also the need to plan economic and marketing analysis.

The experts also remarked the need to organise other consultations among all the stakeholders of the project, involving the hatcheries, the processing plants, the feeding plants and the bank system. It is evident that these actors have different capacities and interests; it is crucial to consider their participation in the decision making process, for strategy identification and selection. This approach aims at maximizing the social and project benefits, minimizing the negative impact, avoiding/reducing risks and conflicts.

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1. OPENING OF THE MEETING

The Stakeholder Consultation on shrimp rearing activities was held in Gowater (Chabahar) on 13 September 2006 and was hosted by the SHILAT Iranian Fisheries Organisation of Jihad Ministry of Agriculture in the SHILAT office/guest house of Gowater complex.

The consultation was attended by the SHILAT staff/expert involved in the Project, by UNDP experts, by technicians and farmers of the private sector of Gowater site and by CIRSPE/AFTM experts and staff.

Mr. SISTANI Aquaculture Deputy Iranian Fisheries Organisation SHILAT Chabahar, welcomed the participants and underlined the importance of the Italian project in the site.

Mr. OSTBY, UNDP Iran Representatives, expressed his regards to the all project staff involved in the UNDP/Italian project, remarking that the project must give importance to the natural resources characteristics.

Mr. FARZIN, UNDP Project Officer, underlined the exigency to identify the best development strategy for the shrimp sector taking into account the all constrains from technical, economic and market aspects.

The participants agreed to organise the meeting presenting preliminary results to UNDP delegation, according to the main objectives of the Consultation:

a) Presentation of the Italian project main aspect and technical approach;
b) Presentation of the pilot productive experiences carried out in Gowater.
c) Analysis of the activities done in Gowater.

CIRSPE staff prepared power point presentations illustrating the Gowater field activities, also giving the written contributions presented in this document.

The first presentation, by Mr. Roberto Ugolini gave a picture of the project background, remarking some aspects of the technical approach.

The second presentation by Mr. U.S. Sethi gave a picture concerning the aquaculture in Iran and the shrimp rearing sector, remarking the main characteristics of Gowater complex.

The third presentation by Deepak Patnaik concerned the 3 Italian productive experiences on site, from management and technical point of views.

The fourth presentation was by Mr. D. K. Murty remarked 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.

2. PROJECT BACKGROUND

The first presentation, by Mr. Roberto Ugolini gave a picture of the project background and approach.

The project is strictly connected to the effort of the Italian Government for reinforcing political and economic relations with the Islamic Republic of Iran, considering both the commercial relationships (exploitation of Iran's raw materials and export of Italian technology, industrial products and consumer goods) and the intention to develop the peace process in the Middle East area. It is evident that this scope can be reached only promoting development projects and investing in local human resources in the area, supporting the civil society and economic productive processes.

In June 2000 the Italian and the Iranian Ministries of Foreign Affairs signed a "Meeting Memorandum" expressing the intention to finance cooperation activities in the Province of Sistan Baluchestan, that is the poorest in the Republic of Iran. The Province borders with Afghanistan and with Pakistan, having a strategic role for the central Government.

Italian technical mission deeply studied the topics relevant to the cooperation program and 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 shrimps, where a large facility (about 1.200 hectares) has been built near the location of Gowater, roughly 110 km to the east of the city.

UNDP has the duty to manage directly the budget related to the equipment that will be purchased on the base of identification by SHILAT.
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 basis of an agreement with SHILAT on February 2004.

In the shrimp sector, limitations in terms of technology, service and marketing are evident. Unmistakable problems of growth and consolidation are strictly connected to the marketing dynamic evolution, for the increasing of the cost of production and for technical management aspects that, at this stage, must be properly considered (diseases, stocking density, feeding, technology).

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

The project consists of

a) production initiatives with the results to be transferred to the private beneficiaries;
b) supply of technology with the purpose to demonstrate the worth of new production strategies;
c) testing and proposing technical packages innovative but, at the same time, appropriate to the context.
d) trainings reserved for the technicians of the SHILAT/the Ministry of Agriculture, with forecasted fall-out on the private operations, given that the individuals trained will be employed in the extension service.

Considering both the objective and the expected results, production strategies must be correlated to the market (species, sizes, period of sale, markets).

3. SHRIMP SECTOR IN IRAN

The second presentation by Mr. U.S. Sethi gave a picture concerning the aquaculture in Iran and the shrimp rearing sector, remarking the main characteristics of Gowater complex.

Shrimp farming in the 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. Presently more than 11.000 hectares were identified as suitable for coastal shrimp culture.

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

Iranian farm- raised shrimp production is export oriented. Shrimp farming, particularly *Fenerropenaeus 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 the cost of production.
- Less know-how of scientific culture.
- Only one major crop per 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 from October to April.

However, two crops per year can be achieved in Balochestan, where shrimp farming conditions are better in terms of pond water salinity and temperature most of the year except during the period from December/January to February/March.

Big efforts were taken every year to develop the culture and the production increased from few MT to near 2000 MT during 1995 to 2003.

Indian White Shrimp (*Penaeus indicus*) is cultured on a commercial scale by private entrepreneurs in Gowater shrimp farming complex over the past 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 1.920 ha of total water area.
General period of shrimp culture for only one crop a year starts from beginning of June to end of October. The climatic conditions in this farming complex are more suitable compared to all other shrimp farming complexes till developed in Iran, with good water quality and high natural

productivity of soil. This complex possesses ideal climatic condition to carry out two crops annually (till date not tried/practiced and proposed by the Italian project).

Farm operation and pond preparations starts one month before stocking of seeds.

Due to "White Spot" disease outbreaks in other provinces in previous years, recent/new scientific methods and Better Management Practices (BMP) are needed to be followed accurately to prevent this killer disease from entering this Farming Complex.

4. FIELD ACTIVITIES

The third presentation by Deepak Patnaik remarked some of the Italian project activities on site.

SHILAT and CIRSPE took the decision to start the field activities with the 2006 productive season, with the aim to make this aquaculture system sustainable and economically viable.

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 productive pilot activities in Gowater (Chabahar) are testing different strategies based on the stocking density, feeding and fertilisation, nursery sector (two rearing cycle/year by pre-fattening) etc., with the aim to compare the different results both from productive and economical point of view.

Attention is paid 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.

Innovative technological packages shall be prepared for the shrimp rearing, for instance aerator system and 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. 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 target to disseminate the technologies prepared during the project activities.

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 n.1 pilot productive activity is for two rearing cycles implementation. It deals with the collaboration of four private farms (80 ha approx for 61,6 water/ha). Each farm has 14 ponds (15.4 water/ha) each of 1.10 ha area available for culture. All farms have an initial stocking of 180.000 seeds per pond (16.36 post larvae/sq.m) and using local made feed brand "Chineh".
The planned rearing cycles are from May to September and from July to November (nursery rearing sector/approach).

The n.2 pilot productive activity is designed 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 area of 46.2 ha. The stocking density is 240.000 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 n.3 Pilot productive activity deals with the collaboration of three private farms (60 ha approx for 46,2 water/ha). Each farm has 14 ponds (15.4 water/ha) each of 1.10 ha area available for culture. All farms have an initial stocking of 180.000 seeds per pond (16.36 post larvae/sq.m) and using local made feed brand "Chineh". The planned rearing cycles are from May to September and this experience will be used such as "control" for the experiences n.1 and for evaluating the profitability limits of one rearing cycle.

5. NURSERY MANAGEMENT

The fourth presentation was by Mr. D. K. Murty and concerned the n.1 pilot productive activity dealing with the use of nursery system, to have a successful second crop before the onset of unfavourable climatic conditions.
The farmers that are participating to this experiences are utilising two ponds in the farm middle (P-7/8) for nurseries stage and pre-fattening of PL of the second cycle.
In these pond, PL have been stocked at high density (just for a pre-fattening stage till the weigh of 2-3 gr., from June/July to September; about 127 PL sq m).
It is important to remark that with nursery pond properly constructed (500 sq m) the density for pre-fattening can achieve 250 PL sq m.
During this month of September these "little shrimp" are harvesting to be stocked at density of 12-16 PL sq m in the other farm ponds for fattening stage, (September to November) for the second harvesting.
One technical protocols is helping each individual farmer to carry on either two crops or high stocking with high sizes in a single calendar year.

Successful completion of these projects will give more choices to shrimp culture systems in Gowater and IRI as a whole.

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.

6. TECHNICAL SURVEY

CIRSPE proposed to UNDP and SHILAT to carry out technical survey to the private farms/ponds involved in the project for the demonstration of some activities.

Some ponds were selected to have samples of shrimp reared (pilot experiences n. 1 and n. 3. 180.000 PL/pond). Samples of the animals have been collected and good general conditions have been showed: colour, absence of disease, size.

Concerning experience n.1 for the two rearing cycles, CIRSPE/AFTM staff organised harvesting of juveniles from nursery pond showing the methods for this operation that is very important for the success of the proposed approach, considering the needs to reduce as much as possible stress and mortality.

The second pilot productive activity is to obtain higher size of shrimps at final harvest, with initial stocking density of 240.000 seeds per pond (21.81 post larvae/sq m). These samples also have showed good general condition of the animals.

7. RECOMMENDATIONS

The experts concluded that it is crucial to organise other consultations between the stakeholders of the project. 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 aims at maximizing the social and project benefits and minimizing 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 indications that can be summarized as follows:

- Province PL production of the / hatcheries is not enough for the Gowater demand. This year the stocking target was about 240 million PL, but by virtue of lacking it was of 204 million with 59% supplied from local hatcheries. This constrains can affect the two crops/year approach for which the demand can achieve about 600-700 millions PL.

- Some private farms are not be able to manage high stocking density in terms of water quality, feeding, rearing control. There is the exigency to consolidate the extension service by SHILAT, and also to disseminate technology and technical instruments (ox metres, pH metres, salinometres, aerators, water pumps).

- There is the need to remark the control on diseases by technical protocol written for private sector.

- There is the need to install laboratory with fundamental equipments.

- Electricity for all the farmers can improve production results.

- Quality of the life of the people working there is also important, organising a health/medical centre also to improve working condition for people in Gowater Complex.

- The Italian project must identify a better technical/economic productive approach, to give indications to the private sector in order to increase profitability on shrimp rearing.

- Effort must be done to reduce production cost and also to control PL price and feed price, involving the actors of this sector.

- There is the need to organise the marketing and bank system approach.

Finally, UNDP, SHILAT and CIRSPE considered this second project Stakeholder consultation very useful for the project. At the same time it is evident that the project must extend the invitation for the next meetings to other sector actors (hatcheries, farmers, processing plants, feed plants, banking system) and, finally, to Italian Embassy/Italian Cooperation such as Donor.

ANNEXES

Italian Project Approach

Roberto Ugolini

CIRSPE Project Manager

The origin of project "Aquaculture Development in Sistan Baluchestan" goes back to the 2000. They are connected to the effort of the Italian Government for reinforcing political and economical 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.

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 developed projects and emergency initiatives with the purpose to develop the peace process in the Middle East area and, for this reason, is promoting development programmes, 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" expressing the interest to finance cooperation activities in the Province of Sistan Baluchestan, the poorest in the Republic of Iran. 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.

Finally the Project Proposal has been approved by the Italian Ministry of Foreign Affairs (act n.49; 24/6/2003; N. aid 6945.01.3), proposing to UNDP to participate to the project. The agreement has been signed on 24 February. The Ministry of Jihad Agriculture – SHILAT Iranian Fisheries Organisation has been designated as the implementing agency and CIRSPE (Italian Fisheries Research Centre-Rome) such as the contractor for providing technical assistance and training (total budget of 1.744.000 Euro), on the base of an agreement with SHILAT on February 2004.

UNDP has taken the duty to manage directly the budget related to the equipment, to be purchased on the base of identification by SHILAT.

The project begun on May 2005; the initial phases have been dedicated to context analysis to up to date the project activities according the SHILAT new exigency and needs.

The project's main target is to strengthen and expand aquaculture activities in the two areas in the Sistan Baluchestan Province, in terms of production, technology, economic results, in order to increase the socio-economic level of target groups and the local communities involved. The project is expected to have significant impact on the living standards of target groups, as well as indirect socio-economic benefits for the local communities, and also generate a model for provincial level replication.

This target can be achieved with the identification of valid appropriate production strategies and of technologies for both the different contexts (fresh water and sea water). Operating strategies must be connected to the market (species, sizes, period of sale, markets) in the 2 sectors of shrimp raising and fresh-waster aquaculture (at least 2 strategies per sector shall be drawn up). Technological

packages shall be prepared for fish hatchery activities and shrimp rearing within the two different contexts (Zabol/Zahak and Chabahar/Gowater) (at least 2 packages per sector shall be prepared and tested).

Expansion of the production base and diversification of production will be evaluate and analysed with the aim to reduce the risks of business operations.

Finally, the reinforcement of the extension service must be reached with the undertaking of a clear-cut effort to disseminate the technologies prepared during the project activities, so a professional growth on the part of the Shilat/Fishing Department is also important and crucial for the consolidation of the sector in the Province.

The specific objectives can be remarked as follows.

i) Valid production strategies for aquaculture in Sistan-Baluchestan;
ii) Appropriate technologies for both fresh water and sea water;
iii) Expansion of the base production and the diversification of the product;
iv) SHILAT capacity building and professional growth.

The specific objectives/related activities descriptions are the following.

i) Operating strategies correlated to the market (species, sizes, period of sale, markets) in the 2 sectors of shrimp and fresh-waster aquaculture (at least 2 strategies per sector shall be drawn up).The productive pilot activities in Gowater (Chabahar) will test different strategies based on the stocking density, feeding and fertilisation, comparing the different results both from productive and economical point of view. Attention will be given to diseases that in other region of the world and also in Iran can affect the rearing, reducing the economical sustainability of this sector. In Zabol area the project will evaluate the technical and economical sustainability of different species, such as trout and carps, remarking the importance of the native species *Schizosthorax zarudny* From this point of view, a new component of the project is related to the lake Hamun.

ii) Innovative technological packages
Technological packages shall be prepared for rearing within the two different contexts (Zabol and Chabahar) (at least 2 packages per sector shall be prepared and tested, for instance oxygenation system, stocking density, Schizothorax reproduction, pre-fattening etc.).

iii) Consolidation/diversification of the production
The aim is to reduce the risks of business operations

iv) 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, Consultation) are organised for donor visibility, both international and national, in part to contribute on bringing together supply and demand (technology and production).

- Internet web page: Project history, Technical and Financial documents and information, project news, technical contributions;
- Newsletter: project news, technical contributions;
- Stakeholder consultations; expert consultations for maximising project results and impacts, minimising the contrasts between the project actors/interests.
- Others: cd-rom, poster, fiery/events participations.

The beneficiaries of the project (who benefit in whatever way from the implementation of the project) are the followings:

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, bank system.

Shilat/Fishery Directorate is one of the beneficiaries/stakeholder that, participating directly to project management, can achieve a high level of professionalism. Other private (hatcheries, feeding plants and processing plant), the Ministry of Agriculture and the Agricultural/Commercial Banks are also final beneficiaries of the project, considering the objective to develop and consolidate the private sector in the context of Province: sector development plan, import of technology, international market, and access to bank credit.

The project is set in 36 months and it will end on May 2008 on the basis of 3 technical phases:

I) Planning (May 2005-November 2005)
Technical/logistic organisation; production activities planning; SHILAT/project new needs and exigency; financial plan revision.

II) Field Activities (December 2005-November 2007)
Pilot production experiences; private sector analysis; training; internet and newletters for project visibility; stakeholder consultations; periodic budget control and revision.

III) Sector Strategies (December 2007-May 2008)
Staheholder consultations; productive data analysis; economic data analysis; project impact; budget control.

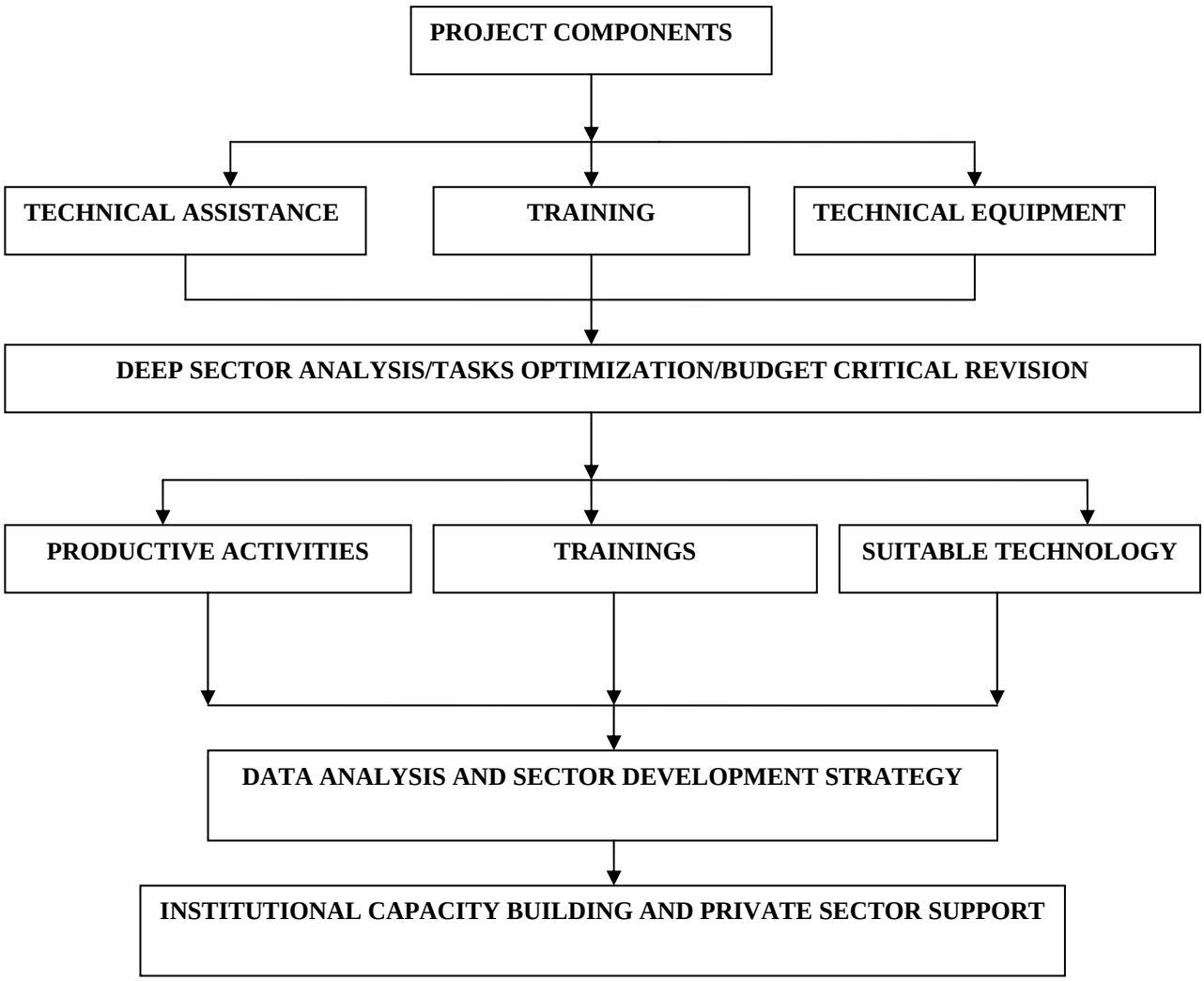
The three technical phases are articulated in n. 6 operative phase, according to a project flexible management to update the project needs, considering the context evolution from technical, socio-economic, ecological and Institutional (SHILAT) point of view.

During the project First Operative Phase (May-November 2005) Italian/CIRSPE experts executed missions to start the technical activities. Many meetings have been done both with SHILAT (Teheran, Chabahar, and Zahedan) and with UNDP/Tehran, always considering the objectives and target of the project financed by the Italian Government.

Technical surveys have been carried out in Gowater area (Chabahar) and Zabol (Zahedan). During September and October SHILAT and CIRSPE have carried out a collection of data using

questionnaires supplied to private farmers in the project sites to up to date their needs. This activity has showed new exigencies of the project, actor and beneficiaries.

CIRSPE TECHNICAL APPROACH AND MANAGEMENT



CIRSPE and SHILAT have identified n.5 tasks, of which n.3 related to technical assistance, n1 for training and n.1 for project management.

- Task 1. Freshwater sector

This task regards the Zahedan/Zabol area and the work is concentrated on Zahak freshwater hatchery. SHILAT has given the indication to concentrate the effort, first of all, on autochthonous/native species of Hamun lake *Schizothorax zarudny.* remarking the importance of methodology approach acquisition that can be very useful for SHILAT technicians. Apart from that on job training for 5 Iranian technicians has been implemented. The project could analyse other suitable species for aquaculture, for instance Indian carp (*Catla catla*) producing both at experimental and a productive level; CIRSPE proposed to carry out a study on the lake Hamun, considering its importance from a socio-economical point of view, related to the water/dam negotiation with Afghanistan. Task 1 is strictly connected with task 4 for the implementation of shrimp training two groups of Iranian technician participated to trainings in India. Stakeholder consultations are very important to maximize the benefits of the project.

- Task 2 – shrimp sector

The rearing activities have been planned for shrimp rearing (*Penaeus indicus*) in gowater/Chabahar.
The target is to give technical assistance to the private sector in Gowater area for shrimp rearing to manage two rearing cycle and testing different stocking density. Shrimp PL have been purchase from 3 private hatcheries for this pilot productive activities and given by grant to some private company in Gowater on the basis of cooperation agreement to have the feedback of data and information. These will be used by CIRSPE to elaborate the proposal for the sector development strategy. Apart from that on job training for Iranian technicians has been implemented Task 2 is strictly connected with task 4 for the implementation of shrimp training (one group of Iranian technician on November 2006 will have training in Thailand).
Stakeholder consultations are very important to maximise the benefits of the project

- Task 3 - study and development strategy

The technical and economic data connected to pilot productive experiences will be analysed for the elaboration of development sector strategies in Sistan Baluchestan Province. Stakeholder consultations are not only very important to maximise the benefits of the project, but also for strategies identification in order to prevent frictions and contrasts between different sector actors.

- Task 4 - training

Institutional support in terms of training for SHILAT technicians both in freshwater (India) and shrimp sector (Thailand). The project approach has identified SHILAT such as beneficiary/target group of the technical activities, and must be directly positively affected by the project at the project purpose level. The SHILAT staff is beneficiating of training, considering the role of the public sector in aquaculture development in the Islamic Republic of Iran: project development, credit and bank system, extension service.
Obviously, Shilat/Fishery Directorate is also one of the project stakeholder that, participating directly to project management, can achieve a high level of professionalism.

- Task 5 - project management

This task includes the project management and other activities such as visibility (internet and newsletter)and administrative/budget planning and control.

For tasks execution CIRSPE is utilising both properly human resources and Iranian subcontractor . This choose is aiming at giving value to the local professional human resources and to maximise the project budget connected to the specific activities.

The following are the contracts already signed:

Task 1

AFTM, Tehran	*Schizothorax zarudny* reproduction in Zahak hatchery, season 2006
IFRO, Teheran	*Schizothorax zarudny* reproduction in Zahak hatchery, season 2007

Task 2

AFTM, Tehran	*Penaeus indicus* shrimp rearing in Chabahar/Gowater, season 2006

Task 4

AFTM, Tehran	Freshwater training in India
NACA, Bangkok	Shrimp rearing training in Thailand

Task 5

PASh, Teheran Internet web page management (www.iranitaly.net)
PASh, Teheran Newsletter management

Considering the tasks and the specific project activities CIRSPE outputs/reports will be the followings

Project Report
- n.6 intermediate technical project report covering a period of 6 months
- n.6 financial project report covering a period of 6 months
- Operative Project Document CIRSPE/SHILAT activities and budget

Technical Assistance Reports (task 1, 2, and 3)
- technical report on schizothorax reproduction (season 2006)
- technical report on schizothorax reproduction (season 2007)
- technical report on shrimp rearing season 2006
- technical report on shrimp rearing season 2007
- technical report on hamun lake
- technical report development strategy

Training Reports (task 4)
- technical report on first india training freshwater sector
- technical report on second india training freshwater sector
- technical report on thailand training shrimp sector

Visibility Reports (task 5)
- technical report on Italian sector
- technical report on Iran-Italy relationships
- technical report on internet management
- technical report on newsletter management

It is important to remark that CIRSPE is preparing an update Operative Project Document that could be examined by the project Steering Committee and signed by SHILAT and CIRSPE both for the previous activities and for the next one.

Shrimp rearing

Udaya Sankar Sethi

AFTM Staff

Iran has three climatic zones: dried/semiarid; Mediterranean zone and humid/semi humid zone. The first zone covers 90% of the country, while the second and the third zone covers 5% each of the total lands of the country.

Out of 17 shrimp farming complexes till developed or under developing, 15 complexes including Gowater are under the category of first zone that follow the desert aquaculture techniques.

Total Iranian fisheries production in Iran during 2005 was 486.700 tons and out of this 351.000 (72%) from capture where as 135.700 tons (28%) from aquaculture. In spite of the fact that the climatic condition pushed the aquaculture industry in two sectors: cold water and warm water.

The share of cold water sector was 24% while the remainder is warm water sector and shrimp shared 5,82% of this in 2005. The maximum share of shrimp from aquaculture went up to 7% (8930 tons) in the country in 2004. Per capita consumption of fisheries product was 6.7 kg/year in the country, compared with 16,3 kg in the rest of the world and of 24 kg and 14,2 kg in the rest of developed and developing countries.

Presently the world production of shrimps stands at 1.5 million tons/annum of which Iran maximum contribution is 0,6%. Considering the Country resources it is well capable of increasing its share more than 10%. However, to meet the widening gap in demand and supply there is urgent need to explore new horizons for fisheries development.

Aquaculture is a viable mean of diversification to increase fish and shellfish production both for domestic consumption and export, rural enlistment, employment and income generation for a wide target of people.

Iran is in the threshold for completing aquaculture industry, rising fish and shellfish production. SHILAT has taken the lead in promoting shrimp farming in Iran and it is responsible for the development and growth around the maritime provinces.

This kind of farming started as a pilot activity with a production of 3,1 tons from 2,3 ha of water on 1992 and it reached up to 8.930 tons from 4.094 ha of water on 2004, being one of the most aggressive aqua industry in the country.
Iran has about 2.790 km of coastline both in south (Persian gulf and Oman sea) and in the northern part (Caspian Sea), at the moment more than 180.000 ha were identified as suitable for coastal shrimp culture with a possible production of more than 360.000 tons of shrimps. Out of this 40.000 ha were allocated to investors for construction.

From this total, 15.000 ha are under construction and 11.000 ha water are ready for the operation. Production in Gowater started with 68,6 tons from 41,7 ha (1,65 tons/ha) on 1999. It reached up to 2.114 from 1007 ha (2,1 tons/ha) on 2003 within 5 years. After that the production reduced to 1.272 tons harvested from 600 ha water in 2004.

The significant reduction was due to the poor profitability of the farmers despite of the best growth comparing it to other complexes.

Considering this difficulties, Iran started to analyze the critical factors and helped the shrimp farmers to get more profit and update the industry.

This enabled, in the next year (2005) the complex to produce 1.800 tons of shrimp from 814,6 ha water (2,2 tons/ha). However in current year (2006) total water culture has gone up to 1.127 ha with 203.619 million of PL stocked in 1.038 ponds. However, comparing it with the best shrimp farming complex of the Country, Gowater has its advantages and constraints. Considering all the constrains fisheries of Iran is helping the industry to update the sector towards sustainable aquaculture.

ANNUAL PRODUCTION IN GOWATER FARMS (TONS)

1999	2000	2001	2002	2003	2004	2005	2006
68,6	355	1022	1276	2114	1272	1800	2400

Shrimp farming is being carried out as a commercial venture by private entrepreneurs in Gowater since 1999. Common facilities have been built by the department of aquaculture to promote shrimp farming as a profitable industry.

Presently the complex shows 1920 ha of total water with 7 hatcheries, 5 processing plants situated near the rearing site. The whole culture area is divided in the two sub complex named north and south.

The north complex is divided into three units with three main feeder canals named C1, C2, C3 and farms are situated both sides of it. This north complex consist of all medium sized farms with 20 ha total area each. Each farm is made of 14 ponds with water area of 1,1 ha in the sector C1 (3 farms) in C2 and C3.
The rest of the farms in C1 have some ponds with water area of 0.6 ha and 13 ponds with 1,1 ha.

South farming complex is made of four big farms units of water spread area from 45.5 ha (48 developed pond) to 146 ha (136) ponds each along with a single medium sized farm of water spread area 16.8 ha including sector named F1, F2, F3, F4, and F0. Each big farm is divided into several sections.

However one 20 ha farm is constructed and managed by SHILAT for pilot activities/study (farm C2-09).

The water source of the complex is provided by an earthen feeder channel connected to the estuary area of Bahukal river to make smooth flow of brackish water in relation of tidal influence. Each main channel has an automatic shutter to allow the water to flow into the channel during high tide times and avoiding the return out of it during the low tide. Water is taken to each farm by water pumps both powered by diesel or by power or by electricity generator. Similarly drainage channels are dug out connecting to main drainage channel which empties into the Oman sea a\few km away from river mouth.

The complex is located around mangrove biotope connected to the estuarine biotope.

Like main feeder channel main drainage channel is also mechanised with automatic shutter in the opposite direction where water can go out from the drainage channel during low tide, but can’t enter inside during high tide. That makes the water exchange easier during culture period or facilitates harvesting at the end of culture.

From each farm, drainage channel water drains out either by gravity flow or with the help of a diesel water pump. General culture condition of the Gowater complex is a desert aquaculture system. The climate conditions are more suitable comparing with all other shrimp farming complexes developed in Iran till now. For instance it is possible to carry out two crops per year.
Finally the main management features of Gowater can be synthesized as follows:

- the complex has a surface of about 1.920 ha of water
- 7 hatcheries in the area (PL supply)
- 5 processing plant in the area (marketing approach)
- important water parameters (temperature, salinity) are more stabile that in other region of Iran;
- The temperature is convenient for 2 crops/year with properly management actions;
- Accessibility to the complex is well developed with white road from Chabahar about 140 km away.
- Electricity should be supplied by the government to the complex. There are some constrains for the farmers and most of them cannot have electricity.
- The hatcheries can guarantee PL for the two crops, in good health for diseases prevention. Up till now the quality of the seed produced is very high comparing it with the seed produced in other part of the Country.
- The quality of the product after harvesting can be preserved considering that processing plant are near the rearing farms.
- The size of ponds is not too big and the management can benefits from pond size of 0,6-1,1 ha.
- Important effort by SHILAT in terms of technical assistance, extension service and training.

On the other hand, the main constrains can be focused as follows:

- The PL production of the / hatcheries is not enough for the Gowater demand. This year the stocking target was about 240 million PL and the real demand of 204 million with only 59% supplied from local hatcheries. This constrains can affect the two crops/year approach for which the demand can achieve about 600-700 millions PL.
- Some private farms are not able to manage high stocking density in terms of water quality, feeding, rearing control. There is the exigency to consolidate the extension service by SHILAT, and also to disseminate technology and important technical instrument (oxymetres, pH metres, salinometres, aerators, water pumps).
- There is the need to increase the control on diseases by technical protocol written for the private sector.
- There is the need to install laboratory with basic equipments.
- Electricity for all the farmers can improve production results.
- There is also the need to improve the quality of the life of the people working there, organising a health/medical centre also to improve working condition of the people in Gowater Complex.
- Thee is the need to point the better technical/economic productive approach, to give indication to the private sector in order to increase profitability of shrimp rearing.
- Effort must be done to reduce production cost and also to control PL and feed price, dealing with this sector actors.
- There is the need to organise the bank system approach.

Shrimp fattening management (Task 2)

Deepak Patnaik

CIRSPE/AFTM Staff
Chabahar/ Project Task 2

Field activities introduction

The first productive experiences foresee four private farms (80 ha approx.) having a total water of 61,6 ha. Each of the four farms has 14 ponds (15.4 water/ha) each of 1.10 ha area available for culture. All farms have an starting stocking of 180.000 seeds per pond (16.36 post larvae/sq.m) and using local made (IRI) feed brand "Chineh" Farm.
The code of the farm are C2-03; C2-05; C2-26; C2-27.
Two ponds in the middle (P-7/8) are kept empty for nurseries stocking finalised to the second crop.

The second productive pilot activity is designed to obtain higher sizes of shrimps at final harvest, increasing the overall production using 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/ha area of 46.2 ha. with 240.000 seeds per pond (21.81 post larvae/sq m) which will go through a partial harvesting.
The farm code are the following:
C 2-12; C2-15; C2-21.

The third productive activities aims at finding the maximum profitability in one single crop and the results will be used as a control, considering that they represent the standard condition of rearings in Gowater site.
The farm code are C2-32; C3-07; C3-25.

For the three pilot productive activities, PL 10-15 are stocked in all farms. Seeds were brought from local hatcheries and stocking was done at 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 were 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.

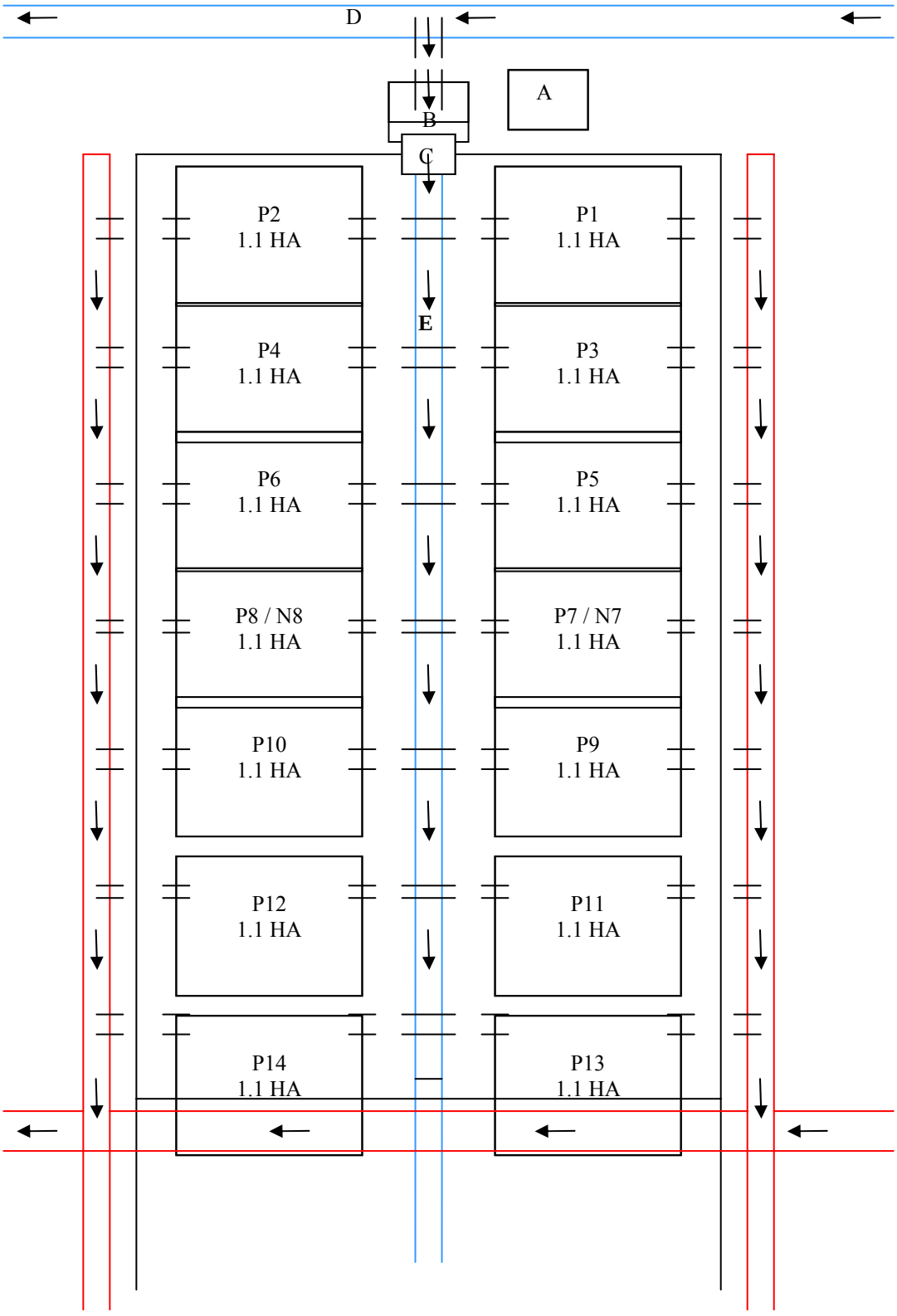
STOCKING DENSITY AND DATA

CH/FR NO.	OWNER	TECHNICIAN LABOURS	PL POND	TOTAL PL	STOCKING	NURSERY
C2/3	**OMIDVARI**	**KASHANI/6**	**180.000 12**	**21.600.000**	20-23/04/06	**X**
C2/5	**RABBANI**	**HOSEINI/6**	**180.000 12**	**21.600.000**	21-29/04/06	**X**
C2/26	**TABAN DARYA**	**HAJI ZADEH/6**	**180.000 12**	**21.600.000**	19-29/04/06	**X**
C2/27	**TABAN DARYA**	**HAJI ZADEH/6**	**180.000 12**	**21.600.000**	20-26/04/06	**X**
C2/32 /31	**TABA TABAEI**	**KASHANI/5**	**180.000 10**	**18.000.000**	20-27/04/06	**CHECK**
C3/7	**RIGI**	**RAHAMDEL/7**	**180.000 12**	**21.600.000**	23-27/04/06	**CHECK**
C3/25	**MOSTAFAE I**	**BAGIZADEH/6**	**180.000 12**	**21.600.000**	20-27/04/06	**CHECK**
C2/12	**JALALI**	**ASDAIRY/**	**240.000 14**	**33.600.000**	28/04-08/05/06	**HIGH D**
C2/15	**HAJ SEID JAVADI**	**HOSEINI/**	**240.000 14**	**33.600.000**	04-12/05/06	**HIGH D**
C2/21	**TONDO**	**TONDO/**	**210.000 2 240.000 9**	**32.000.000**	01-14/05/06	**HIGH D**

STOCKING DENSITY

PARTICULARS	CROP I			CROP II		GRAND TOTAL
	NORTH COMPLEX	SOUTH COMPLEX	TOTAL	NURSERY	2ND CROP	
TOTAL FARM STOCKED	**54**	**03**	57	**04**	04	61
TOTAL POND STOCKED	**668**	**320**	988	**08**	48	1036
TOTAL WSA STOCKED (HA)	**726.2**	**346**	1072.2	**8.8**	52.8	1125
TOTAL PL STOCKED (M.)	**127.8**	**67.3**	195.1	**8.5**	8.5	203.6

SCHEMATIC DIAGRAM OF A PROJECT FARM



A: Guest House B: Pumping unit C: Filtration unit

D: Main inlet channel E: Feeder canal F: Drainage canal

G: Main dranage channel P: Grow out pond N. Nursery pond

COMPARATIVE TABLE PRODUCTIVE ACTIVITIES

PARTICULARS	NURSERY PROJECT		HIGH STOCKING	NORMAL STOCKING	TOTAL
WATER HA/FARM	15.4		15.4	15.4	-
TOTAL WATER HA	61.6		46.2	46.2	154
NO. OF FARMS	04		03	03	10
PONDS/ FARM	14		14	14	
TOTAL PONDS	56		42	42	140
GROW-OUT PONDS	48		42	36	126
NURSERY PONDS	08		NA	NA	08
TOT. N STOCKING M.	8.5		NA	NA	8.5
	1^{ST} CROP	2^{ND} CROP*			
STOCKING/POND (M.)	0.18	-	0.24	0.18	-
STOCKING/FARM (M.)	2.16	-	3.36	2.16	
TOTAL STOCKING (M.)	8.64	-	10.1	6.48	
STOCKING DENSITY	16.4	-	21.9	16.4	-
FEED USED	CHINEH, HAVORRASH, LE GOUESSANT		CHINEH, LEGOUESSANT	CHINEH, HAVORRASH	-

Pond management

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

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

Two kind of pumping systems are in operation in the project farms- vertical and centrifugal ones. Some farms have the infrastructure for setting two pumps but most of them only have one for culture operations without any spare one for the emergencies.

No electricity is supplied in any of the farms, but diesel generators are in use for lighting purposes. Freshwater is brought from the nearby town in tankers to carry out the daily 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 re-fertilising 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) about 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.

However, some farms may not have followed the same steps due to the 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 without any spare one available in case of emergencies. The pumps are having delivery pipe of 12-14″ diameter for water discharge into the filtration unit.

Water exchange schedules and flow through, have been 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 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 discharging the incoming water into feeder channel and culture

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.

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 were found to be within 42-55 ppt and pH 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 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) for 35-50 kg/pond and use of fermented molasses of 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 were 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.

This management method was followed with extreme care in all ponds due to higher DOC's, organic load at pond bottom, inferior quality of incoming channel water and shrimp biomass. The following works were carried out on a regular basis:

- Water quality parameters checked two times a day on a daily basis i.e. pH, Water Temperature, Dissolved Oxygen (DO). Transparency checked with Secchi disk, when required.
- Water Exchange Schedule and changes made depending on pond situations/water intake (pumping unit conditions).
- Physical observation of bloom colour and benthic algae development.
- Feeding zone top layer and pond bottom mud physical analysis for any presence of obnoxious gases i.e. ammonia (NH_3) and fine traces of Hydrogen Sulphide (H_2S) with improper water exchanges.
- Physical observation of incoming channel water quality and its water level along with parameters recorded.
- Presence of dinoflagellates, luminescent bacteria (bioluminescence) in pond water/channel was checked and management methods recommended accordingly.
- Application of lime materials (CaO and $CaCO_3$) and other pond water supplements with their correct doses recommended depending on pond conditions.
- Plankton analysis done, when required.
- Water culture with bloom development (inorganic fertilization and pre-biotic application) followed during pond preparation for 2^{nd} crop initiation in grow-out ponds after harvest of 1^{st} crop.

Recommendations were made during field visits and follow-ups were also made within short intervals, where necessary. Efficient pond management methods were followed immediately in case of crisis. Water exchange and flow thorough with optimum water level maintenance was followed according to the situations as much as possible in the project farms. The condition of the pumping unit was taken into consideration before giving any prescription to the farmer.

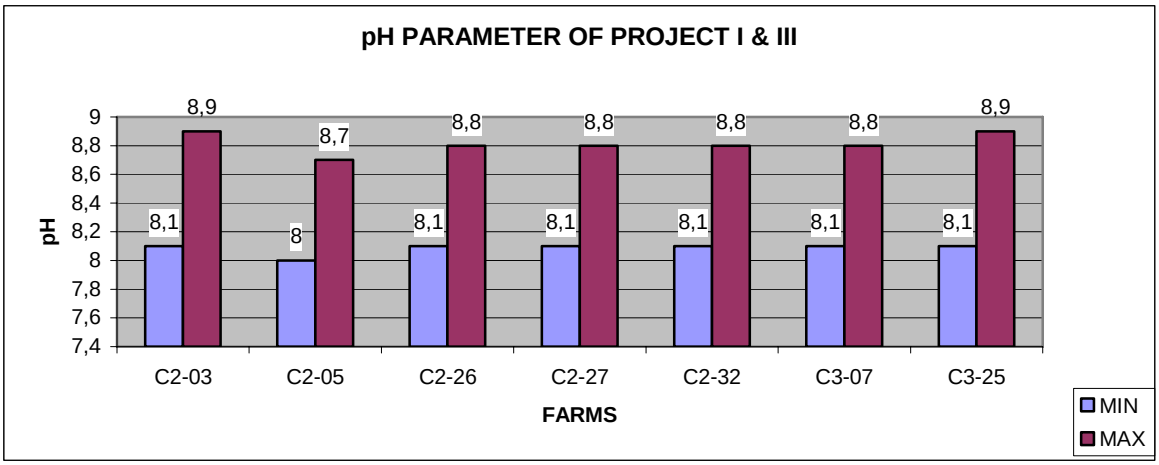
PARAMETERS CHECKED FOR MAINTAINING WATER QUALITY

Affecting Factors	Optimum/Safe Concentration	Limits noted	Management Methods Followed	Measurement Frequency
DO	3-7	1.2-7.5	Control of phytoplankton, organic load, water exchanges.	Twice daily (6 am & 5 pm)
pH	8.0-8.5	P: 7.9-8.9 Ch: 7.9-8.4	Use of lime & alum, molasses mixture, water exchanges.	Twice daily (6 am & 5 pm)
Salinità	20-35	P: 40-47 Ch: 36-39	Regular Water Exchange / Flow Through when required.	Once daily
Turbidity	Transparency 30-50 cms on sacchi disk	25-70	Water Exchanges, lime and fermented molasses applications, alum appl^{n}.	When required.
Temperature	28-33 ^{o}C	27.8-33.6	Water Exchange, maximum water level maintained.	Twice daily (6 am & 5 pm)

P: POND WATER Ch: CHANNEL WATER

LIMIT OF WATER QUALITY PARAMETERS FOR PROJECT FARMS

PARAMETERS	PROJECT I & III		PROJECT II	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
pH	8.0	8.9	7.9	8.9
SALINITY	40	47	40	47
TEMPERATURE	27.8	33.5	27.8	33.6
DO	1.5	7.5	1.2	7.4


pH PARAMETER OF PROJECT I & III
pH
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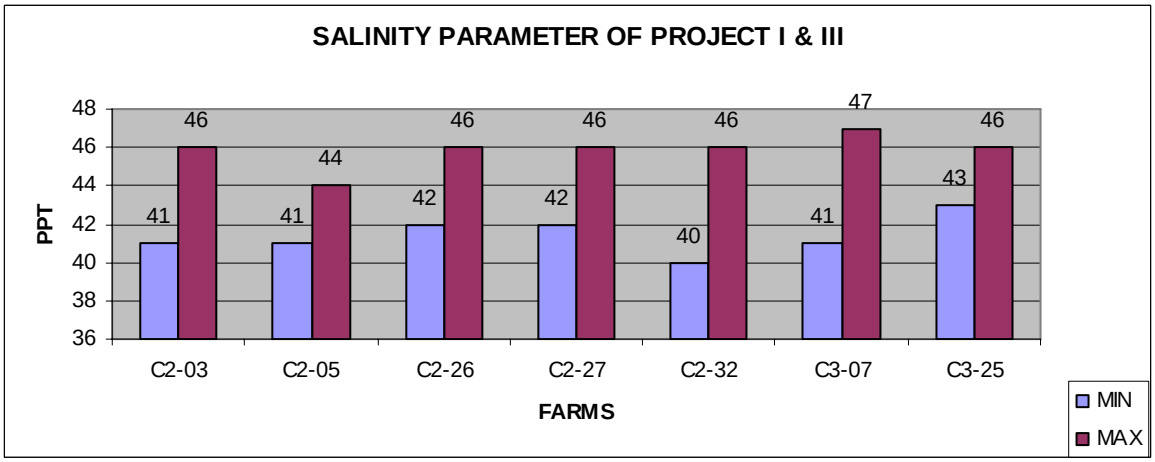
C2-03
C2-05
C2-26
C2-27
C2-32
C3-07
C3-25
FARMS
MIN
MAX


SALINITY PARAMETER OF PROJECT I & III
PPT
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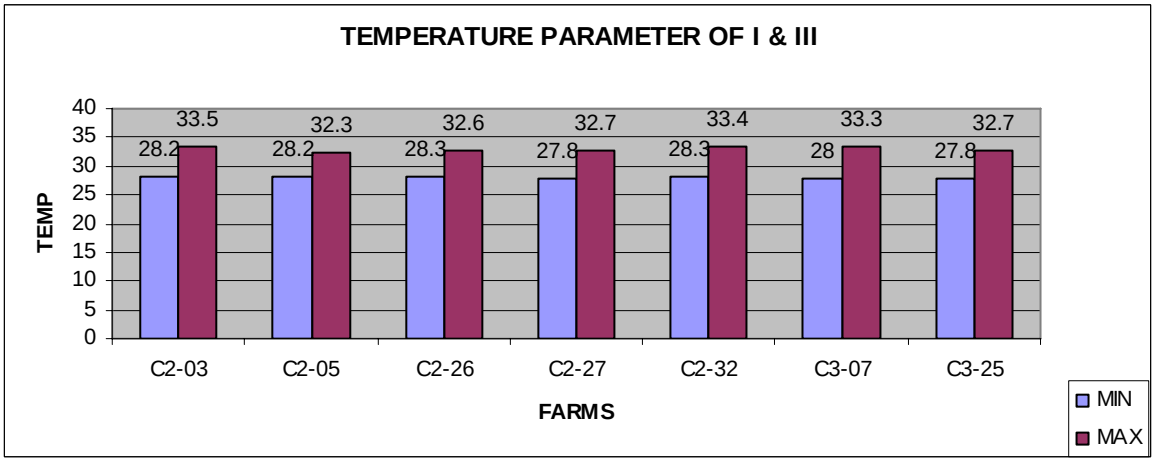
C2-03
C2-05
C2-26
C2-27
C2-32
C3-07
C3-25
FARMS
MIN
MAX


TEMPERATURE PARAMETER OF I & III
TEMP
40
35
30
25
20
15
10
5
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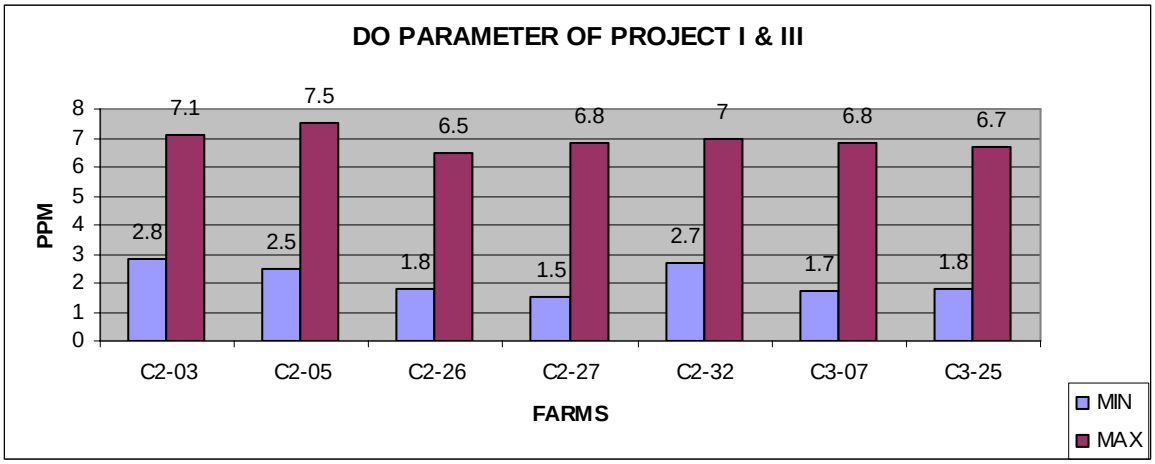
28.2
33.5
28.2
32.3
28.3
32.6
27.8
32.7
28.3
33.4
28
33.3
27.8
32.7
C2-03
C2-05
C2-26
C2-27
C2-32
C3-07
C3-25
FARMS
MIN
MAX


DO PARAMETER OF PROJECT I & III
PPM
8
7
6
5
4
3
2
1
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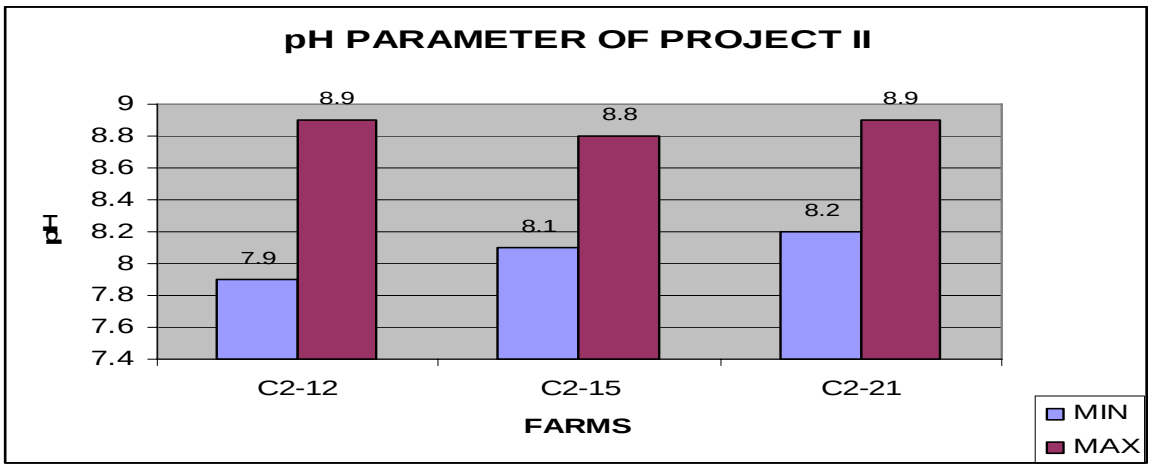
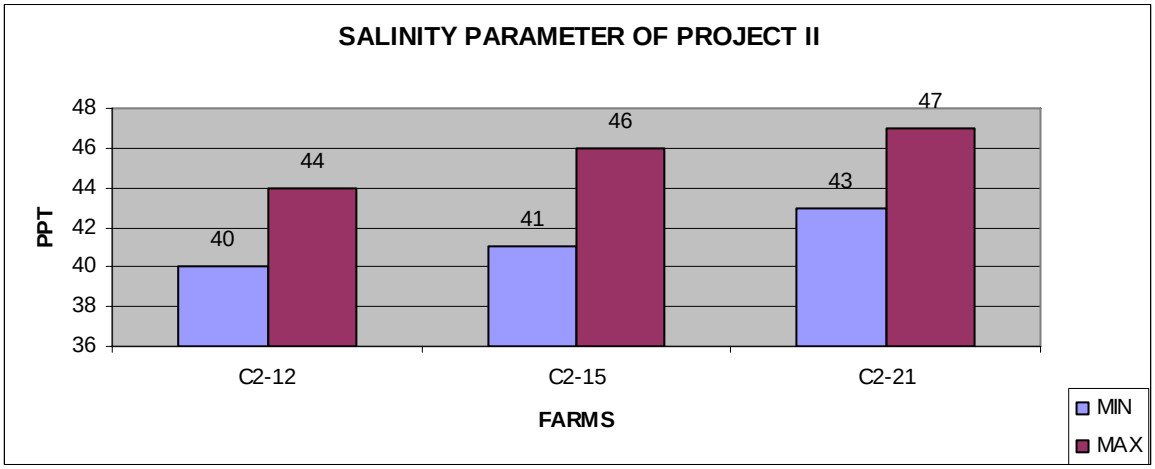
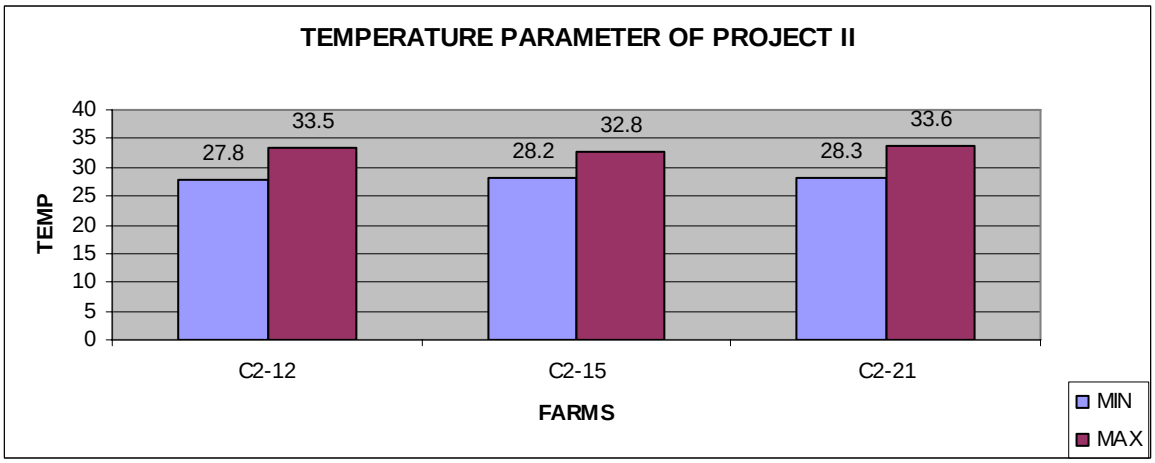
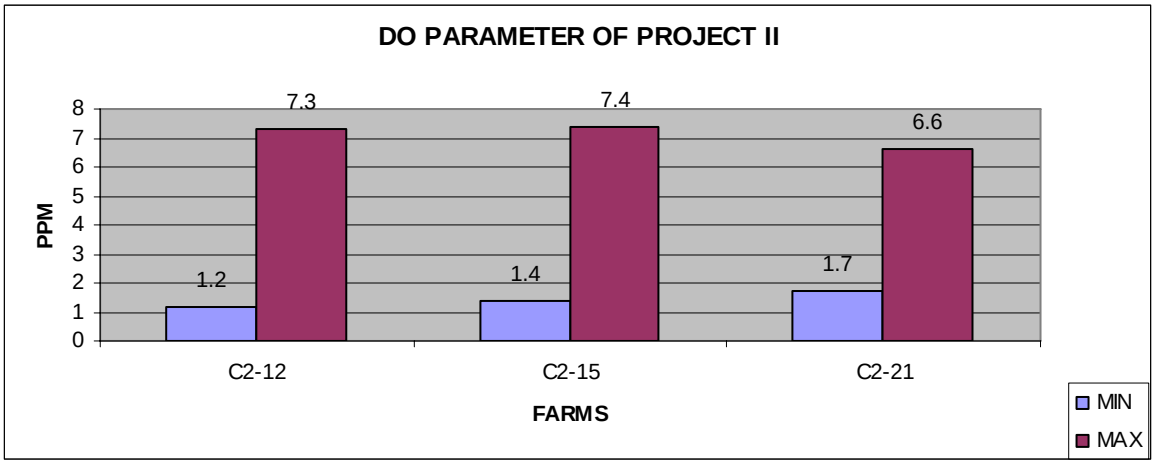
2.8
7.1
2.5
7.5
1.8
6.5
1.5
6.8
2.7
7
1.7
6.8
1.8
6.7
C2-03
C2-05
C2-26
C2-27
C2-32
C3-07
C3-25
FARMS
MIN
MAX


pH PARAMETER OF PROJECT II
9
8.8
8.6
8.4
8.2
8
7.8
7.6
7.4
pH
7.9
8.9
8.1
8.8
8.2
8.9
C2-12
C2-15
C2-21
FARMS
MIN
MAX


SALINITY PARAMETER OF PROJECT II
48
46
44
42
40
38
36
PPT
40
44
41
46
43
47
C2-12
C2-15
C2-21
FARMS
MIN
MAX


TEMPERATURE PARAMETER OF PROJECT II
40
35
30
25
20
15
10
5
0
TEMP
27.8
33.5
28.2
32.8
28.3
33.6
C2-12
C2-15
C2-21
FARMS
MIN
MAX


DO PARAMETER OF PROJECT II
PPM
8
7
6
5
4
3
2
1
0
7.3
7.4
6.6
1.2
1.4
1.7
C2-12
C2-15
C2-21
FARMS
MIN
MAX

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 (CaCO3)		
- 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

Feed management

Three feed brands were used in project farms as follows:

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 on site and it is shown 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 have been observed 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 date 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 up 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 phase of the project. It is checked and properly monitored during the field visits. The records concerned:

a) water quality parameters
b) feed management
c) biometry

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 avoid any mistakes.

FARM PERFORMANCES REPORT OF C2-03

POND NO.	INITIAL STOCKING	DATE OF STOCKING	DATE OF HARVESTING	DOC	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	CUM. FEED (KG)	FCR
1	**180000**	**19.04.06**	**19.08.06**	**122**	**13.79**	**83.24**	**2066**	**3030**	**1.47**
2	**180000**	**19.04.07**	**04.09.06**	**138**	**13.82**	**85.68**	**2131.5**	**3630**	**1.70**
3	**180000**	**19.04.08**	**19.08.06**	**122**	**12.81**	**86.71**	**2000**	**3111**	**1.56**
4	**180000**	**19.04.09**	**04.09.06**	**138**	**12.96**	**88.61**	**2067.5**	**3563**	**1.72**
5	**180000**	**20.04.06**	**18.08.06**	**120**	**11.96**	**92.59**	**1994**	**3037**	**1.52**
6	**180000**	**20.04.07**	**03.09.06**	**136**	**13.52**	**89.5**	**2178**	**3562**	**1.64**
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
9	**180000**	**20.04.06**	**18.08.06**	**120**	**12.11**	**96.2**	**2098**	**3014**	**1.44**
10	**180000**	**20.04.07**	**02.09.06**	**135**	**12.84**	**77.88**	**1800**	**3458**	**1.92**
11	**180000**	**22.04.06**	**17.08.06**	**117**	**13**	**78.46**	**1836**	**2930**	**1.60**
12	**180000**	**22.04.07**	**03.09.06**	**134**	**13.26**	**88.8**	**2119.5**	**3544**	**1.67**
13	**180000**	**22.04.08**	**17.08.06**	**117**	**12**	**85.18**	**1840**	**2823**	**1.53**
14	**180000**	**22.04.09**	**30.08.06**	**130**	**12.32**	**85.51**	**1897**	**3316**	**1.75**
AVERAGE				127	12.84	86.53			1.62
S.D.*				8.48	0.66	5.25			
TOTAL	2160000						24028	39018	

- Standard Deviation

SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C2-03

POND NO.	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1	**-**	**6**	**578**	**1430**	**52**	**-**	**-**	**-**	2066
2	**12**	**1**	**604**	**1432**	**56.5**	**-**	**-**	**26**	2131.5
3	**-**	**-**	**212**	**1198**	**536**	**-**	**-**	**54**	2000
4	**-**	**91.5**	**372**	**870**	**654**	**-**	**-**	**80**	2067.5
5	**-**	**-**	**34**	**796**	**1164**	**-**	**-**	**-**	1994
6	**2**	**142**	**564**	**1010**	**382**	**18**	**-**	**60**	2178
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
9	**-**	**-**	**6**	**1033**	**1059**	**-**	**-**	**-**	2098
10	**-**	**64**	**232**	**942**	**496**	**36**	**-**	**30**	1800
11*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**20**	1836
12	**-**	**50**	**521.5**	**1076**	**430**	**18**	**-**	**24**	2119.5
13*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**20**	1840
14	**-**	**26**	**176**	**766.5**	**908**	**6**		**14.5**	1897
TOTAL	14	380.5	3299.5	10553.5	5737.5	78	0	328.5	24028

* Represents processing details regarding break-up size grades not available till date from the processor.

FARM PERFORMANCES REPORT OF C2-05

POND NO.	INITIAL STOCKING	DATE OF STOCKING	DATE OF HARVESTING	DOC	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	CUM.FEED (KG)	FCR
1	**180000**	**20.04**	**16.08.06**	**118**	**11.64**	**95.91**	**2010.5**	**3193**	**1.59**
2	**180000**	**20.04**	**29.08.06**	**131**	**12.28**	**96.86**	**2140.5**	**3574**	**1.67**
3	**180000**	**21.04**	**25.08.06**	**126**	**13.99**	**88.66**	**2232.5**	**3509**	**1.57**
4	**180000**	**21.04**	**28.08.06**	**129**	**14.38**	**88.83**	**2300**	**3577**	**1.56**
5	**180000**	**21.04**	**24.08.06**	**125**	**13.89**	**88.37**	**2210**	**3532**	**1.60**
6	**180000**	**21.04**	**27.08.06**	**128**	**13.32**	**90.53**	**2170.5**	**3509**	**1.62**
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
9	**180000**	**25.04**	**25.08.06**	**121**	**14**	**84.3**	**2125.5**	**3296**	**1.55**
10	**180000**	**25.04**	**26.08.06**	**123**	**15.41**	**85.8**	**2380**	**3523**	**1.48**
11	**180000**	**27.04**	**23.08.06**	**118**	**14.12**	**83.35**	**2119**	**2979**	**1.41**
12	**180000**	**27.04**	**26.08.06**	**121**	**13.85**	**82.91**	**2066.5**	**3417**	**1.65**
13	**180000**	**27.04**	**23.08.06**	**117**	**10.9**	**102**	**2000**	**3217**	**1.61**
14	**180000**	**27.04**	**25.08.06**	**120**	**12.92**	**83.07**	**1932**	**2962**	**1.53**
AVERAGE				123	13.33	89.22			1.57
S.D.*				4.68	1.26	6.16			
TOTAL	2160000						25687	40288	

* Standard Deviation

SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C2-05

POND NO.	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1	**-**	**-**	**47.5**	**535**	**1380**	**46**	**-**	**2**	2010.5
2	**2**	**18**	**234**	**924**	**852.5**	**108**	**-**	**2**	2140.5
3	**-**	**32**	**824**	**1268**	**76**	**-**	**-**	**32.5**	2232.5
4	**-**	**80**	**1268**	**808**	**120**	**-**	**-**	**24**	2300
5	**-**	**28**	**730**	**1352**	**82**	**-**	**-**	**18**	2210
6	**-**	**8**	**508**	**1254.5**	**360**	**-**	**-**	**40**	2170.5
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
9	**-**	**22**	**774**	**1296**	**33.5**	**-**	**-**	**-**	2125.5
10	**8**	**388**	**1606**	**378**		**-**	**-**	**-**	2380
11	**-**	**36**	**860**	**1194**	**29**	**-**	**-**	**-**	2119
12	**-**	**58**	**806**	**952**	**234.5**	**-**	**-**	**16**	2066.5
13	**-**	**-**	**6**	**236**	**1396**	**362**	**-**	**-**	2000
14	**-**	**2**	**228**	**1220**	**460**	**-**	**-**	**22**	1932
TOTAL	10	672	7891.5	11417.5	5023.5	516	0	156.5	25687

POND NO.	INITIAL STOCKING	DATE OF STOCKING	DATE OF HARVESTING	DOC	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	CUM.FEED (KG)	FCR
1	**180000**	**20.04.06**	**31.08.06**	**133**	**13.23**	**88.99**	**2119**	**3481**	**1.64**
2	**180000**	**19.04.06**	**22.08.06**	**126**	**11.89**	**69.16**	**1480**	**2656**	**1.79**
3	**180000**	**20.04.06**	**30.08.06**	**132**	**12.12**	**89.1**	**1944**	**3255**	**1.67**
4	**180000**	**19.04.06**	**22.08.06**	**126**	**12.88**	**83.15**	**1927.5**	**2842**	**1.47**
5	**180000**	**20.04.06**	**30.08.06**	**132**	**12.7**	**89.34**	**2042**	**3519**	**1.72**
6	**180000**	**19.04.06**	**21.08.06**	**125**	**13.85**	**82.83**	**2064.5**	**3039**	**1.47**
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
9	**180000**	**20.04.06**	**29.08.06**	**130**	**12.74**	**94.97**	**2178.5**	**3305**	**1.52**
10	**180000**	**20.04.07**	**21.08.06**	**122**	**12.31**	**92.49**	**2049**	**3166**	**1.55**
11	**180000**	**20.04.08**	**28.06.08**	**130**	**12.8**	**93.8**	**2161.5**	**3374**	**1.56**
12	**180000**	**20.04.09**	**20.08.06**	**122**	**12.26**	**100.3**	**2213.5**	**3263**	**1.47**
13	**180000**	**22.04.06**	**28.08.06**	**127**	**12.48**	**91.32**	**2052**	**3286**	**1.60**
14	**180000**	**22.04.06**	**20.08.06**	**119**	**13.09**	**89.95**	**2119.5**	**3310**	**1.56**
AVERAGE	-	-	-	127	12.70	88.78	-	-	1.58
S.D.*	-	-	-	4.51	0.54	7.81	-	-	-
TOTAL	2160000	-	-	-	-	-	24351	38496	-

FARM PERFORMANCES REPORT OF C2-26

* Standard Deviation

SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C2-26

POND NO.	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1	**-**	**82**	**492**	**1020**	**520.5**	**-**	**-**	**4.5**	2119
2	**-**	**6**	**844**	**-**	**-**	**630**	**-**	**-**	1480
3	**-**	**46**	**128**	**646.5**	**1114**	**-**	**-**	**9.5**	1944
4	**-**	**-**	**44**	**1512**	**369**	**-**	**-**	**2.5**	1927.5
5	**-**	**-**	**396**	**950**	**628**	**52**	**8**	**8**	2042
6	**-**	**-**	**632**	**1394**	**38.5**	**-**	**-**	**-**	2064.5
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
9	**-**	**14**	**302**	**1202.5**	**606**	**50**	**-**	**4**	2178.5
10	**-**	**-**	**10**	**1178**	**861**	**-**	**-**	**-**	2049
11*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	2161.5
12	**-**	**-**	**12**	**1222**	**979.5**	**-**	**-**	**-**	2213.5
13	**-**	**18**	**-**	**1302**	**718**	**-**	**-**	**14**	2052
14	**-**	**-**	**98**	**1759.5**	**262**	**-**	**-**	**-**	2119.5
TOTAL	0	166	2958	12186.5	6096.5	732	8	42.5	24351

* Represents processing details regarding break-up grades not available till date.

FARM PERFORMANCES REPORT OF C2-27

POND NO.	INITIAL STOCKING	DATE OF STOCKING	DATE OF HARVESTING	DOC	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	CUM.FEED (KG)	FCR
1	**180000**	**19.04.06**	**02.09.06**	**137**	**12**	**71.3**	**1540**	**2623**	**1.70**
2	**180000**	**19.04.06**	**28.08.06**	**131**	**11.2**	**63.33**	**1326**	**2577**	**1.94**
3	**180000**	**19.04.07**	**01.09.06**	**135**	**14.19**	**88.78**	**2276**	**3526**	**1.55**
4	**180000**	**19.04.08**	**28.08.06**	**131**	**12.06**	**76.33**	**1665**	**3003**	**1.80**
5	**180000**	**21.04.06**	**01.09.06**	**134**	**12.2**	**98.38**	**2160**	**3424**	**1.59**
6	**180000**	**21.04.07**	**26.08.06**	**128**	**11.68**	**102.39**	**2153**	**3397**	**1.58**
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
9	**180000**	**24.04.06**	**01.09.06**	**130**	**13.98**	**79.03**	**1989**	**3077**	**1.55**
10	**180000**	**24.04.07**	**25.08.06**	**123**	**13.68**	**72.6**	**1788.5**	**2592**	**1.45**
11	**180000**	**24.04.08**	**31.08.06**	**128**	**12.79**	**80.2**	**1846**	**3077**	**1.67**
12	**180000**	**25.04.06**	**24.08.06**	**122**	**13.13**	**82.75**	**1956.5**	**3015**	**1.54**
13	**180000**	**25.04.07**	**31.08.06**	**128**	**14.26**	**81.65**	**2096**	**3102**	**1.48**
14	**180000**	**25.04.08**	**23.08.06**	**120**	**13.88**	**76.06**	**1900.5**	**3087**	**1.62**
AVERAGE				129	12.96	81.07			1.61
S.D.*				5.25	1.07	11.08			
TOTAL	2160000						22697	36500	

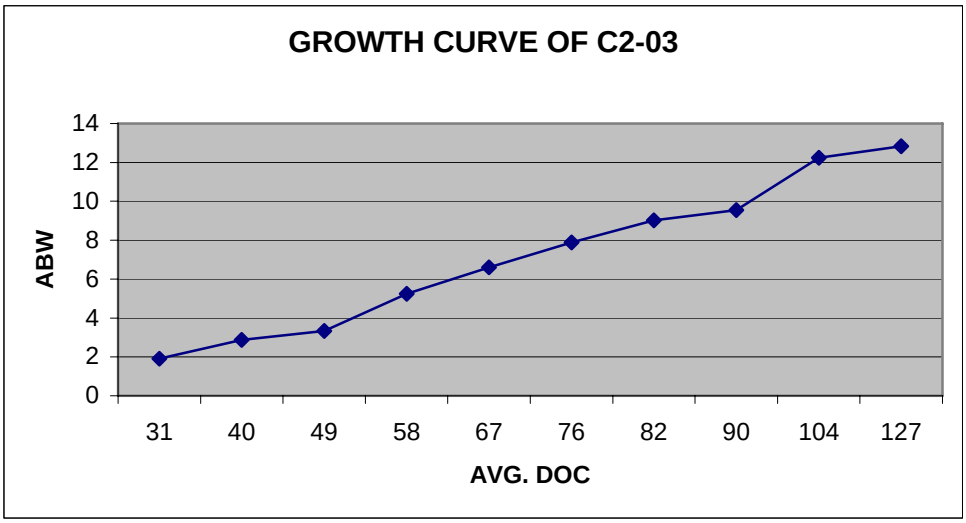
* Represents Standard Deviation

SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C2-27

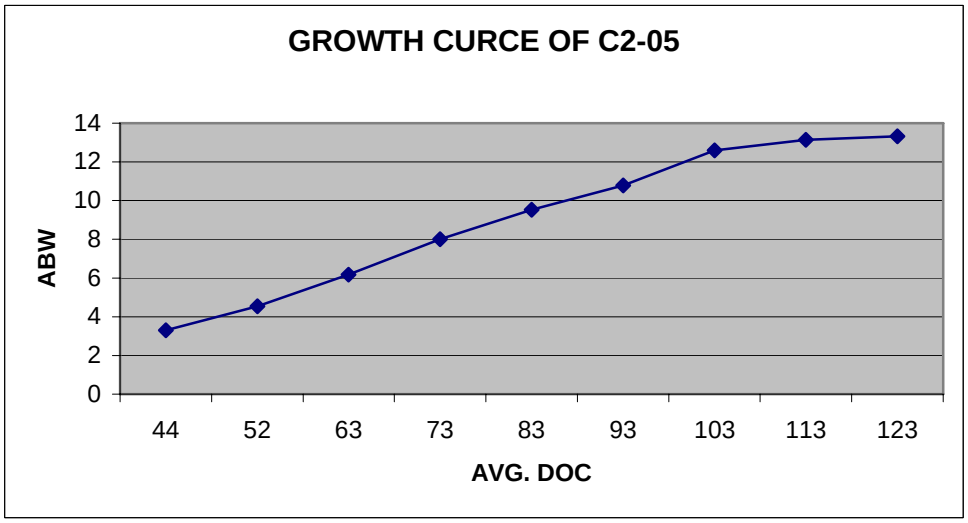
POND NO	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	1540
2	**-**	**14**	**-**	**64**	**1182**	**24**	**-**	**42**	1326
3	**-**	**174**	**1020**	**856**	**222**	**-**	**-**	**4**	2276
4	**-**	**-**	**34.5**	**768**	**822**	**32.5**	**-**	**8**	1665
5	**-**	**6**	**150**	**894**	**1102**	**4**	**-**	**4**	2160
6	**-**	**34**	**20**	**664**	**1326**	**95**	**10**	**4**	2153
7	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
8	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
9	**-**	**82**	**573**	**1002**	**318**	**6**	**-**	**8**	1989
10	**-**	**10**	**494**	**1156**	**114.5**	**-**	**-**	**14**	1788.5
11	**-**	**-**	**120**	**1252**	**474**	**-**	**-**	**-**	1846
12	**-**	**4**	**180**	**1496**	**276.5**	**-**	**-**	**-**	1956.5
13	**-**	**108**	**874**	**1072**	**32**	**6**	**-**	**4**	2096
14	**-**	**-**	**588**	**1296**	**16.5**	**-**		**-**	1900.5
TOTAL	0	432	4053.5	10520	5885.5	167.5	10	88	22697

* Represents processing details regarding break-up grades not available till date.

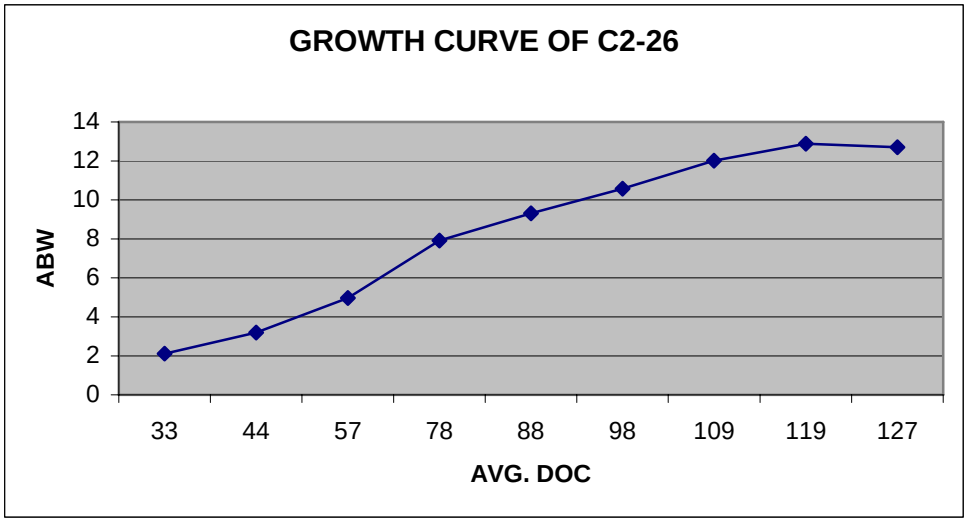
GROWTH PARAMETER GRAPHS OF PROJECT FARM



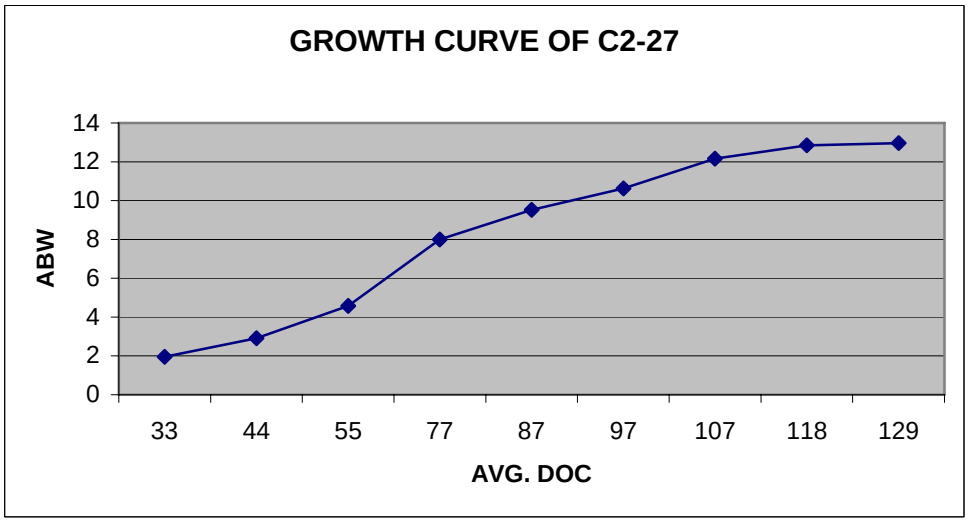
NOTE: The growth curve showed a decreasing trend from 104 DOC till end which can be correlated with poor feed quality of Grower II (CODE 405) of Chineh Brand (some batches). Pump damages with no water exchanges (high organic load at pond bottom) for more than 6 days during 80 to 90 DOC also resulted with poor growth increment of shrimps.



NOTE: Very negligible growth increment of shrimps observed for almost 20 days i.e. 103 to 123 DOC which can be reasoned out for poor quality of No.4 & 5 code (some batches) of Chineh feed. The feed conversion ratio (FCR) also increased reducing the profit margins for the farmer.



NOTE: The declining trend towards the end (109 to 127 DOC) with 0.7 gm increment in growth in almost 20 days is highly distinguishable from the above graph shown. Poor feed consumption (405 of Chineh feed) and unhealthy pond bottom as well as water quality in few ponds resulted in such adverse situations.



NOTE: The same situation of poor growth from 107 DOC as described above was quiet clear from the above figure. Poor feed quality (405 of Chineh feed) plays the most important role in slow growth of shrimps and ultimate increase in FCR of the farm. There was a negligible growth increment of 0.8 gm (avg.) in almost more than 20 days (107-129 DOC). Poor condition in two ponds (soil and water quality) also added to the above situation.

FARM PERFORMANCES REPORT OF C2-12

POND NO.	INITIAL STOCK (NO)	DOC AT PARTIAL HARVEST	PRESENT STOCK (NO)	DOC	CUMULATIVE FEED (KG)	ABW (GM)	BIOMASS			FCR
							HARVESTED (KG)	PRESENT* (KG)	TOTAL* (KG)	
1	**240000**	**108**	**213000**	**125**	**4174**	**13.8**	**285**	**1982**	**2267**	**1.84**
2	**240000**	**107**	**201000**	**125**	**4150**	**15.0**	**485**	**2093**	**2578**	**1.61**
3	**240000**	**-**	**240000**	**127**	**3607**	**17.0**	**-**	**2051**	**2051**	**1.76**
4	**240000**	**-**	**240000**	**127**	**3799**	**17.1**	**-**	**2062**	**2062**	**1.84**
5	**240000**	**99**	**175000**	**130**	**4240**	**16.7**	**795.5**	**2020**	**2816**	**1.51**
6	**240000**	**113**	**225000**	**130**	**3516**	**16.3**	**200**	**1970**	**2170**	**1.62**
7	**240000**	**102**	**196000**	**130**	**4321**	**16.5**	**549**	**2000**	**2549**	**1.70**
8	**240000**	**103**	**184000**	**131**	**4284**	**16.3**	**675.5**	**1970**	**2646**	**1.62**
9	**240000**	**106**	**213000**	**133**	**4693**	**14.2**	**288**	**2242**	**2530**	**1.85**
10	**240000**	**104**	**194000**	**133**	**4582**	**15.3**	**490**	**2294**	**2784**	**1.65**
11	**240000**	**105**	**179000**	**134**	**4567**	**13.8**	**712.5**	**1982**	**2695**	**1.69**
12	**240000**	**103**	**189000**	**134**	**4519**	**14.7**	**555**	**2064**	**2619**	**1.73**
13	**240000**	**116**	**196000**	**135**	**4554**	**15.2**	**539**	**2113**	**2652**	**1.72**
14	**240000**	**104**	**182000**	**135**	**4407**	**15.4**	**647**	**2133**	**2780**	**1.59**
AVERAGE		106		131		15.5				1.69
TOTAL	3360000		2827000		59413		6222	28976	35198	

- Represents estimated figures of biomass

SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C2-12

POND NO.	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1	**-**	**-**	**4.5**	**196**	**278.5**	**6**	**-**	**-**	285
2	**-**	**-**	**-**	**256**	**229**		**-**	**-**	485
3	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
4	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
5	**-**	**-**	**2**	**278**	**492**	**23.5**	**-**	**-**	795.5
6*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	200
7	**-**	**-**	**12**	**318**	**212**	**7**	**-**	**-**	549
8	**-**	**-**	**2**	**318**	**355.5**		**-**	**-**	675.5
9	**-**	**-**	**-**	**46**	**232**	**10**	**-**	**-**	288
10	**-**	**-**	**-**	**84**	**377**	**28**	**-**	**1**	490
11	**-**	**-**	**-**	**40**	**612.5**	**60**		**-**	712.5
12	**-**	**-**	**-**	**12**	**416**	**122**	**5**	**-**	555
13	**-**	**-**	**-**	**58**	**444**	**37**	**-**	**-**	539
14	**-**	**-**	**-**		**567.5**	**79.5**	**-**	**-**	647
TOTAL	**-**	**-**	20.5	1606	4216	373	5	**-**	6222

*** represents 200 kg of harvesting material of pond no. 6 was mixed with harvesting material of pond no.1 and was processed together.**

FARM PERFORMANCES REPORT OF C2-15 (ON 09.09.06)

POND NO.	INITIAL STOCK (NO)	DOC AT PARTIAL HARVEST	PRESENT STOCK (NO)	DOC	CUMULATIVE FEED (KG)	ABW (GM)	BIOMASS			FCR
							HARVESTED (KG)	PRESENT* (KG)	TOTAL* (KG)	
1	**240000**	**-**	**240000**	**121**	**3747**	**13.1**	**-**	**2311**	**2311**	**1.62**
2	**240000**	**-**	**240000**	**121**	**3792**	**13**	**-**	**1875**	**1875**	**2.02**
3	**240000**	**-**	**240000**	**123**	**3696**	**14.6**	**-**	**1598**	**1598**	**2.31**
4	**240000**	**-**	**240000**	**123**	**3470**	**14.8**	**-**	**1613**	**1613**	**2.15**
5	**240000**	**105**	**186000**	**124**	**3396**	**14.9**	**618.5**	**1852**	**2470.5**	**1.37**
6	**240000**	**-**	**240000**	**123**	**3253**	**14.6**	**-**	**1598**	**1598**	**2.04**
7	**240000**	**107**	**208000**	**126**	**4005**	**15.9**	**394**	**2184**	**2578**	**1.55**
8	**240000**	**-**	**240000**	**126**	**3418**	**13.5**	**-**	**1957**	**1957**	**1.75**
9	**240000**	**102**	**171000**	**126**	**4058**	**13**	**688**	**1875**	**2563**	**1.58**
10	**240000**	**106**	**181000**	**126**	**3959**	**13.2**	**698**	**1695**	**2393**	**1.65**
11	**240000**	**101**	**181000**	**126**	**4147**	**13**	**612**	**2292**	**2904**	**1.43**
12	**240000**	**108**	**191000**	**129**	**4103**	**15.2**	**595.5**	**2103**	**2698.5**	**1.52**
13	**240000**	**106**	**194000**	**129**	**3951**	**13.5**	**553**	**1957**	**2510**	**1.57**
14	**240000**	**107**	**187000**	**129**	**4109**	**15.5**	**677.5**	**2143**	**2820.5**	**1.46**
AVERAGE		105		125		14.1				1.72
TOTAL	3360000		2939000		53104		4836.5	27053	31890	

SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C2-15

POND NO	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
2	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
3	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
4	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
5	**-**	**-**	**-**	**284**	**395.5**	**2**	**-**	**-**	681.5
6	**-**	**-**	**-**		**-**	**-**	**-**	**-**	-
7	**-**	**-**	**-**	**220**	**174**	**-**	**-**	**-**	394
8	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
9	**-**	**-**	**6.5**	**4**	**258**	**419.5**	**-**	**-**	688
10	**-**	**-**	**-**	**134**	**558**	**6**	**-**	**-**	698
11	**-**	**-**	**-**	**-**	**14**	**488**	**110**	**-**	612
12	**-**	**-**	**10**	**304**	**281.5**	**-**	**-**	**-**	595.5
13	**-**	**-**	**6**	**97**	**414**	**32**	**-**	**4**	553
14	**-**	**-**	**8**	**368**	**300**	**1.5**	**-**	**-**	677.5
TOTAL	-	-	30.5	1411	2395	949	110	4	4899.5

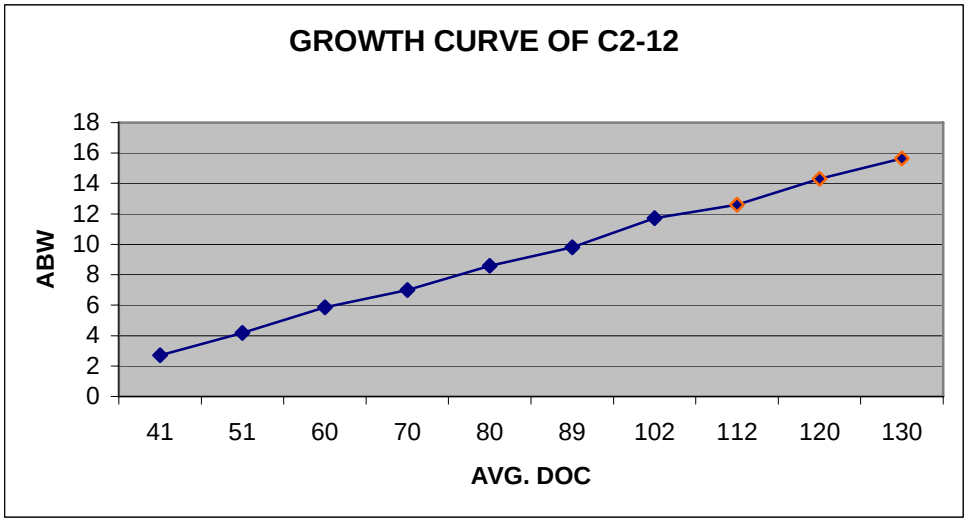
FARM PERFORMANCES REPORT OF C2-21

POND NO.	INITIAL STOCK (NO)	DOC AT PARTIAL HARVEST	PRESENT STOCK (NO)	PRESENT DOC	CUMULATIVE FEED (KG)	ABW (GM)	BIOMASS			FCR
							HARVESTED (KG)	PRESENT* (KG)	TOTAL* (KG)	
1	**240000**	**110**	**191000**	**133**	**4104**	**14.11**	**565.5**	**1563**	**2128.5**	**1.93**
2	**240000**	**123**	**189000**	**133**	**4223**	**12.51**	**612.5**	**1400**	**2012.5**	**2.10**
3	**240000**	**109**	**203000**	**133**	**3737**	**14.41**	**476.5**	**1584**	**2060.5**	**1.81**
4	**240000**	**109**	**200000**	**133**	**3912**	**15.82**	**512.5**	**1691**	**2203.5**	**1.78**
5	**240000**	**111**	**194000**	**132**	**3975**	**14.12**	**556**	**1696**	**2252**	**1.77**
6	**240000**	**121**	**207000**	**132**	**3976**	**13.86**	**433.5**	**1681**	**2114.5**	**1.88**
7	**240000**	**109**	**189000**	**128**	**3942**	**14.47**	**605**	**1727**	**2332**	**1.69**
8	**240000**	**114**	**186000**	**128**	**3819**	**13.95**	**586**	**1556**	**2142**	**1.78**
9	**240000**	**106**	**173000**	**127**	**3862**	**13.16**	**638**	**1624**	**2262**	**1.71**
10	**240000**	**114**	**193000**	**128**	**3948**	**13.1**	**551**	**1624**	**2175**	**1.82**
11	**240000**	**95**	**178000**	**124**	**3839**	**13**	**616.5**	**1617**	**2233.5**	**1.72**
12	**240000**	**107**	**181000**	**127**	**4151**	**12.8**	**598.5**	**1583**	**2181.5**	**1.90**
13	**240000**	**111**	**187000**	**119**	**3565**	**11.9**	**594**	**1346**	**1940**	**1.84**
14	**240000**	**108**	**199000**	**119**	**3721**	**12.8**	**508.5**	**1583**	**2091.5**	**1.78**
AVERAGE	-	110	-	128	-	13.57	-	-	-	1.82
TOTAL	3360000		2670000		54774		7854	22275	30129	

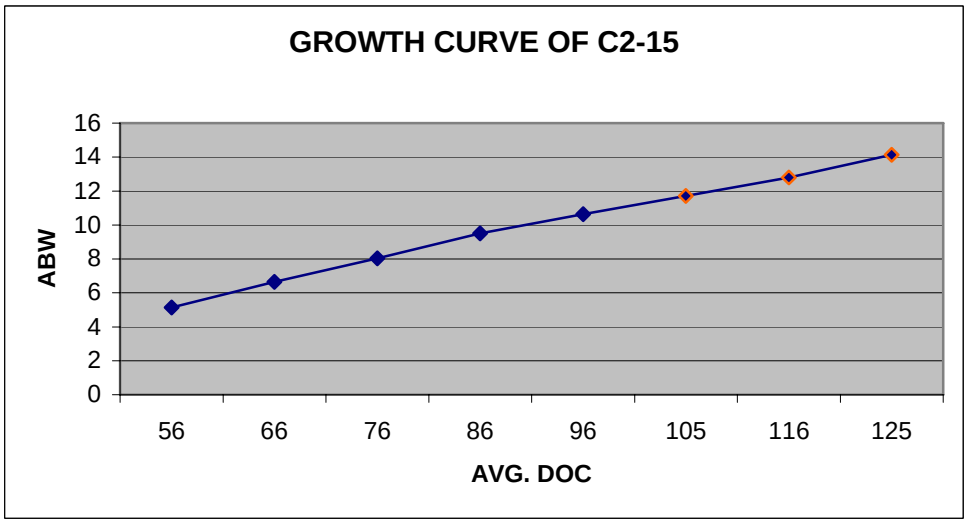
SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C2-21

POND NO	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1	**-**	**-**	**12**	**182**	**354**	**17.5**	**-**	**-**	565.5
2	**-**	**-**	**58**	**314**	**236.5**	**-**	**-**	**4**	612.5
3	**-**	**-**	**66**	**391**	**19.5**	**-**	**-**	**-**	476.5
4	**-**	**-**	**17**	**291.5**	**204**	**-**	**-**	**-**	512.5
5	**-**	**-**	**-**	**144**	**412**	**-**	**-**	**-**	556
6	**-**	**-**	**47.5**	**258**	**110**	**-**	**-**	**18**	433.5
7	**-**	**-**	**-**	**204**	**401**	**-**	**-**	**-**	605
8	**-**	**6**	**14**	**460**	**68**	**-**	**-**	**38**	586
9	**-**	**-**	**-**		**228**	**406**	**4**	**-**	638
10	**-**	**-**	**-**	**70**	**447**	**18**	**-**	**16**	551
11*	**-**	**-**	**-**	**-**		**-**	**-**	**-**	616.5
12	**-**	**-**	**-**	**-**	**388.5**	**210**	**-**	**-**	598.5
13*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	594
14	**-**	**-**	**90**	**354**	**44.5**	**-**	**-**	**20**	508.5
TOTAL	-	6	304.5	2668.5	2913	651.5	4	96	7854

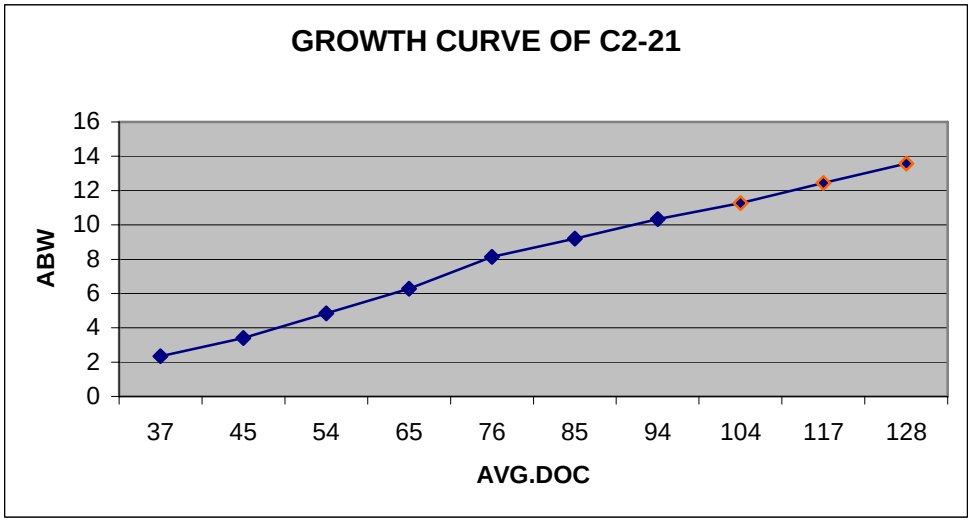
GROWTH PARAMETER GRAPHS



NOTE: There was only a gradual increase in growth after 106 DOC (DOC at partial harvest) up to 130 DOC as marked above. Poor feed consumption of Le Gouessant brand (Gr-II used at present) and high organic load at pond bottom (poor pond preparation and also low level of feed management practiced) showed slight high FCR (already reached the break even point). So, they were strongly recommended to go for immediate harvest of all ponds.



NOTE: There was no remarkable differences observed with increase in growth of shrimps after partial harvest (105 DOC) can be correlated with poor feed quality of Le Gouessant feed (currently using Gr-II) with daily feed ration reduced and no good water exchanges followed at such high DOC's. Recommended to go for complete harvesting after conducting one more biometry so to increase the ABW above 15 gm.



NOTE: Poor feed consumption (with poor feed quality of Gr-II of Chineh feed) and overall farm management was affected every time due to inefficient water exchanges followed (poor pump efficiency of a single pump used) resulted with no major differences observed in growth increment as before.

FARM PERFORMANCES REPORT OF C2-32

POND NO.	INITIAL STOCKING	DATE OF STOCKING	DATE OF HARVESTING	DOC	ABW (GM)	SURVIVAL** (%)	BIOMASS** (KG)	CUM. FEED (KG)	FCR*
1	**180000**	**25.04.06**	**NA***	**137**	**14.4**	**89.03**	**2308**	**3424.6**	1.48
2	**180000**	**25.04.06**	**NA***	**137**	**15.6**	**85.20**	**2392**	**3220.7**	1.35
3	**180000**	**25.04.06**	**NA***	**137**	**16.1**	**84.57**	**2451**	**3252.4**	1.33
4	**180000**	**25.04.06**	**NA***	**137**	**15.3**	**85.64**	**2358**	**3301.3**	1.40
5	*180000*	*23.04.06*	*26.08.06*	*125*	*11.18*	*87*	*1750*	*2948.4*	1.68
6	*180000*	*24.04.06*	*08.09.06*	*137*	*13.7*	*82*	*2022*	*3254.3*	1.61
7	**180000**	**23.04.06**	**NA***	**139**	**13**	**89.03**	**2083**	**3697**	1.77
8	*180000*	*23.04.06*	*06.09.06*	*136*	*13.71*	*72.03*	*1778*	*3144.1*	1.77
13 (31)	*180000*	*19.04.06*	*07.09.06*	*141*	*13.87*	*87.62*	*2187*	*3787.6*	1.73
14 (31)	*180000*	*19.04.06*	*05.09.06*	*137*	*13.21*	*90.5*	*2165*	*3801.2*	1.76
AVERAGE				136	14.01	85.26			
S.D.*				4.22	1.44	5.28			
TOTAL	1800000						21494	33832	1.57

* Represents harvesting not yet over and will be completed within next week time.

** Represents data estimated based on maximum daily feed ration.

SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C2-32

POND NO	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1*	-	-	-	-	-	-	-	-	-
2*	-	-	-	-	-	-	-	-	-
3*	-	-	-	-	-	-	-	-	-
4*	-	-	-	-	-	-	-	-	-
5	-	-	**26**	**322**	**1176**	**226**	-	-	1750
6	-	-	-	-	-	-	-	-	2022
7*	-	-	-	-	-	-	-	-	-
8	-	**32.5**	**502**	**1114**	**128**	**1.5**	-	-	1778
9	-	**15.5**	**621.5**	**1536**	**14**	-	-	-	2187
10	-	**14**	**362**	**1434**	**323**	**16**	-	**16**	2165
TOTAL	-	-	-	-	-	-	-	-	9902

* represents harvesting not yet completed

FARM PERFORMANCES REPORT OF C3-07

POND NO.	TOTAL STOCK (M.)	DOC	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	FCR
1	**180000**	**138**	**13.63**	**85.44**	**2096.1**	**1.8**
2	**180000**	**138**	**15.66**	**81.87**	**2307.7**	**1.64**
3	**180000**	**138**	**16.28**	**69.26**	**2029.7**	**1.79**
4	**180000**	**138**	**14.65**	**83.5**	**2201.8**	**1.72**
5	**180000**	**138**	**14.95**	**82.96**	**2232.6**	**1.69**
6	**180000**	**138**	**13.70**	**85.37**	**2105.3**	**1.79**
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**
9	**180000**	**135**	**15.15**	**82.64**	**2253.5**	**1.73**
10	**180000**	**135**	**14.75**	**83.31**	**2212**	**1.68**
11	**180000**	**135**	**15.43**	**81.91**	**2274.9**	**1.63**
12	**180000**	**135**	**14.57**	**83.57**	**2191.8**	**1.73**
13	**180000**	**134**	**14.86**	**70.96**	**1898.1**	**1.74**
14	**180000**	**134**	**15.00**	**82.69**	**2232.6**	**1.66**
TOTAL	2160000	136	14.89	81.12	26036	1.72

NOTE: It was recommended to the farmer to go for immediate harvesting because the farm almost reached the break even point and the FCR is increasing without much effect on growth increment.

FARM PERFORMANCES REPORT OF C3-25

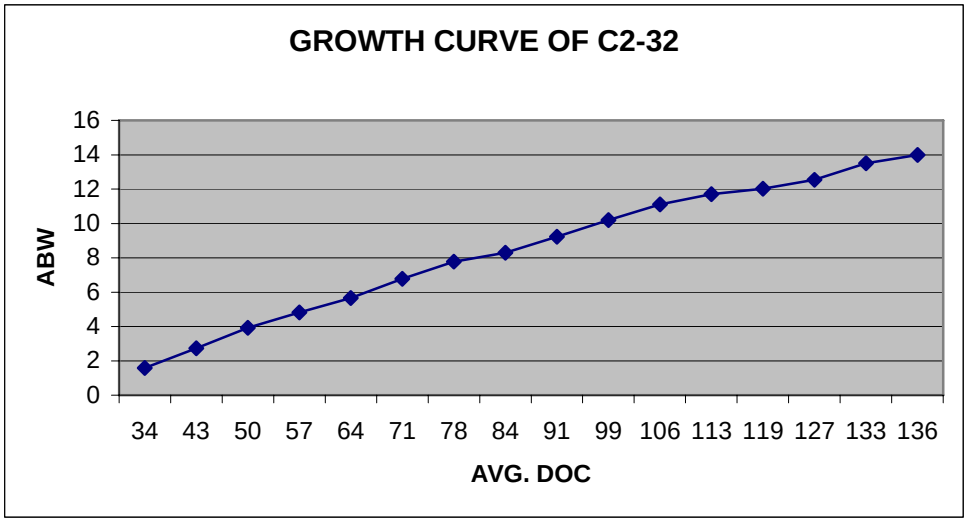
POND NO.	INITIAL STOCKING	DATE OF STOCKING	DATE OF HARVESTING	DOC	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	CUM. FEED (KG)	FCR
1	**180000**	**20.04.2006**	**10.09.2006**	**143**	**17.42**	**64.61**	**2026**	**3415**	**1.69**
2	**180000**	**20.04.2007**	**09.09.2006**	**142**	**16.31**	**75.14**	**2206**	**3567**	**1.62**
3	**180000**	**20.04.2008**	**10.09.2006**	**143**	**17.29**	**75.19**	**2340**	**3897**	**1.67**
4	**180000**	**20.04.2009**	**09.09.2006**	**142**	**16.1**	**79.57**	**2306**	**3529**	**1.53**
5	**180000**	**21.04.2006**	**07.09.2006**	**140**	**17.09**	**74.49**	**2281**	**4036**	**1.77**
6	**180000**	**21.04.2006**	**08.09.2006**	**141**	**14.25**	**97.86**	**2511.5**	**3988**	**1.59**
7	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
8	**NURSERY**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
9	**180000**	**21.04.2006**	**30.08.2006**	**133**	**15.62**	**79.9**	**2245.5**	**3812**	**1.70**
10	**180000**	**21.04.2006**	**05.09.2006**	**138**	**15.33**	**81.1**	**2238**	**3480**	**1.55**
11	**180000**	**24.04.2006**	**05.09.2006**	**138**	**14.84**	**45**	**1200**	**2015**	**1.68**
12	**180000**	**24.04.2006**	**03.09.2006**	**136**	**15.34**	**83.86**	**2316**	**3614**	**1.56**
13	**180000**	**27.04.2006**	**02.09.2006**	**135**	**13.95**	**85.14**	**2137**	**3366**	**1.58**
14	**180000**	**27.04.2006**	**29.08.2006**	**132**	**14.33**	**80.56**	**2075**	**3026**	**1.46**
AVERAGE	-	-	-	139	15.66	76.87	**-**	-	1.62
S.D.*	-	-	-	3.87	1.21	12.73	-	-	-
TOTAL	2160000	-	-		-	-	25882	41745	-

SIZE GRADATION OF HARVEST SHRIMPS (HEAD-ON) OF C3-25

POND NO	GRADES							OTHERS	TOTAL
	40-50	50-60	60-70	70-80	80-100	100-120	>120		
1*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	2026
2*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	2206
3*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	2340
4*	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	2306
5	**130**	**1162**	**970**	**6.5**	**2**	**-**	**-**	**10**	2280.5
6	**-**	**94**	**1066**	**1329.5**	**22**	**-**	**-**	**-**	2511.5
7	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
8	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
9	**-**	**694**	**1124**	**395.5**	**32**	**-**	**-**	**-**	2245.5
10	**-**	**604**	**984**	**647**	**3**	**-**	**-**	**-**	2238
11	**22**	**148**	**610**	**370**	**48**	**-**	**-**	**2**	1200
12	**-**	**622**	**1106**	**538**	**50**	**-**	**-**	**-**	2316
13	**-**	**104**	**942**	**796**	**290**	**4**	**-**	**1**	2137
14	**-**	**260**	**936**	**640**	**211**	**24**	**-**	**4**	2075
TOTAL	152	3688	7738	4722.5	658	28	-	17	25882

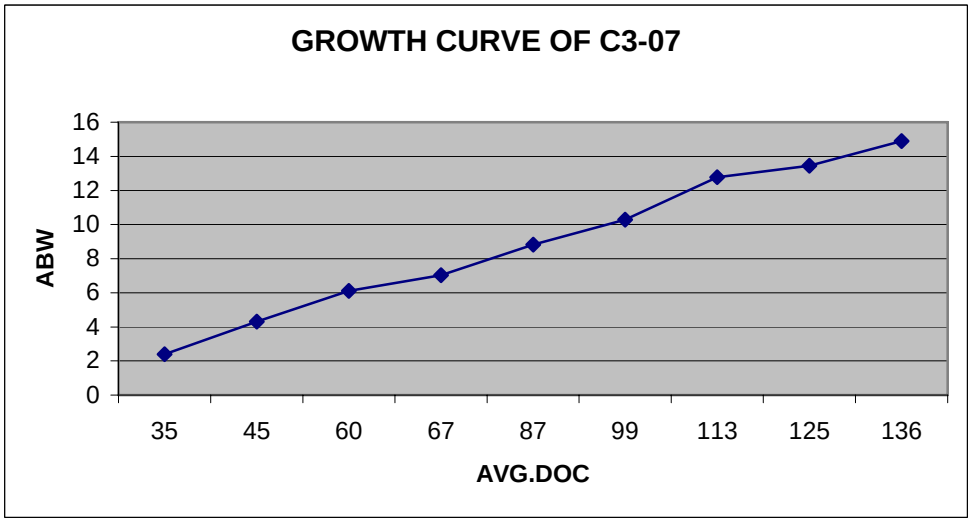
* REPRESENTS PROCESSING DETAILS REGARDING BREAK-UP GRADES NOT AVAILABLE TILL DATE.

GROWTH PARAMETER GRAPHS

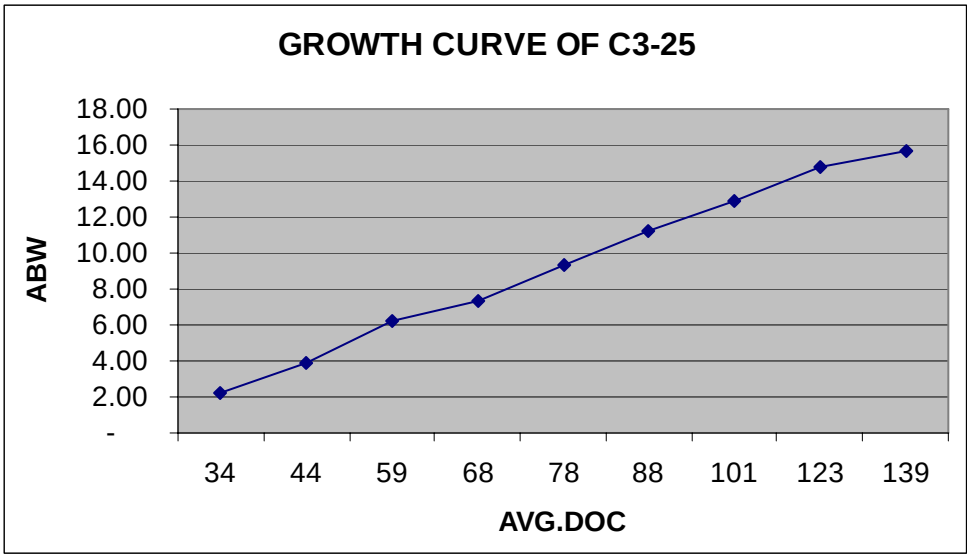


NOTE: The overall growth pattern for this farm was seen below Gowater standard due to many factors i.e. frequent pump damages and low water exchange rates, high organic load, some batches of Chineh Grower feed with poor quality level, poor pond management during initial DOC's, etc. Due to the change of feed from 127 DOC till end (used Havorrash and Le Gouessant for a period of ten days), the figure showed an increasing trend. * Quality feed plays a very important role in overall shrimp growth and FCR and ultimately decides profitability.

FIGURE IX



NOTE: This farm faced heavy problems with pump getting damaged for more than 10 days, mortalities occurred due to DO shortages, unstable water quality with high pH values, high organic load in pond bottom, no technical manpower for farm management, etc. during mid of the crop as shown in the figure. Again, the growth curve showed a retarding trend at 113 to 125 DOC which can be correlated with poor feeding ration without proper check tray observation on a daily basis.



NOTE: The farm showed better growth curve steady growth of shrimps except during 60 DOC and 130 DOC due to unavailability/shortages of farm workers, supervisors and even farm technician for effective management. Instead of regular pump damages, due to good slope of the pond bottom, organic load/black soil was discharged properly every time water exchanges were done. Poor feed quality of some batches of Chineh feed (Grower) may also cause growth retardation towards the end.

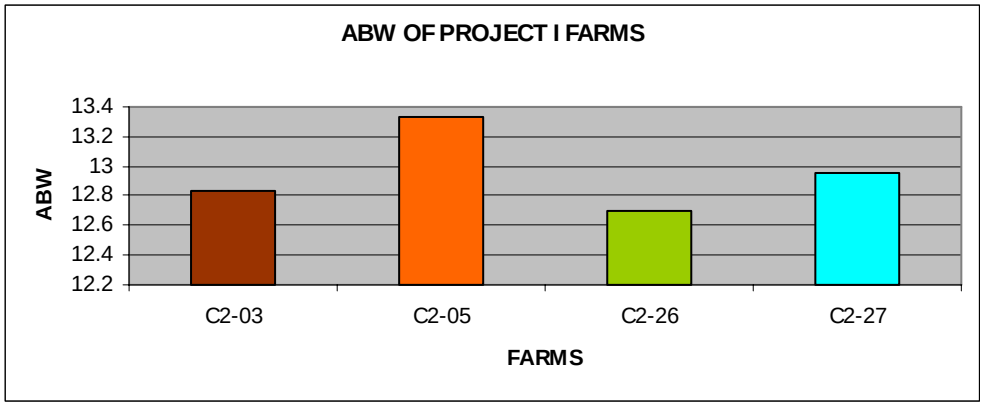
COMPARATIVE STUDY OF PROJECT FARM PRODUCTION

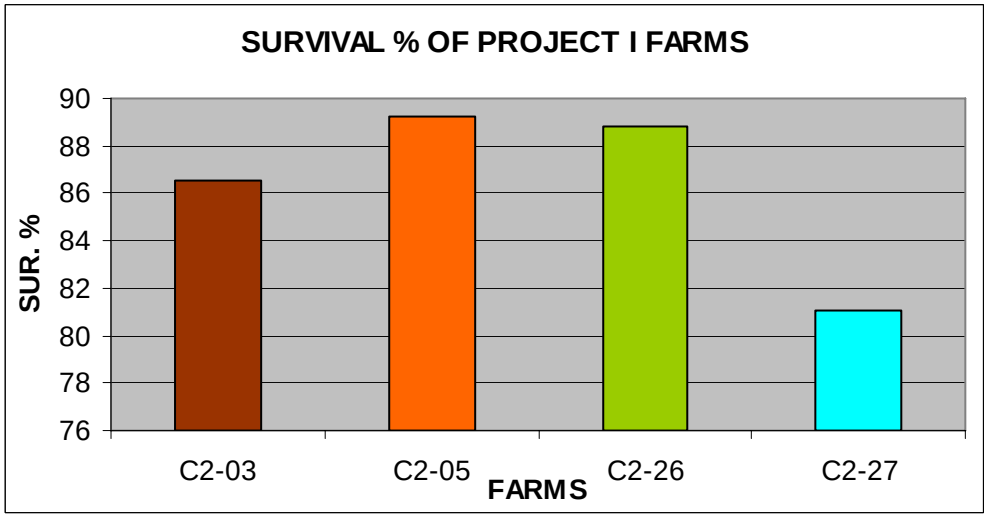
FARM NO.	STOCKING (M.)	AVG. DOC	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	CUM. FEED (KG)	FCR
C2-03	2.16	127	12.84	86.53	24028	39018	1.62
C2-05	2.16	123	13.33	89.22	25687	40288	1.57
C2-26	2.16	127	12.7	88.78	24351	38496	1.58
C2-27	2.16	129	12.96	81.07	22697	36500	1.61
TOTAL	8.64	-	-	-	96763	154302	-
AVERAGE	-	127	12.96	86.4	-	-	1.59

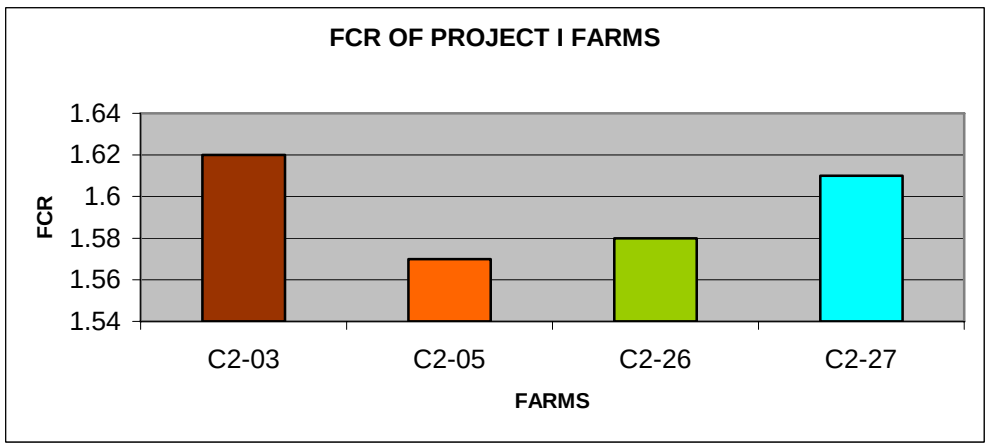
COMPARATIVE STUDY OF PROJECT HA PRODUCTION

FARM NO.	STOCKING (M.)	AVG. DOC	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	HA	KG/HA
C2-03	2.16	127	12.84	86.53	24028	13,2	1820,3
C2-05	2.16	123	13.33	89.22	25687	13,2	1945,9
C2-26	2.16	127	12.7	88.78	24351	13,2	1844,7
C2-27	2.16	129	12.96	81.07	22697	13,2	1719,4
TOTAL	8.64	-	-	-	96763	52,8	1832,6
AVERAGE	-	127	12.96	86.4	-		1832,6

COMPARATIVE STUDY OF GROWTH PARAMETERS OF PROJECT





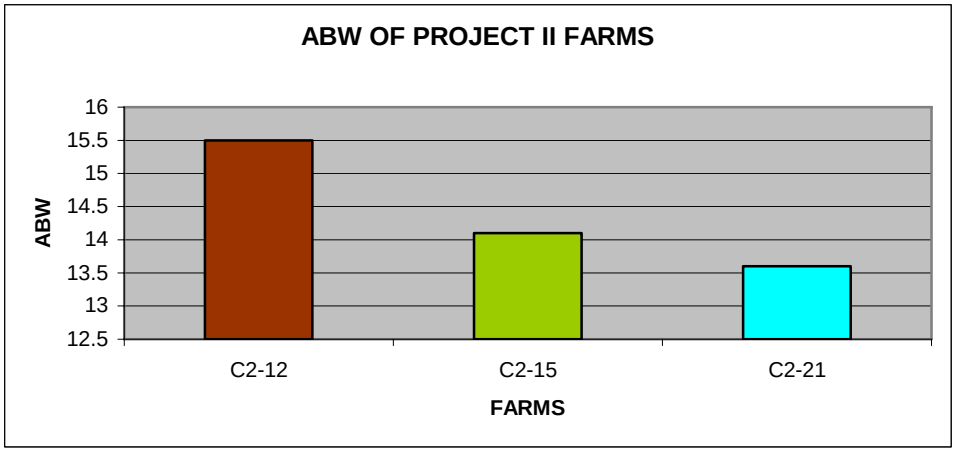


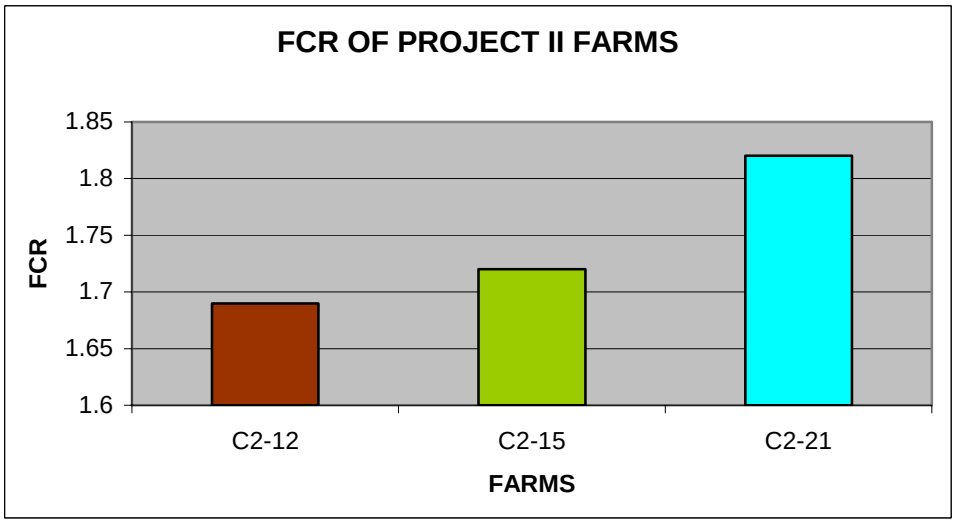
COMPARATIVE STUDY OF PROJECT

FARM NO.	TOTAL STOCK (M.)	PRESENT STOCK (M.)	DOC	CUMULATIVE FEED (KG)	ABW (GM)	BIOMASS*			FCR
						HARVESTED (KG)	PRESENT* (KG)	TOTAL (KG)	
C2-12	3.36	2.82	131	59413	15.5	6222	28976	35198	1.69
C2-15	3.36	2.94	125	53104	14.1	4836.5	27053	31890	1.72
C2-21	3.36	2.67	128	54774	13.6	7854	22275	30129	1.82
TOTAL/	10.08	8.43		167291		18913	78304	97217	
AVERAGE			128		14.4				1.74

- represents estimated values

COMPARATIVE STUDY OF GROWTH PARAMETERS





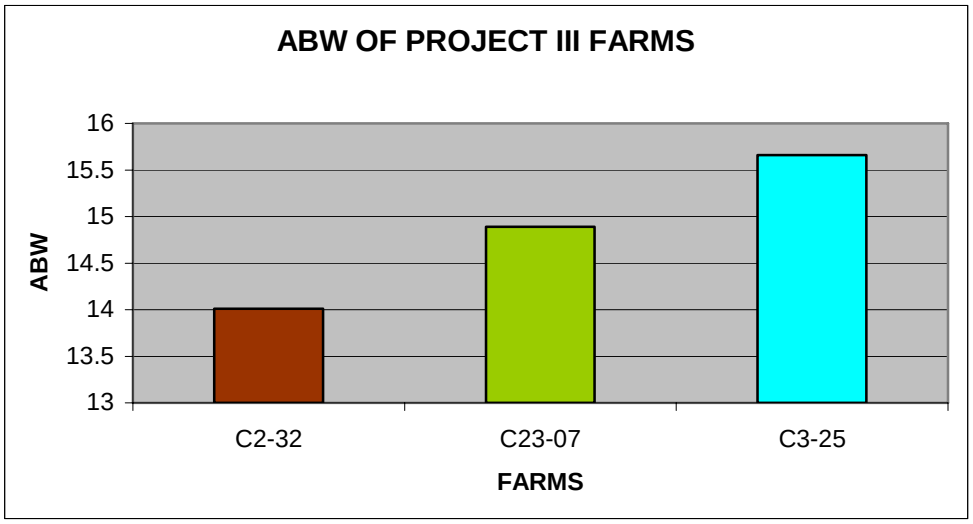
COMPARATIVE STUDY

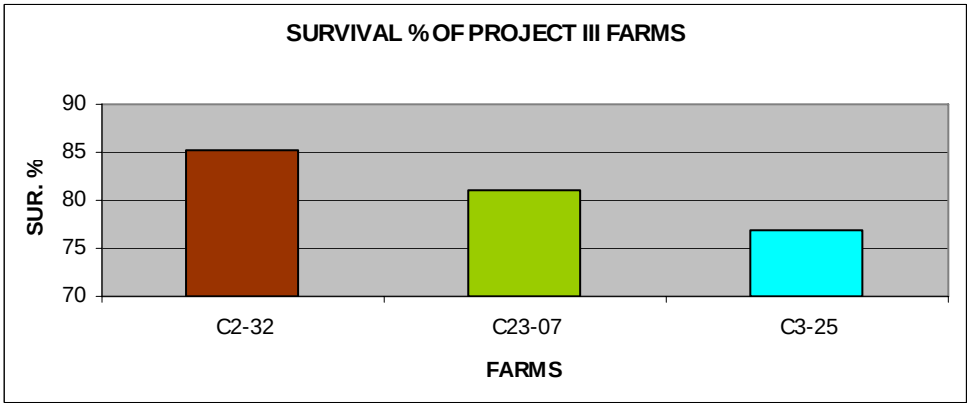
FARM NO.	STOCKING (M.)	AVG. DOC	ABW (GM)	SURVIVAL* (%)	BIOMASS* (KG)			CUM. FEED	FCR
					ACTUAL	EST.	TOTAL		
C2-32	2.16	136	14	85.26	9902	11592	21494	33832	1.57
C3-07**	2.16	136	14.9	81.12	-	-	26036	44664	1.72
C3-25	2.16	137	15.7	76.87	25878	-	25878	41745	1.62
AVERAGE	-	136	14.9	81.08	-	-	-	-	1.64
TOTAL	6.48	-	-	-	35780	11592	73408	120241	-

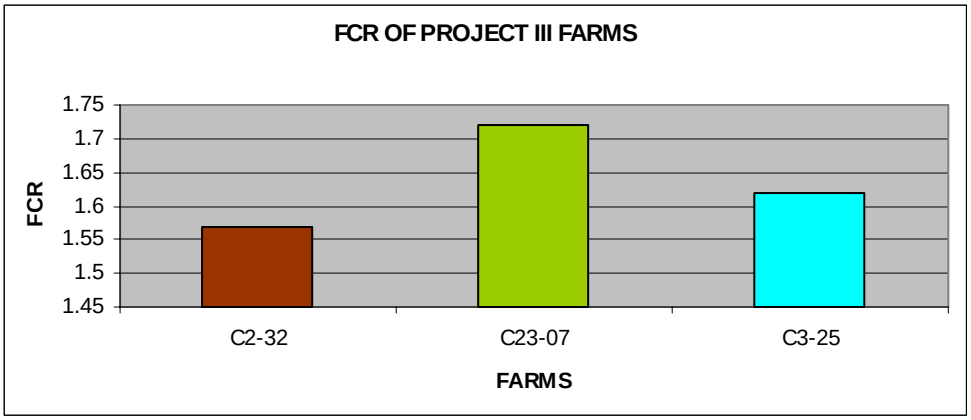
* represents estimated values

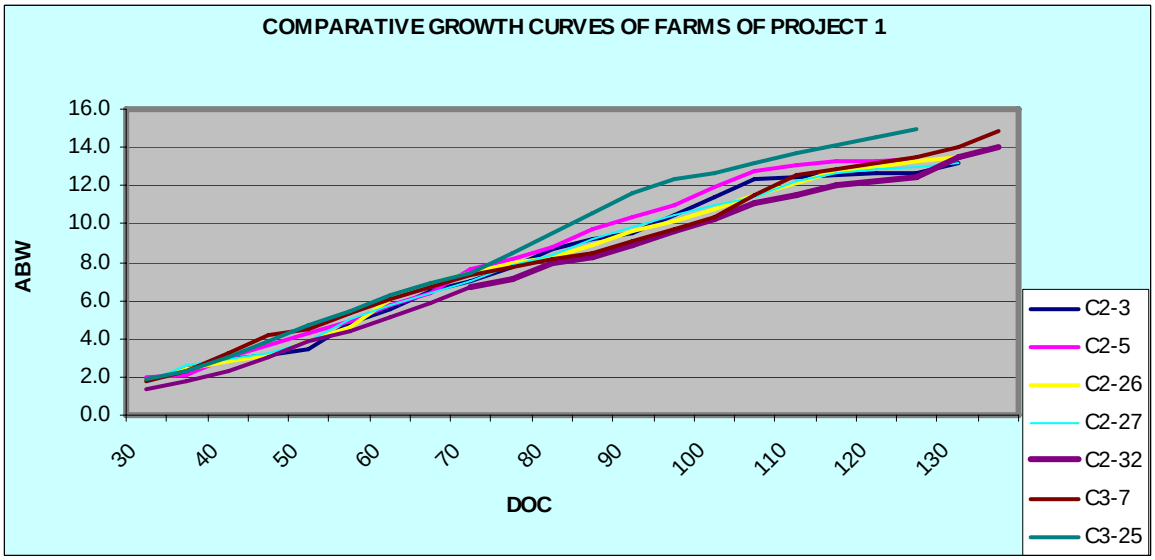
** represents harvesting not yet started

COMPARATIVE STUDY OF GROWTH PARAMETERS



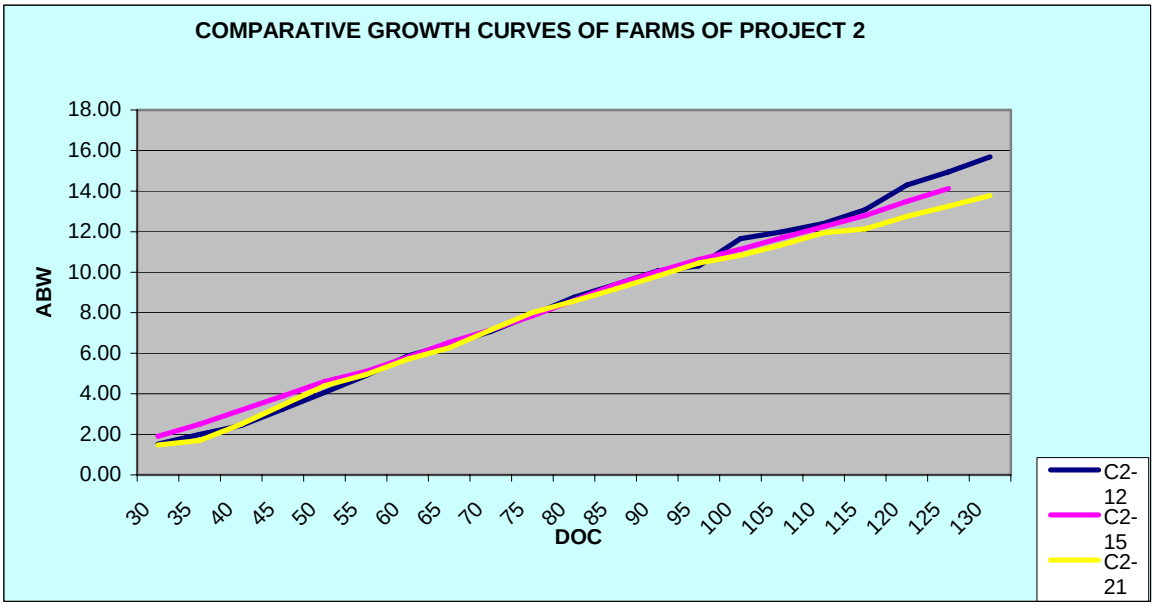






NOTE:

The farms used Chineh feed (Grower) up to the end showed a decreasing trend while the farm (C2-32) who changed to other brands towards the end showed better growth increment. C2-07 seen with poor management around 110 to 120 DOC (used Havorrash feed- performance not up to the mark as reported).



NOTE: Partial Harvesting was conducted in all these three farms having high initial stocking densities. The growths were maintained as such after partial harvesting.

Disease prevention

Regular shrimp health monitoring and assessment is done pond wise during check tray observations. Cast net observations are made in case of emergencies for a faster 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 the weekly reports.

The following are some of the parameters associated with shrimp health that was faced in all the project farms:

a) Plancton crash, lablab 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 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 the followings:
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.

Some of the common shrimp health disorders encountered within this 2nd Intermediate Period was as follows:

- Loss of appetite, white gut (muscle necrosis) and poor growth increment and little mortalities of shrimps observed due to occurrence of dinoflagellate bloom (release toxins) in couple of ponds of PROJECT I & II. Proper recommendations were given immediately for

the elimination of these deadly planktons (water exchange, application of lime and sanitizers) and addition of feed supplements to increase the appetite and growth.

- Dissolved Oxygen depletion with shrimp surfacing during early morning and asphyxiation was experienced in few ponds of PROJECT II farms before performing partial harvesting procedures. Biometry results showed poor growth increment during that week. Shrimps seen with loose shell, reddish appendages and empty gut. The main cause was high organic load deposits with black soil formation in the feeding zone. Other reasons can be correlated with high biomass, no aeration facilities except water exchanges done at periodic intervals without water circulation and waste removal by means of central drainage facilities. Immediate actions i.e. flow thorough, physical disturbances, application of potassium permanganate, bottom water exchanges, etc. were taken for recovery. Mass mortality not faced in any of the project ponds.
- Gill choke and gill swelling was observed in some shrimps by cast netting during routine check-up schedule in a single farm of PROJECT I. The main reason was the delay in water exchange for more than one week due to pump damage helped in high black soil at bottom with ammonia formation. Sanitizer ($KmNO_4$ solution) application with repeated water exchange helped in complete recovery.
- Stress and soft shell presence in shrimps was found in a single pond of PROJECT III because of bacterial infection due to poor pond bottom. Loss of appetite and white gut was also noticed. It took some time for complete recovery of this situation. Repeated bottom water exchange method with high doses of lime application was followed to reduce the organic load.
- Luckily, not a single pond was affected with vibrio contamination during this 2^{nd} intermediate period. Water exchange schedule was strictly followed in all farms not giving the chance to these opportunistic bacteria species to dominate.
- Antennae cut with rough and brittleness of antennae in shrimps was observed during Biometry study in few ponds. This was a case of bacterial load at the pond bottom occurred due to over feeding and poor pond preparation before stocking. Shrimps looked inactive with delay in moulting cycles (dirty shell). Proper recommendations were made and recovered from this situation within a couple of days.
- Swollen gut was observed in shrimps in mostly one or two ponds mainly due to toxins released from blue green algal (BGA) population and dinoflagellate patches seen in the water surface. Developing a stable bloom, particularly diatomaceous species in pond water improved the situation.
- Hyper-pigmentation of exoskeleton was also experienced in a single pond of PROJECT II due to poor pond bottom condition (high organic load due to uneaten feed, faecal matter and dead planktons. Bottom flushing with CaO application with one moulting cycle over corrected this type of condition in shrimp.
- Partial gut and faecal matter not that of feed colour with frequent smaller cuttings was observed during check tray observation in some ponds of all PROJECT farms. High bacterial colonies in shrimp gut and poor pond bottom are the main reasons for the above symptoms. It was corrected with the inoculation of helpful bacterial populations and yeast mixed in feed into the shrimp gut and following high rates of water exchanges.

It was always recommended to all farms during field visits to go for some of the most important steps (BMP's) i.e.

- Good pond preparation
- Maintaining stable bloom with transparency between 30-50 cm
- Stronger PL and optimum stocking density
- Regular use of prebiotic media for development of helpful bacterial populations for both water/soil and shrimp gut

- Waste removal by efficient water exchanges (reducing the organic load) through proper filtration processes
- Maintaining optimum DO and pH levels
- Demand feeding by regular check tray observations
- Regular use of lime materials and correct use of sanitizers when required to culture healthy shrimps with minimal disease outbreak and increasing profitability.

Nursery management approach (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 lots of employment opportunity for the locals. However, many farmers in Iran are not so happy to go ahead with the international market.

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 favourable like in Baluchestan province. To achieve this, farmers need to go in for nursery system.

Advantages of nursery system:

- Annual/ha production increasing
- Increasing of PL demand (benefits for hatcheries);
- Increasing of feed (benefits for feeding plants)
- Reducing the risk of disease connected to high stocking density
- Ensuring good survival as shrimps are transferred at a bigger size.
- Improving of FCR

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

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 assistance has been organised for the farms in order to supply guidelines in each individual farms for the starting of nursery shrimp management. A workshop was also conducted at this regard at the 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:

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

- Do not use urea & phosphate for at least 2 days before stocking. If necessary, use molasses.

Fry selection & Stocking

- Select only PL which passes through both PCR & Stress test (salinity stress). PCR result can be obtained from IVO.
- 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 PL 12 (i.e. survival is less than 80%), perform the same test at PL 15 & 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 PL 15. Try to avoid PL above 18.

PL Stocking:

- Acclimatize PL to pond conditions (mainly for salinity & temperature) before releasing them into the nursery pond.
- For a better acclimatization, put all PL into a 500 litre capacity tank (or 2 pcs of 250 litre capacity tanks).
- Fill the pond water into another tank of same capacity kept at an elevated level.
- Now slowly add pond water from the tank into PL tank until salinity & temperature are equalized.
- Turn the water in the PL tank & siphon out PL in to the pond from sides of the PL tank
- Do not stock the dead & weak PL which accumulate at the centre of the PL tank.
- Better use Oxygenation (using oxygen cylinders) for better survival.
- Normal time for acclimatization is 10 minutes for every 1 ppt / 1 ºC 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**	
		1ST GROOVE	**2ND 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

- 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 have to be transferred. Survival should be more than 90% after 2 days. If not, check water quality & correct it.
- Check moulting. It should be less than 10%. If it is more postpone the transfer.
- Keep all materials ready.
- Start transfer by 4 – 5 pm.
- Check DO every 30 minutes. DO should not be < 2 ppm.
- Take ABW at every 50 / 100 kg transferred.
- Perform post-hapa test.
- Weigh the dead shrimps in the survival net next day.
- 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 of the present crop.

PARTICULAR OF HARVERST OF NURSERY PONDS

FARM NO.	POND NO.	TOTAL PL STOCKED	DOC AT HARVEST	ABW (GM)	SURVIVAL (%)	BIOMASS (KG)	TOTAL FEED (KG)	FCR	DATE OF HARVEST
C2-03	P7	1250,000	50	2.3	85	2444	2156	0.88	31/8/06
	P8	1250.000	51	2.2	82	2255	2450	1.09	13/9/06
C2-05	P7	750000	43	2.2	62	1022	1576	1.54	5/9/06
	P8	1100000	53	2.7	83	2340	2400	1.03	18/9/06
C2-26	P7	1000000	55	2.6	86	2239	2387	1.07	10/9/06
	P8	1000000	52	2.4	92	2196	2145	0.98	8/9/06
C2-27	P7	1100000	50	2.4	82	2158	2272	1.05	11/9/06
	P8	1100000	44	2.6	80	2264	1802	0.80	4/9/06

Stakeholders approach (Task 2)

R. Ugolini

CIRSPE Project Manager
Chabahar/ Project Task 2

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. Either, implementers, facilitators beneficiaries or adversaries can be also defined stakeholders.

The importance of stakeholder analysis is related to the fact that different groups have different capacities and interests; it is crucial to explicitly, understand and recognize these groups/interests not only during the objectives/problems identification but, above all, for strategy identification and selection.

Stakeholders analysis is very useful during the project implementation, considering the "flexibility" that is necessary to adopt for a developing project.

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

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 tool 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.

It is shared opinion that it is crucial to organise consultations between stakeholders of the project, considering the all stage of the shrimp sector, from the hatcheries to the ponds, to the processing plants. Sector actors can benefit from an appropriate development strategy aiming at increasing income, to gain the economic value of the production, in order to generate new and wider employment in the project area.

The beneficiaries of the project are those who benefit in whatever way from the implementation of the project:

- 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.

- 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, bank system.

The proposed 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 ANALYSIS MATRIX			
Stakehoders basic characteristics	Interests/problems	Capacity/motivation	Actions to address stakeholders interests
Gowater private sector 1.900 ha for rearing; Low income; Marketing constrains; Low association level;	• Increase Production • Employment; • Disease control; • Market organisation	• Reduce production cost; • Increase the profit • Feed quality/price • Market control	• Technical assistance 2 cycle, water quality aerators system, training. • Shilat support • Bank system support • Farm Association
Hatchery farmers Local hatchery; Low production Low association level	• Increase PL production • Disease control	• Reduce production cost • Increase the profit	• Shilat support • Bank support • Association
Feed production Feed quality and price;	• Increase production • Employments; • Feed quality/price	• Increase profit and production	• Bank support • Association
Bank system Commercial approach; Development approach;	• Credits	• Increase credit value • Increase financed project	• Sector technical analysis, development project, Shilat support
Shilat Technical know how; Extension service Development approach	• Sector development • Technical approach	• Government budget • International budget • Financed projects	• Development plan and strategies
Iranian government Development approach Policy maker	• Rural development • Employments • Policy development approach	• Province economy support • Rural/Farm project	• Development plan and strategies

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., with the aim to compare the different results both from productive and economical point of view.

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 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.

Shrimp rearing development is strictly connected to seed production in terms of quality and quantity. Just to give an idea, Gowater complex with about 1.900 water ha can demand about 342 million of PL (1 cycle) to 684 million PL (2 cycles).
According to the CIRSPE/AFTM analyses the maximum production Province capacity is now (2005 and 2006) between 126 and 280 millions of PL.

It is evident that valid productive strategy for shrimp production can have positive effects on hatcheries in terms of PL production, income and employments.
The following table shows the existing hatchery in Sistan Baluchestan (January 2006).

The same methods foresees that the processing plant sector must be taken into consideration, considering its importance from marketing aspect.

Anyway, the project intend to use the rearing data of the productive experiences to elaborate shrimp development strategy in Sistan Baluchestan.

The Final Report of Chabahar activities (season 2006) will take into consideration both technical and economic aspects, such as remarked in the proposed index.

N	Hatchery	Manager	Price EU Mill. PL	Facilities	Management	Production conditions	Technicians
1	Abzi Parvar Chabahar	Madani	4400	Very good	Excellent	Ready	2 Indians since 6 years
2	Meigo Kesht	Eskandari	4400	Very good	Good	Ready	Changing
3	Anfal Behar	Morravej	na	Very good	Poor	Ready	Changing
4	Arbian Bahar	Nejad Labbaf	4170	Excellent	Good	Under repayment	Changing
5	Afzoon Sazan	Mirhashemian (Mrs)	na	Average	Average	Maintenance	Changing
6	Abzi Parvar Bahar	Arabi	3825	Good	Good	Under repayment	Indians since 3 years
7	Abgin Hamoon	Salehi	na	Closed	Na	Closed	na

PRODUCTION (million/PL)

N	Hatchery	2003	2004	2005	2006 (prevision)
1	Abzi Parvar Chabahar	40	50	60	80
2	Meigo Kesht	Na	na	na	50
3	Anfal Behar	Na	na	na	Na
4	Arbian Bahar	44	24	closed	70
5	Afzor Sazan	Na	na	na	na
6	Abzi Parvar Bahar	23	4	16	80
7	Abgin Hamoon	Na	Na	Na	Na

Na: not available

Processing farms

PROCESSING PLANTS IN CHABAHR

	COMPANY	MANAGER	LOCATION	CAPACITY /DAY		PERSONNEL				COLD STORAGE	EC	PHONE	ACTIVE IN SHRIMP
				FISH	SHRIMP	WORKER	STAFF	GRADUATED	TECHNICIAN				
1	**TAZE ABZI**	**ELAHI**	**PASABANDAR**	**40**	**15**	**32**	**2**	**1**	**1**	**300**	**740**	**33330035**	*****
2	**TABAN DARYA**	**TOOSI**	**BERIS**	**40**	**20**	**10**	**4**	**-**	**3**	**500**	**741**	**88310053**	*****
3	**JAHAN SETARE**	**ABROSHAN**	**RAMIN**	**40**		**19**	**2**	**2**	**1**		**2**	**2220780**	
4	**KONARAK BOROODAT**	**YAR AMIRI**	**KONARAK**									**3550 KONARAK**	
5	**MAKRAN**	**PARSA**	**TANG**			**22**	**6**	**1**	**1**			**2221739**	
6	**MAH DARYAYE KHALIJ**	**JAHANGIRI**	**PASABANDAR**	**10**	**30**	**4**	**1**	**1**	**1**		**13642**	**3401 PASABANDAR**	
7	**BERIS BOROODAT**	**ALIPOOR**	**BERIS**			**32**	**7**	**1**	**2**			**88303600**	
8	**SARBANAYE CHABAHAR**	**FALLAH**	**KONARAK**	**20**		**12**	**3**	**1**	**1**			**88952724**	
9	**DOLFINE PASABANDAR**	**SALMANI**	**PASABANDAR**		**10**					**700**			*****
10	**SEID AZMA**	**TAVASOLI**	**RAMIN**	**20**		**14**	**1**	**-**	**4**				
11	**713 TANG**	**ZEBARJAD**	**TANG**			**42**	**2**	**-**	**1**			**09123470039**	
12	**HAMOOR**	**BARANI**	**CHABAHAR**			**47**	**2**	**-**	**1**		**822**	**4445641**	
13	**BALOOCHESTAN**	**ADIB ZADEH**	**CHABAHAR**	**40**		**23**	**9**	**1**	**1**			**88728997**	
14	**DORRIN MEIGOO**	**ESKANDARI**	**KONARAK**	**12**	**10**	**15**	**6**	**3**	**1**	**200**		**88726776**	
15	**IRAN GOWATER**	**HOJAT PANAH**	**PASABANDAR**	**60**	**10**	**16**	**3**	**-**	**1**	**420**		**2221660**	*****
16	**DARYAYE NILGOON**	**NIK NEJAD**	**PASABANDAR**	**40**	**10**	**12**	**3**	**-**	**1**	**400**	**821**	**3331 PASABANDAR**	*****
17	**SUNDIZ TRADE**	**RAHMANIFAR**	**RAMIN**			**6**	**5**	**-**	**4**		**816**	**88304197**	
18	**SHAYAN**	**SAFAVI**	**KONARAK**		**5**	**23**	**30**	**5**	**6**			**88973265**	
19	**MIAMY CHABAHAHR**	**AINE AFROOZ**	**KONARAK**	**3**	**0.5**	**6**	**1**	**1**	**2**			**3338242**	

Proposed economic approach

POND FARM (Single crop, 2 cycles, high density)
HATCHERY
PROCESSING FACTORY

Farm description
Ha
Water ha
Stocking density/ha
Rearing cycle
Production/ha
Total production
Technicians
Workers
Bank and annual interest

1. INVESTMENT COSTS

1.1. pond construction	
1.2. water pumps	
1.3. generator	
1.4. office/store	
1.5. vehicles	
1.6. computer	
1.7. others	

2. FIXED COSTS

2.1. depreciation 10 years (farm construction)	
2.2. depreciation equipments 5 years	
2.3. annual bank interest	

3. VARIABLE COSTS

3.1 shrimp PL	
3.2. feeding	
3.3. electricity and fuel	
3.4. technicians n……	
3.5. workers n…….	
3.6. fishing net	
3.7. ice	
3.8. others	
3.9. others	

4. INCOME

4.1. annual production tons ……	RIALS…..
4.1. taxis	

5. PROFIT

FINAL REPORT PROPOSAL (CONTENTS)

SHRIMP REARING
GOWATER COMPLEX
MARCH-NOVEMBER 2006

PROJECT TASK 2

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- 1.1 Province and location
- 1.2. The shrimp sector in Iran
- 1.3. Shrimp sector in Sistan Baluchestan
- 1.4. Sector constrains (problems)
- 1.5. Technical approach in Gowater

2. OBJECTIVE

3 EXPECTED RESULTS

4. COMPONENT DESCRIPTION (methodology)
- 4.1. Technical assistance for private sector
- 4.2. Productive experiences
  - 4.2.1. Single crops
  - 4.2.2. 2 cycles
  - 4.2.3. High stocking density
- 4.3. On job training

5. RESULTS TECHNICAL ASSISTANCE
- 5.1. Private sector approach
- 5.2. Rearing Protocol
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  - 6.1.7. Economic preliminary data
- 6.2. Two cycle (farms C2/3; C2/15; C2/26; C2/27);
  - 6.2.1. Stocking data
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6.3. High stocking density (farms C2/12; C2/15; C2/21)
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- 6.2.4. Growth
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- 9.1. Main constrains
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ANNEX

THE SPECIE (*Penaeus indicus*)
HATCHERIES LIST/CAPACITY IN SISTAN
HATCHERY MANAGEMENT DESCRIPTION (look NACA web, ecc.)
DETAILED REARING DATA (our activities)
PICTURE
MARKETING APPROACH DESCRIPTION IN GOWATER (Processing factory list/capacity in Sistan)
ECONOMIC DATA

List of participants
(Chabahar and Gowater meetings)

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