WAGENINGEN UR
For quality of life




Land, Water and Ecosytems Management in the Khrisna River Basin

Report of the inception visit and stakeholder consultation workshop

September 15-23, 2006, Andhra Pradesh, India

Willem Brandenburg – Plant Research International
Ingrid Gevers – Wageningen International
March 31, 2007

TABLE OF CONTENTS

1 BACKGROUND

India, as the world's major irrigating country uses the largest share of its water resources for irrigation purposes. The demand for water from both the agricultural and the non-agricultural sectors is growing rapidly, causing an increased pressure on available water resources. In many areas overexploitation of the resources and environmental degradation are already experienced. The national and state governments of India, therefore, face huge challenges in water management.

The project "Land, Water and Ecosystems management in the Krishna River basin (LWEM)" envisages to show the potential benefits of allocative water management as a possible (future) alternative for present water management practices. The hypothesis that a change in water management practices can lead to a significant increase in overall agricultural productivity, whilst offering opportunities for environmental reconstruction, will be investigated. The LWEM project is funded by the Ministry of Agriculture, Nature and Food Quality (LNV) of the Government of the Netherlands and supports the LNV policy on socially, economically and environmentally sustainable use of water, with focus on decision support in water allocation, improved water productivity in agriculture and combating (deltaic) degradation and salinisation.

Allocative water management may lead to the introduction of entirely new, innovative farming systems. Although most project activities will be implemented upstream, the coastal zone of the Krishna River estuary will also be studied to identify existing and potential problems resulting from land and water management in the catchment. The long term objectives of this coastal component of the Khrisna river basin project are formulated as follows:

- Analyse the current situation with respect to coastal aquaculture (adverse impacts, existing issues and conflicts)
- Assess the impact of land use activities upstream on coastal resources
- Identify opportunities for a wise use of the coastal zone (land & marine resources) balancing ecological values with economic benefits and social interests (triple P approach)

In 2006 the coastal project activities were built around the exchange of knowledge about innovative farming systems based on salt water agriculture. It was explored whether salt water agriculture could be a potential alternative for sustainable biological production in the saline fringes of the lower Khrisna river basin.

The visit conducted from September 15 till 23, 2006 therefore focused on the aquaculture and farming practices currently being implemented in the catchment of the Khrisna river basin. The specific objectives of the visit were to:

- Organsise a local consultation meeting in which various stakeholders will present the current situation of land and resource use from their perspective.
- Visit various sites in the Khrisna river basin delta (Guntur district & Khrisna district) to assess the present situation with respect to coastal aquaculture and farming systems.
- Identify possible partners for the development of a proposal for salt water farming in the Khrisna river basin delta.

Based on the outputs of the stakeholder consultation workshop and the discussion with stakeholders and the Royal Netherlands Embassy in Delhi, a project proposal towards a tailor-made coastal zone development in the catchment area of the Krishna river basin is to be formulated in 2007. The summary of activities implemented during the trip can be found in Annex 1.

2 STAKEHOLDER CONSULTATION WORKSHOP

2.1 Workshop approach

At September 21, a one day stakeholder consultation workshop was held in Machilipatnam, a town located in the delta of the Khrisna river basin. The workshop and the field visits were organised in partnership with Dr. Ram Ramasubramanian of the Swaminathan Foundation based in Chennai. Dr. Ramasubramanian has extensive experience in mangrove conservation and management in Andhra Pradesh, Orissa and Tamil Nadu.

The purpose of the workshop was to facilitate a multisectoral dialogue between various stakeholders being responsible for management of coastal resources and/or depending on them for their livelihood or research activities. The programme can be found in Annex 2.

The workshop followed an interactive participatory approach which enabled a broad discussion between the participants. A variety of methods and tools such as brainstorming, groups work, field visit, presentations etc. were used to facilitate the workshop process and to encourage active participation. Individual and group outputs were shared and discussed with the participants in plenary sessions. Hence, this way the outcome is not owned by the facilitator or a few individuals but by all participants

Twenty eight participants attended the workshop. Representatives of the local government (fisheries, agriculture), the Marine Products Export Development Authority (MPEDA-NACA), fish farmers, Swaminathan Foundation and ANGRAU University were represented. They all first shared their interest in the coastal zone of the river basin, the problems encountered and possible solutions to overcome them. The list of participants is included in Annex 3.

Groups work & presentation of the outputs

Willem Brandenburg then introduced new concepts on salt water farming. Its applicability as alternative income generating livelihood option in the catchment area of the Khrisna river basin was discussed. Experiences and lessons learned in the presently on-going "Zilte Zoom" project, a project on saltwater agriculture in the Dutch coastal zone were shared. This saline fringe is like the coastline in India intensively used for agricultural production, fisheries, aquaculture, recreation and nature values. As so often these different demands can lead to conflicting claims. The "Zilte Zoom" project supports the input of the Ministry of Agriculture, Nature & Food quality to find sustainable solutions for strengthening the coastal zone in the field of nature, landscape and recreation.

After the presentation the workshop explored the possibility for the introduction of saltwater agriculture in the Delta of the Khrisna river basin and discussed which steps to take next in the further development of this initiative.

In the afternoon a visit was made to mangrove areas and fish ponds at the coast in Khrisna district. Due to time constraints Guntur district could not be visited.

2.2 Workshop outputs

The consultation workshop provided a platform for key stakeholders to give direction and critical inputs to the activities to be planned under the coastal component of the LWEM project. After briefly introducing themselves, the participants were divided according to stakeholder groups; local government (agriculture, fisheries and planning), the Marine Products Export Development Authority (MPEDA-NACA) and fish farmers, MS Swaminathan Foundation, and the Ancharaya N.G. Agricultural University (ANGRAU).

Each stakeholder group was asked to discuss and present the answers to the following points:
1. discuss and list down the main activities each individual or organisation is involved in
2. indicate the location of work on a map. The fish farmers were asked to indicate operational and abandoned ponds
3. identify the main problems and issues faced in the coastal area
4. list possible solutions or initiatives that have already been initiated to counteract the problems.

The workshop outputs can be found in Annex 4.

Issues & problems
The largest problems faced in the coastal area according to all stakeholder groups are related to aquaculture practices. Lack of farming knowledge, management skills and farming inputs, such as fingerlings and infrastructure, result in diseases, poor growth rates and a low income of the fish farmers. Conversion of mangroves for agriculture, aquaculture and salt pans results in saline soils and loss of biodiversity due to environmental degradation. National calamities such as cyclones and floods have large impact on the coastal ecosystem and the people depending on them. The Khrisna river being one of the most highly utilized rivers in peninsular India, has seen a reduction in fresh water flow over a period of time, which has had a large impact on the growth an regeneration of mangroves.

Insufficient technical support is given by the government to the fish farmers to improve their aquacultural practices. Other land-use activities such as agriculture cause pollution and drainage of the tidal areas is problematic.

Possible solutions and activities undertaken this far
MPEDA-NACA has responded to the problems encountered by shrimp farmers by developing a set of 'Good Management Practices" for shrimp farming taking into consideration the situation of Andhra Pradesh, the major state producing aquaculture shrimps fro export. These GMPs were put into place in 10 different farmer ponds through a demonstration programme which proved to be very successful with 8 out of 10 ponds recording profits despite the disease outbreaks. The demonstration was also successful since no antibiotics or banned chemicals were used in the production cycle.

Based on the success of the GMPs the concept of village participatory shrimp farming was developed in 2003. Recommended strategies were promoted to be adopted by a wider section of the farming community in a particular locality. The GMPs were fine tuned to suit the conditions of the locality to quality and lead to the development of Better Management Practices (BMPs). The individual farmers joining the demonstration programme are given the freedom to adopt the BMPs to his own capacity, farm conditions and financial resources. The participatory farming approach also aims to organize the local farmers in so called 'self-help groups'.

The MPEDA-NACA programme proves itself to be very successful and has been well appreciated by all stakeholders including farmers, input suppliers, development agencies and exporters. For more information, brochures and technical leaflets see http://www.mpeda.com

ANGRA University conducts research on salt tolerant crops such as rice, pulses and vegetables. They also look on ways to improve the drainage networks.

In Andhra Pradesh, the MS. Swaminathan Research Foundation (MSSRF) jointly with village level institutions and the Forest Department has restored large areas of degraded mangrove wetlands which has lead to an increased biodiversity in the area such as fish and crab resources. The restoration activities were build on the results of floristic studies, vegetation surveys and participatory methods such as transect mapping, resource mapping and historical analysis which were entered in a GIS database. A process of joint mangrove management has been initiated in Tamil Nadu, Andhra Pradesh and Orissa involving local village in the management and conservation of the mangrove surrounding their communities. MSSRF has documented the results of their studies, community development activities and mangrove restoration approach in a number of manuals, reports, guides and prepared several volumes on Mangrove wetlands in India (www.mssrf.org).

2.3 Field visits

The day before the workshop was implemented visits were made to the research station and trial fields of the ANGRA University and the District Agricultural Advisory & Transfer of Technology Centre (DAAPTT). ANGRAU executes various trials with local varieties to test their salt tolerance levels. They have now identified a number of salt tolerant rice varieties that perform well under the local conditions.

Trials to test salt tolerance of rice varieties at the ANGRAU research station

Visits were paid to an operational, an abandoned fish pond and a pond now used for rice cultivation.

Operational fish pond

Abandoned fish pond

Rice cultivation in fish pond

The lower catchment of the Khrisna river basin (first picture below) and the recently constructed bridge connecting Guntur and Khrisna district (picture shown at bottom of the page) were visited. A local newspaper conducted and interview on the objectives of the field visit and mission (See Annex 5).

In the afternoon of the stakeholder consultation workshop various sites in the coastal area of the river basin delta (Guntur district & Khrisna district) were visited to assess the present land-use (coastal aquaculture and farming systems) in the delta. A local fish harbour, mangrove stands and abandoned fish ponds now used for paddy culture were visited. Various mangrove species and associates were found.

Fishermen mending their nets

Mangrove associate species Sevusium portulacastrum

One of the mangrove associates found in the estuaries of the Khrisna river basin in Guntur and Khrisna district was *Salicornia brachiata*. This species is capable of growing in very high saline soils and can be grown as a commercial species in seawater farming as vegetable salad and edible oil can be extracted from the seeds.

Mangrove associate: Salicornia brachiata

Two fruits of mangrove species: Aegiceras cornoculatum (left) and Ceriops decandra (right)

3 NEW CONCEPTS AND THE KHRISNA RIVER BASIN

3.1 Sustainable biological production in the saline fringe of Andhra Pradesh

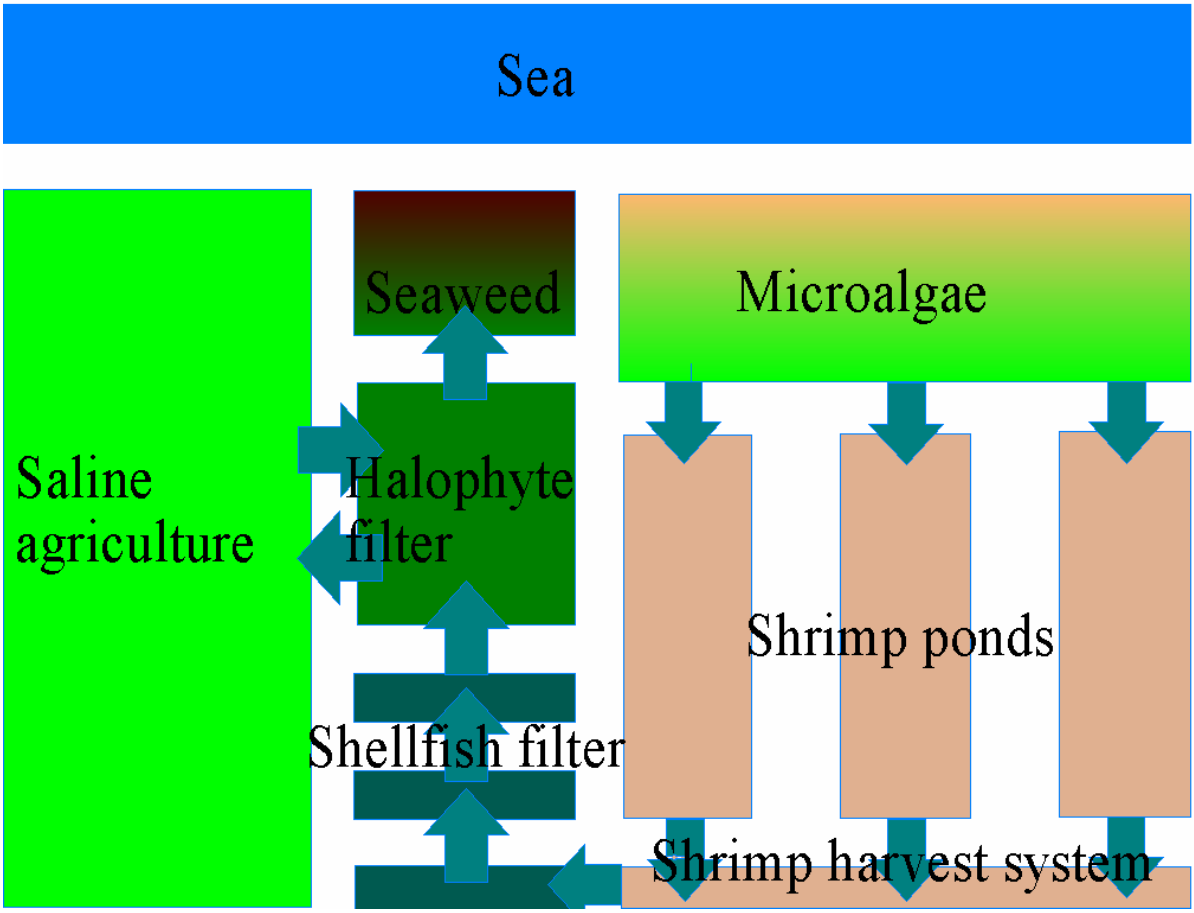
Salinisation in the coastal zones of Andhra Pradesh is increasing. Such is very obvious in the lower Krishna River Basin. Andhra Pradesh is the main state producing aquaculture shrimp for export purposes. Both larger companies and small scale farmers have invested in this business.
For the construction of ponds large parts of the natural coastal zone vegetation has been removed. Nowadays, most of the coastal mangrove vegetation has been converted to aquaculture ponds, salt pans and paddy fields.

However, coastal mangrove ecosystems are the natural nursing grounds for hundreds of aquatic species including economically important fish and shellfish. Mangroves play an important role in controlling erosion caused by flooding and storm surges. They also act as a barrier during cyclones and protect the coastline. Thus it is necessary to conserve the existing mangroves and plant mangroves where ever they can be grown near the shrimp ponds. Mangroves will also help in reducing the impact of sea level rise anticipated due to global warming and will protect the adjacent farming lands. A restoration programme for mangrove vegetations is now under study the M.S. Swaminathan Research Foundation for the East Coast of India, especially Orissa, Andhra Pradesh and Tamil Nadu.

Outbreaks of viral diseases are the major constraint to shrimp aquaculture production. White spot disease (WSD), vibriosis and loose shell syndrome are the most common disease problems in India. The most successful strategies for controlling diseases in shrimp ponds are based on a combination of prevention by exclusion, and Better Management Practices that focus on creating a healthy, non-stressful environment for the shrimp.

Outbreaks of diseases, fluctuating in market prices and lack of capacity, expertise and financial means have caused a lot of small scale farmers to look for alternative sources of income in Andhra Pradesh. Most of the shrimp farmers that participated in the workshop were involved or knew about the Village-Level Participatory Shrimp Farming introduced by MPEDA-NACA. They expressed their interest to improve their shrimp production through better management practices but were also eager to diversify their ways of income generation.

Integrated multitrophic aquaculture (IMTA)
In order to establish a sustainable biological production system one should follow the principle of integrated multi-trophic aquaculture (IMTA) i.e. with a closed nutrient cycle, with sanitary precautions and a good combination of low input and economic benefit. It is therefore necessary to combine both animal and plant production systems in such a way that the nutrients that come from the animal production systems are taken up by the plant production systems. The integrated system has to be designed in such a way that the dimensions of the different components meet the requirements for the mentioned closed nutrient cycle: saline water IN = saline water OUT. This condition is set by the combination of both a production system and coastal nature conservation, as laid down in the scheme below:



Andhra Pradesh has a coastal zone with a length of 600 km and has a potential ranging from 300,000 – 500,000 ha for integrated multi-trophic aquaculture.

3.2 Mariculture – Farming at sea

Farming at sea is felt to be something imaginary. However, when looking at issues such as food security and competing claims in the field of renewable energy, nature conservation and other societal functions, it is obvious that integration towards multifunctional land use alone can hardly meet all claims at the long run. At the same time the marine and coastal resources are still being used in a very similar way as centuries ago. The main human activities still being collecting, hunting, mining and dumping. Mankind thus threats the marine resources but overlooks the marine potential of triple P sustainable biological production: fish, crustaceans, shellfish, seaweeds and micro algae.

Keeping India's ambitions in the field of economic development, food production, renewable energy production, and at the same time conservation of its biodiversity in mind, mariculture may have great potential and will contribute through the combination of marine plant and animal production, especially in its coastal zones.

The coastal zone of Andhra Pradesh close to the mouth of the Krishna River is a location with a high potential for mariculture. The on-going shrimp production has resulted in the destruction of

mangrove ecosystems that now are understood to have an important function in coastal defence as well as breeding, nursing and feeding ground for marine organisms. Starting with mangrove restoration programmes, it is worthwhile looking at the possibility of including the establishment of seaweed farms in the development planning.

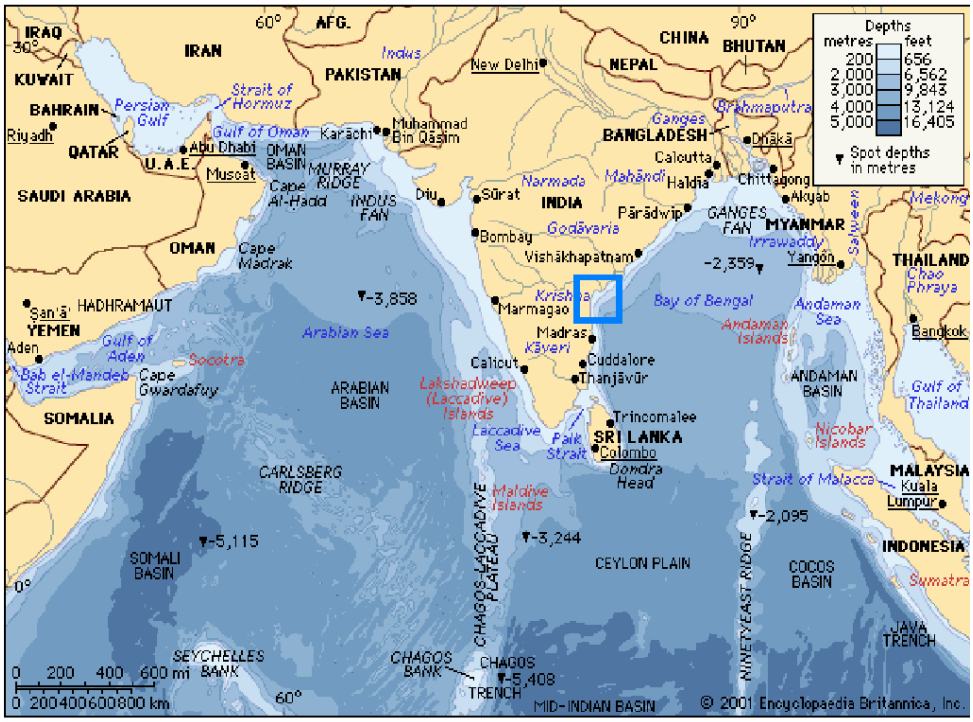
Today, seaweeds are recognised as an important natural source to produce a range of products, such as minerals special proteins, carbohydrates, fatty acids and a range of special secondary metabolites. Increasing interest in these products has been expressed by the food and pharmaceutical industry, the personal health care industry and recently the energy sector.

Traditionally, seaweeds were collected in the sea both in temperate and tropical regions. One of the first applications of these sampled seaweeds was as green manure in agriculture. Presently various seaweed production systems are designed: offshore, near shore and even at the landside in pond systems. Many of those systems are, however, not sustainable due to their polluting impact on the marine environment.

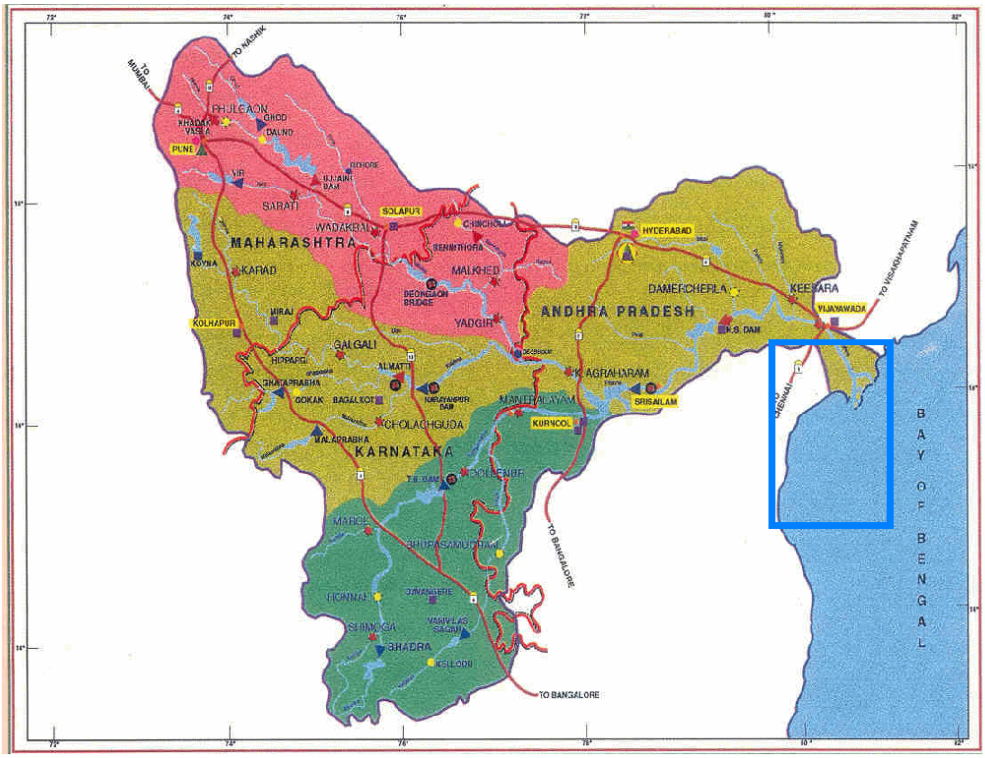
Energy Centre the Netherlands (ECN) and Wageningen UR (Wageningen Imares, the marine and coastal resources institute at Yerseke and Plant Research International at Wageningen), in partnership designed a production system for seaweeds which aims to produce in a sustainable productive way and is balanced in its energy costs. The principle behind the production system is to make optimal usage of the photoreceptor systems in seaweed, to apply a precise nutrient feeding technique and to use the marine environment as an energy source for the processing of the harvested product. It is estimated that it should be possible to produce at least 70 tonnes dry matter/ha/year under tropical zone conditions. Such yields are feasible, if adequate plant nutrition is provided.

Seaweed is of increasing importance globally; the global market values about U$ 600 million and is growing annually with 10%. Seaweed is harvested for hydrocolloids: alginates, carrageenan and agar. Seaweed does not contain lignin or lignocelluloses. Consequently, 80% of its dry matter - under Indian conditions 56 metric tonnes - is fermentable. It is therefore an efficient resource for the combined ethanol and electricity production. Based on these figures it can be concluded that seaweeds could provide and important resource in terms of food (binding agency in food processing) and bio energy for India. The Andhra Pradesh district appears to be geomorhologically suitable for the establishment of seaweed plantations with near shore processing of biomass based on seaborne energy sources by nutrient upwellings.

The two figures on the next page show the areas with high potential for seaweed production farms in India and Andhra Pradesh in particular. Following a schematic representation of a seaweed plantation is shown.

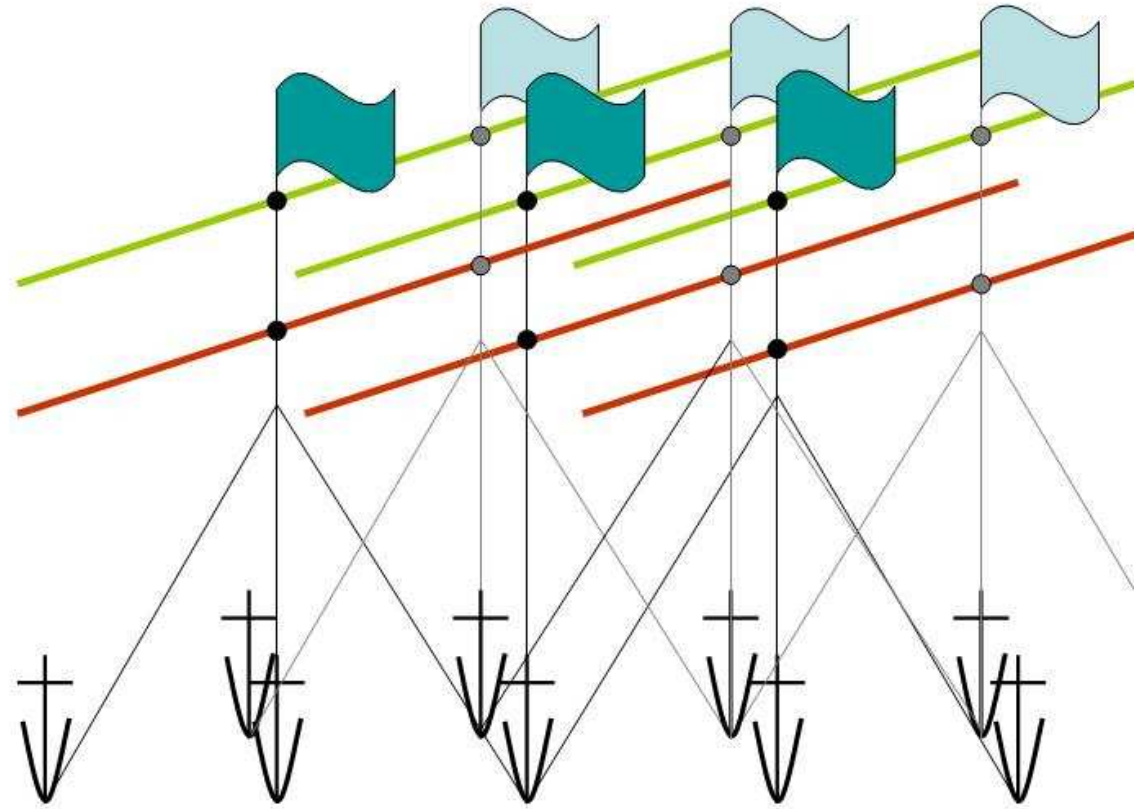


Bay of Bengal – ☐ potential locations of seaweed plantation



Krishna river basin – ☐ potential locations of seaweed plantation

Schematic presentation of a seaweed plantation



Green seaweed lines above
Brown or red seaweed lines underneath
Anchor cables

Seaweed lines also function as devices for (additional plant nutrition.

4 NEXT STEPS TO TAKE

The new concepts on salt water farming that were introduced during the stakeholder consultation workshop were well received and welcomed by the participants. The workshop concluded to further explore the possibility for the introduction of saltwater agriculture and was in support of organising a larger consultation workshop at the start of 2007 to formulate a bilateral project proposal for a tailor made coastal zone development including the triple P aspects in the catchment area of the Khrisna river basin. Partnerships with the Swaminathan Foundation, MPEDA-NACA and ANGRA University were established to take the initiative forward

After the workshop and fieldtrips, a visit was paid to the M.S. Swaminathan Research Foundation in Chennai to explore their interest to support the development of a proposal for the introduction of salt water farming in India. MSSRF already being familiar with the concept of salt water farming indicated to be very interested to establish a demonstration project where various stakeholder groups (agriculture, fisheries, watershed development etc.) can work together. MSSRF expressed their interest to further develop such concepts for India in partnership with other organisations and expert.

The outputs of the workshop and next steps to take were shared with the Agricultural Counselor of the Royal Netherlands Embassy in Delhi who was in support of the proposed activities and willing to financially support the proposal development workshop scheduled for the beginning of 2007. A proposal including the outline of the workshop was to be submitted for KNIP funding to the Embassy. Under the same KNIP funds illustrative material on shrimp farming was already be produced for the Bay of Bengal programme. It was suggested to link up with this programme. However the Agricultural Counselor got replaced shortly after this visit. The agreements and plan made were discussed with his successor. Unfortunately he put the previously planned activities on a hold and did not want to support initiative until WUR developed a strategy for their support to India.

5 ANNEXES

Annex 1. Summary of activities
Annex 2. Workshop programme
Annex 3. List of participants
Annex 4. Workshop outputs
Annex 5. Article in local newspaper

ANNEX 1. SUMMARY OF ACTIVITIES

Voyage to India 2006 15-22 September 2006

Ingrid Gevers (Wageningen International) and Willem Brandenburg (Plant Research International)

The programme was thoroughly prepared by Dr Ram Ramasubramanian of the Swaminathan foundation, who works in the mangrove restoration programme in Andhra Pradesh

16-17 September 2006 Hyderabad
Monday 18 September 2006

Visit to the A.N.G.R.A. University at Rajendranagar, Hyderabad
We have spoken to Dr B. Reddy Director IP of the University about our programme to set up a cooperative programme at the Krishna river estuary on sustainable aquaculture. He agreed in joining such programme and gave us all possible support through the experimental station at Machilipatnam. We had a guided tour along the university's premises.

Tuesday 19 September
Arrival at Machilipatnam
We made a visit to the A.N.G.R.A. University experimental station and visited the trial fields.
They executed extensive trials with rice with local landraces and selected for salt tolerance. They now have moderately salt tolerant rice varieties that performed well under local conditions.

Wednesday 20 September
Initial stakeholder meeting at Machilipatnam with

- local fishermen,
- representatives of MPEDA (the Marine Products Export Development authority of the Ministry of Commerce and Industry)
- representatives of NACA (Network of Aquaculture Centres in Asia-Pacific)
- representatives of the A.N.G.R.A. University (Rajendranagar, Machilipatnam and Bapatla)

Introduction by Ingrid Gevers explaining objectives of the workshop, the approach to be used and expected outputs. Presentation by Willem Brandenburg on sustainable aquaculture based on the combination of plant and shrimp production, and mangrove restoration

The attendees were split in three groups to determine local needs, problems and whether there was sufficient support for an eventual joint programme to develop and as a first action for the set up of a more extensive stakeholder dialogue. The conclusion was after a fruitful meeting that we should proceed.

In the afternoon we visited the local fish harbour and visited natural mangrove stands. We observed pigs that were kept under brackish conditions in the open. Along the Krishna river we were interviewed by the Dennan Chronicle on our objectives.

Thursday 21 September
Arrival at Chennai.
Visit to the headquarters of the M.S. Swaminathan foundation were we had a long discussion with Dr. M. Velayutham, executive director of the foundation. In this discussion, we reported our results of the stakeholder meeting and agreed on going forward in a joint programme between Wageningen

UR, the Swaminathan foundation and the A.N.G.R.A. University on sustainable aquaculture as set out before. Another topic was the mutual interest on farming at sea. Together with the Swaminathan foundation we will explore the possibilities of setting up sustainable seaweed plantations along the Indian coastal zone.

Friday 22 September

Arrival at Delhi. Meeting with Ir. Arnold Parzer, counsellor for Agriculture, Nature and Food Quality, and his technical associate Mr. Anand Krishnan at the Royal Dutch Embassy in Delhi. We reported the outcome of our visit to India, which was highly appreciated and agreed on looking for possibilities to organise the extended stakeholder meeting for sustainable aquaculture production in the Krishna river estuary. It was agreed that a proposal for a larger proposal development workshop would be prepared and submitted under KNIP funds for 2006. The proposal development workshop was tentatively scheduled to take place in February 2007.

ANNEX 2. WORKSHOP PROGRAMME

9.00 – 10.00	Opening
10.00 – 11.00	Introduction of participants Groups work - Activities coastal zone Khrisna river basin
11.00 – 11.30	Presentations per stakeholder group
11.30 – 11.45	Introduction to the Land, Water and Ecosystems in the Khrisna River Basin Project
11.45 – 12.30	Presentation on 'Saline Fringe' project
12.30 – 13.00	Future activities
13.00	Lunch
13.30	Field visit

ANNEX 3. LIST OF PARTICIPANTS

Title	Name	Position	Contact
	T.V. Satyanarayana	Projectmanager AP water management project (Angrau) Bapatla 522101, AP	
Dr.	V. Sankara Rao	Principal Scientist & Head Saline water scheme (Angrau) Bapatla 522101, AP	
Dr.	Mrs. G.V. Laskshmi	Senior scientist (soils) Saline water scheme (Angrau) Bapatla 522101, AP	
Dr.	Y. Radha Krishna	Senior scientist (Agronomy) Saline water scheme (Angrau) Bapatla 522101, AP	Phonenr. 05643 225098
Dr.	P.R.K. Prasad	Senior scientist (soil science) Water management project (Angrau) Bapatla 522101, AP	Email: Prk_prasad@yahoo.com Phonenr. 918643225194
Dr.	M. Raghu Babu	Scientist (SWE-1) Saline water scheme (Angrau) Bapatla 522101, AP India	Email: Mbmovva@yahoo.co.in Mobile: 919440959651
	G. Ravi Babu	Scientist (SWE) AP water management project Garikapadu 521175 Jaggayyapet (M) Krishna (DK) AP	Email: Ravibg2004@yahoo.com Mobile: 9848572321
	K.V.S. Rami Reddy	Scientist (SWE) AP water management project Home science college buildings Bapatla 522101 Guntur (DT)	Email: ksubbaramireddy@yahoo.co.in Phonenr: 08643 225194
Dr.	G.Girije Shankar	Deputy director of Agriculture Machilipatnam	Mobile: 9440516732
Dr.	R.A. Raju	Principal scientist (Agronomy) AP water management project Undi 534199	Email: Raraju05@yahoo.co.in Mobile: 9441324555
Dr.	Ch. Sreenivas	Scientist (soil science) AP water management project Unci 534199	Email: csvasu@yahoo.com Phonenr: 9440415303
	Anis Saifuddin	Deputy director Mpeda Andhiva Pradesh	Email: Anis_saifuddin@yahoo.co.in Phonenr: 919441886021
	Umesu	Project supervisor Mpeda Naca	Phonenr: 9440711600
	G. Ravibabu	Fieldmanager Meda Naca project	Email: 9440572986 Phonenr: 9440572986
	D. Kalpana	Scientist (SWE)	Email: Kalpana-duda@yahoo.co.in

Dr.	Yvara Prasad	Coordinator Daattcenter Machiuratnam	Phonenr 9948083820 008672 250629
	B. Rana Krishna	Farmer (aquaculture)	
	Kokiligadda Yadukondalu	Farmer (aquaculture)	
	Balagan Kutumba Rao	Farmer (aquaculture)	Mobile: 9347550627 Machilipatnam
	Vanamadi Sardayya	Farmer (aquaculture)	Mobile: 9989082234 Machilipatnam
	Lanka Namcharayya	Farmer (aquaculture)	Mobile: 9290079828 Pollatcitrippa Village Machilipatnam
	Moka Madhu	Farmer (aquaculture)	Bandharu Korta Garabdibba Road Machilipatnam
	Vanamadi Kasava Rao	Farmer (aquaculture)	Pollatcitrippa Village Machilipatnam
	Bochula Anil Kumar	Farmer (aquaculture)	Bandharu Korta Machilipatnam Mobile: 9391241290
	Ramani Nagamurati Krishna	Farmer (aquaculture)	Bandharu Korta Raja Ratna Garam Gillakaladindi Road Phonenr: 08672 220211
	Ramani Vishna Babu	Farmer (aquaculture)	Bandharu Korta Raja Ratna Garam Machilipatnam
	Sealam Katasua Rao	Farmer (aquaculture)	Bandharu Korta Gillakaladindi Road Machilipatnam
	Sealam Sai Pvarad	Farmer (aquaculture)	Goraladibba Machilipatnam Mobile: 9948196040

ANNEX 4. WORKSHOP OUTPUTS

FISH FARMERS

Activities

- Aquaculture & fishing
- Bandar Mandal
- 12 farmers from different villages:
  Bandar kota – 4 farmers
  Campbell peta – 2 farmers
  Machilipatnam – 1 farmer
  Polatithippa – 3 farmers
  Garaladibba – 2 farmers

	Village name	Total land acres	Abandoned ponds (acres)	Culture Rawas (acres)
1	Bandar kota	500	250	250
2	Campbell peta	600	500	100
3	Machilipatnam		Many	100
4	Polatithippa	1600	1100	500
5	Garaladibba	700	600	100
Total				

Biggest problems

- Disease problems. (W.s.s.v / bacterial)
- Repair work. (Drains / ponds / channels)
- No laboratories.
- Afterwards 1993 cyclones continuous outbreaks.
- Poor quality seed
- No alternative species suitable for Aquaculture.
- Price and marketing problems.
- Poor support from fisheries departments.
- Sick / disease shrimps improper handling.
- Poor inlets & outlets of drains & ponds.
- Diesel rate.

Possible solutions

- Need help?
- Power supply?
- Assistance in farming?
- Investment problems?

Already done

Nothing has been done for us.

MARINE PRODUCTS EXPORT DEVELOPMENT AUTHORITY (MPEDA)

Activities
1. To promote and develop aquaculture in the country in general, shrimp & scamp, in particular.
2. To provide technical assistance.
3. To provide financial assistance in the form of subsidy.
4. To promote & develop shrimp hatchery.
5. To educate & monitor against the use of antibiotics.
6. To educate on BMP.
7. To prepare master plan for plan & systematic development

Area of operation
All coastal states of India.

Problems
1. Diseases
2. Poor pond structure.
3. Improper drainage.
4. Lack of infrastructure- electricity & road

Possible solution
1. Good quality seed.
2. Good management through Better Management Practices.
3. Support from government & NGO's for infrastructure development.

MARINE PRODUCTS EXPORT DEVELOPMENT AUTHORITY – NETWORK OF AQUACULTURE CENTRES IN ASIA PACIFIC (MPEDA – NACA)

Activities
Shrimp farming through co-operative approach

Area of operation
AP, KA, GJ, OR. TN.
In AP. WG. E.G. Krishsna (GD & PT).

Problems
1. Crop losses due to shrimp disease
2. Shallow ponds
3. Poor quality seed
4. Poor feed
5. Poor pond management

Possible solutions
- Co-operative approach in tackling disease
- Good- pond preparation
- Good- quality seed
- Good- pond management
- No- use of antibiotics, pesticides and insecticides

M.S. SWAMINATHAN RESEARCH FOUNDATION (MSSRF)

Activities
- Sustainable Agriculture
- Biodiversity conservation
- Coastal systems research (mangroves, non-mangroves)
- Biotechnology
- Information and communication technology for rural communities

Area of operation
- East – Coast of India. Particularly Tami Nadu and the Andhra Pradesh states.
- Andhra Pradesh – (East) Godavari & Krishna Wetlands (Khrisna and Guntur districts).

Issues / Problems
- Conversion of mangroves for; shrimp / fisheries / saltpans / agriculture.
- Unsustainable harvest
- Reduction in fish catch / freshwater flow
- Lack of infrastructure
- Limited livelihood options.

Solutions
- Development of mangroves / coastal forestry where ever possible.
- Enhancing the fishery resources: Aquaculture.
- Saline water farming:
    - integrated with fisheries
    - cage culture
    - mariculture diversification

ACHARAYA N.G. RANGA AGRICULTURA; UNIVERSITY (ANGRAU)

List of activities
- Investigations on ground water quality.
- Conjunctive use of water (fresh + saline).
- Salt tolerance crops.
- Management of abandoned aquaponds.
- Skimming techniques for harnessing fresh water.
- Reclamation of salt affected & waterlogged areas SSD.
- Participatory approach in salt water Agriculture.
- Rice – poultry – Aquaculture – Dairying – farming

Area of operation
80'28E 15'54'N MSL4.9M
West Godavari: Akivedu, Undi, Bhimavasam, T.P. Gudem.
Kristina: Machilipatnam, Koduva, Nagayalanka, Bantamilla, Kruthiuanu, Kaikalur, Kalidindi.
Guntur: Repalli, Nizampatnam, Pihovanipalem, Karlapalem, Bagatla.
Prakasam: Chirala, Vetapalem, China Ganjam.

Problems in Coastal Zone

- Saline ground water, sea water intrusion
- Coastal saline soils
- Environmental degradation due to Aquaculture
- Problems due to agriculture (excess use of pesticides)
- Coastal erosion
- Failure of Aquaculture
- Tidal affects on ground water & estuaries
- Poor drainage and water logging
- Nature calamities – cyclones & floods

Possible solutions

- Improvement of drainage networks (SSD)
- Technologies for harnessing good quality water
- Conjuncture water use
- Development of high productive farming systems
- Forestation
- Salt tolerance crops & G.M.

ANNEX 5. ARTICLE IN LOCAL NEWSPAPER

ఉప్పునీటి సాగుపై నెదర్లాండ్ బృందం అధ్యయనం

ప్రథమ వర్ధంతి