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TATA

Blue Ocean Innovation

(mKRISHI® - Fisheries Service)

NAIP Component – 3: Strategies to enhance adaptive capacity to climate change in vulnerable regions

Dineshkumar Singh

Partners in Innovation

About Tata Consultancy Services (TCS)

Tata Consultancy Services is an IT services, consulting and business solutions organization that delivers real results to global business, ensuring a level of certainty no other firm can match. TCS offers a consulting-led, integrated portfolio of IT, BPO, infrastructure, engineering and assurance services. This is delivered through its unique Global Network Delivery Model™, recognized as the benchmark of excellence in software development. A part of the Tata group, India's largest industrial conglomerate, TCS has over 276,000 of the world's best-trained consultants in 44 countries. The company generated consolidated revenues of US $11.6 billion for year ended March 31, 2013 and is listed on the National Stock Exchange and Bombay Stock Exchange in India. For more information, visit us at www.tcs.com.

Acknowledgement

Information when available at right time, to right people and in right quantity, in easy to understand language, it can enable livelihood and save lives. Scientist from various sections of Fisheries research institutes in India, such as Central Marine Fisheries research institute (CMFRI), Indian National Centre of Oceanic Information Services (INCOIS), etc. worked for years on developing various models to generate information which can benefit the fishermen. Potential Fishing Zone (PFZ) and Wind Speed and direction forecasts are one of such innovations. But in the absence of a reliable and wide spread medium to reach to the masses, its impact has not been fully utilized. Platform like mKRISHI® are good channel to disseminate these information in personalized way and in local language. During its 2011 pilot, it triggered a socio-economic revolution by not only saving lakhs liter diesel but also helped in saving lives.

In 2011, Dr. Arun Pande and Dr. Veerendra Veer Singh combined the knowledge of Mobility and fisheries domain, leading to this simple but powerful innovation. Mr. Ranjan Samantaray has always been a big motivation and helped increase the horizon of this service. . Dr. S. S. Shenoi (Director, INCOIS) and his team including Dr. Srinivasa, Dr. Balkrishna and Mr. Nagaraja ensured a continuous improvised support in the availability of the PFZ and Wind Speed and direction services.

TTSL Network Planning Head, Mr. Neeraj Dindore and his team of Raja Srinivas, Ashish Dedhia, ARK Sarma, Yash and Nehal Upadhyay were instrumental in field trials and infrastructure support at seven sites. They were well supported by the RF engineers Rahul, Abhay, Aniruddha and Rajesh. TTSL MD Mr. Srinath, always supported the program and guided on its expansion to more areas. Mr. Himanshu Khanna and G. V. Rao are putting together the business model to achieve this.

Dr. V.V. Singh and his team including Atul Sathe, Nilesh, Kalpesh Keni, Pritesh, DB Thapa, Amol and Priyanka Vichare, helped in arranging the boats, various approvals requires and also participated actively in various boat test drives.

My colleagues Dr. Srinivasu, Sanjay Kimbahune, Sonali Kulkarni, Sujit Shinde, Della Sajan and technical team of Godfrey Mathais, Gyan Prakash, Anubha Nayan, Divya Piplani, Ashish Shinde, Karthik Srinivasan and Kartik Jhanwar helped in service delivery, management and field supported.

I am also thankful to my other colleagues in IARI, ICAR and TCS for their constant guidance and support.

In News

THE TIMES OF INDIA, MUMBAI
MONDAY, MARCH 12, 2012

New technology directs fishermen towards catch

Bella Jaisinghani | TNN

Mumbai: Scientists in a quiet neighbourhood in Versova are testing the waters to see if Mumbai can be turned into a Gold Coast of sorts. Every morning, they try to map out areas in the sea where fishermen might find more schools of fish that day.

Along the coastline of Maharashtra, as *kolis* assemble at the jetty before embarking on a fishing trip, they gravitate towards the community notice board for updates. Advance storm warnings are welcome during the monsoon, but on a routine basis, they are keener to

TRAWLING FOR INFO

- Scientists gather data and satellite images to prepare a weather forecast
- Locations where fish may be available are mapped by assessing water surface temperature, wind velocity and chlorophyll, which indicates fish food
- Mobile phones have been distributed in 13 villages along the coast of Maharashtra, particularly in Raigad district
- Daily updates are received on the mobile phones through GPS technology
- The mobile phones have been given to village heads who relay information to the community

मत्स्य मोबाइल सेवा से मछुआरों को फायदा

नई दिल्ली (एजेंसी)। महाराष्ट्र के रायगढ़ जिले के करीब दर्जन भर तटीय गांवों में मोबाइल सेट का उपयोग कर मछुआरों ने 50 फीसद ज्यादा मछली पकड़ी। यह सेट उन्हें उपग्रह से भेजे संभावित मछली पकड़ने वाले क्षेत्रों के आंकड़े और मानचित्र मुहैया कराता है।

▸ मोबाइल पर भेजे सेटेलाइट संकेतों से पता चलता है समुद्र में कहां पर हैं ज्यादा मछलियां

इन गांवों के मछुआरों को वास्तविक समय के आधार पर मछलियों की झुंड, तूफान, हवा के रुख और तीव्रता के बारे में इन सेट पर प्रत्यक्ष तौर पर मानचित्र और आंकड़े मिलते हैं। भारतीय कृषि अनुसंधान परिषद (आईसीएआर), भारतीय महासागर सूचना सेवा (इन्कोसिस) और टीसीएस की एक परियोजना के तहत ये सेट बांटे गए हैं। केंद्रीय समुद्री मत्स्य पालन अनुसंधान संस्थान (सीएमएफआरआई) के मुख्य वैज्ञानिक वीरेंद्र वीर सिंह ने कहा 'हम संभावित मत्स्य क्षेत्र, हवा के रुख, हवा की तीव्रता और मौसम के बारे में उचित आंकड़े और मानचित्र प्राप्त करने के लिए उपग्रह का उपयोग कर रहे हैं।' सिंह ने कहा 'ग्रामीण संस्थाओं को ताजा-तरीन सूचनाएं मुहैया कराने के लिए, कुल 13 मोबाइल सेट बांटे गए हैं।'

लोकमत

Hello

कोकणातील मच्छीमारांसाठी उपक्रम

मत्स्य क्षेत्र मोबाईलवर

What are the pain points?

TOI THE TIMES OF INDIA,

2 fishermen drown as boat capsizes

TNN Jun 9, 2011

BAGALKOT: Two fishermen ... the Krishna river when ... capsized on Tuesday evening. The incident occurred near Bom... situated near the Almatti d... Krishna river side.

Three fishermen had gone ... fish, when strong winds ... causing it to turn over.

The deceased have been id... Motiram ...

MumbaiMirror

Fishermen to get life jackets after 5 drown

Felix Fernandes, Sep 01, 2010

...ting on the sea would ... life jackets, MP Dr ... said after he visited ... the bereaved ... by local ... to provide life ... village. The ... questions regarding ... the equipment

THE TIMES OF INDIA

Heavy winds make boats float off jetty

Aashish Gharat, TNN | Sep 20, 2013, 04.12 AM IST

URAN: Four fishing boats floated off the jetty near Karanja in Uran on We... owing to heavy wind. While two boa... d 20km ... distan... ear the

Business Standard

BS Reporter | Bhubaneshwar September 25, 2013 Last Updated at 20:18 IST

Fish producers want exemption of VAT on diesel

Industry body says fishermen using mechanised boats are unable to explore new grounds for fishing

THE HINDU

Home News Opinion Business Sport S&T Features Books In-depth Jobs Class...

TODAY'S PAPER » FEATURES » SCI-TECH & AGRI

November 24, 2011

Climate change, human factors will hit fisheries

Climate change and other human-led factors will drive many ... further towards the poles ... While fisheries in a few ... north, may benefit, many ...

THE HINDU

INDIA'S NATIONAL NEWSPAPER SINCE 1878

OUTDOOR POLLUTION IS CARCINOGENIC: WHO

RURAL WAGE GROWTH FALLS

SEVEN-WICKET WIN FOR PAKISTAN

Climate change hits fishermen on Orissa coast

SC asks CBI to probe 'six issues' in Radia tapes

Security intensified ahead

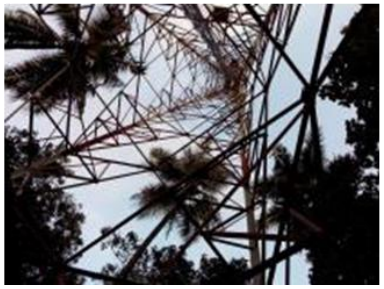
Let's Begin…

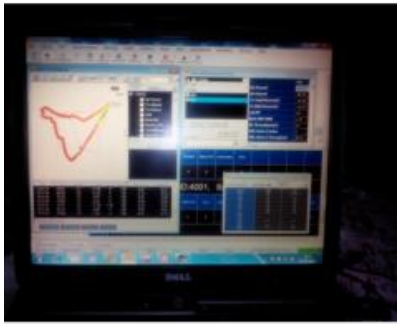
Fishing is the main occupation of the coastal population of 8000KM coastline of India. But the fishermen use the traditional knowledge to catch the fishes, which is more or less a trial and error approach which leads to uncertainty in the catch and heavy diesel consumption. About 1.2% of global oil consumption is used in fisheries, and it is found that fish catching is the main contributor to global warming in the fish production (Anon, 2012). In Indian Coast, Sea surface temperature increased by 0.2 to 0.3 degrees Celsius between 1960 and 2005 (Anon, 2011) which is projected to increase further by 2 to 3.5 degrees C by 2099 (Anon, 2011). Decline in fish catch and increase in fuel rate are two major concerns for fishermen today. Due to large and growing population and low lying coastline, Raigad district of Maharashtra is considered vulnerable to the impact of climate change.

What is Novelty?

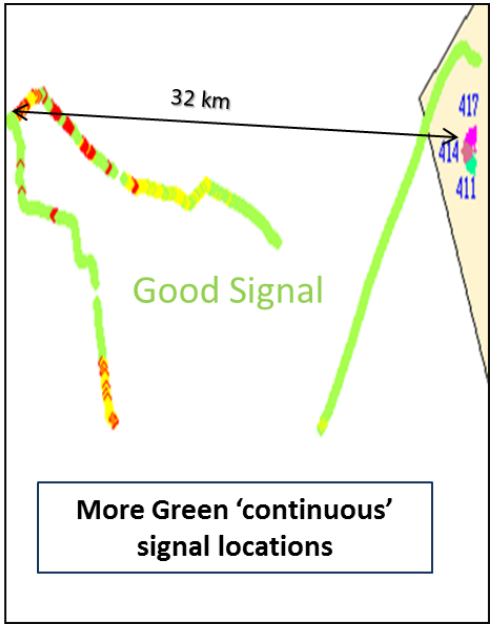
Though services like Potential Fishing Zone (PFZ) and wind advisory are available, they do not reach to most of the fishermen because the current dissemination media through fax and electronic board depends on the electricity, requires maintenance and need skill to operate. ICT has potential to overcome these challenges and bridge the gap between rural fishermen and research institute in fisheries domain.

NAIP Visit and Signal Testing done in deep sea.





TTL CDMA



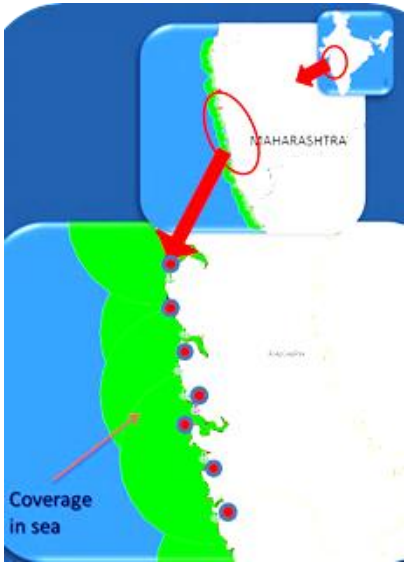
Options

- UHF/VHF Wireless communication equipment – License, regulatory restriction, costly.
- D2H (Dish) – One way, costly, difficult to use
- Satellite phone – Costly, regulatory restrictions
- Mobility – Possible, but none tried? Available signals up to 8-12 KM due to leakage of the coastal towers. Line of sight limitation (25-30 KM) because of earth curvature.

Infrastructure creation!

Finally the "mobility" emerged as the consensus option. Tata Teleservice (TTSL) , CMFRI MRC and TCS carried out joint boat drive across the Raigad and accordingly on the below seven locations, TTSL installed the equipment to enable the release of the CDMA signal in sea up to 30 KM.

1. Sasavane
2. Varsoli_Alibaug
3. Borli-Mandla
4. Murud_Raigad
5. Borli Panchtan
6. Shreevardhan
7. Aravi



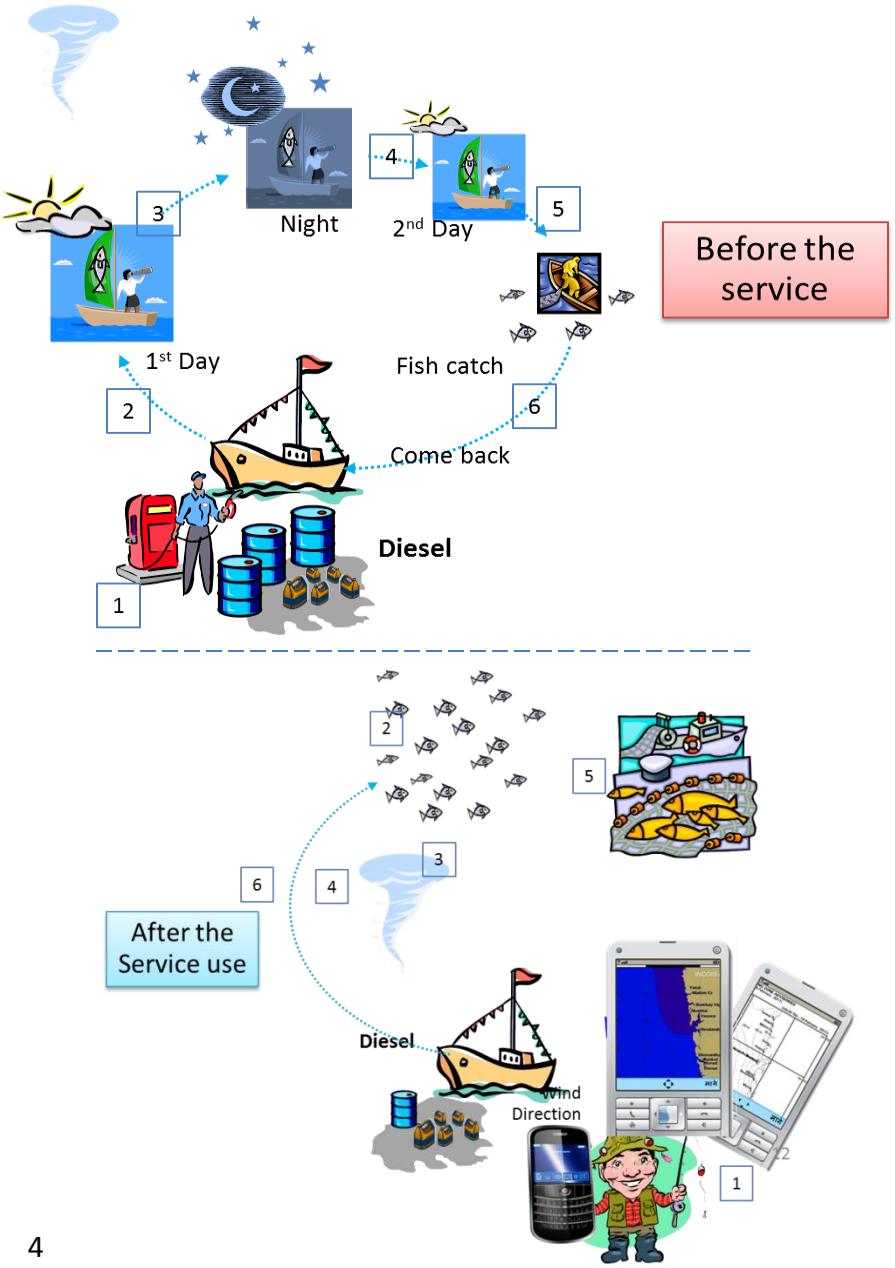
How it works?

Mumbai Research Centre of CMFRI and Tata Consultancy Services' Innovation Lab Mumbai formed a strategic Public Private Partnership (PPP) to develop and deliver the PFZ and other Wind Advisories services in vernacular language to 48 Fishermen Co-operative Societies in 64 coastal fisher villages of Raigad district. These advisories are being disseminated though the platform mKRISHI® Fisheries Service. TCS Innovation Lab deals with generating, editing and uploading PFZ and oceanic wind speed and direction advisories from Indian National Centre of Oceanic Information Services (INCOIS). TCS Innovation Lab itself is maintaining the data center for running the services. mKRISHI® Fisheries Service integrates technologies such as Wireless Sensors, Camera phone and script technology; it is much more than an IT tool. It ensures business benefits to the stakeholders by enabling them to find PFZ areas directly. Images, Text, Voice, Query, Feedback & other services are integrated in the facility and it is available in local Marathi and English languages. Early Warning System (EWS) is also coupled with the mobile service and has been updated to generate advisories 5 days in advance. Oceanic wind speed and direction advisories generated from INCOIS website are displayed four times daily.

What are mKRISHI® Fisheries services features?

- Potential Fishing Zone (PFZ) advisory
- Oceanic Wind speed and direction forecast four times daily (5.30 am, 11.30 am, 5.30 pm and 11.30 pm).
- Early Warning System (Weather Alerts/ Strom Warning).
- Different landing Centre fish price (Sassoon dock,)

Applying the Innovation to use…



Mobile Signal Expansion in deep sea

Availability of the mobility network and the development of the Information and Communication (ICT) tool and services around it, are bringing a revolution in "on land" and in agriculture sector. Slowly this is leading to a "connected" world. This will lead to availability of the many "for masses" services to the end user who need it the most.

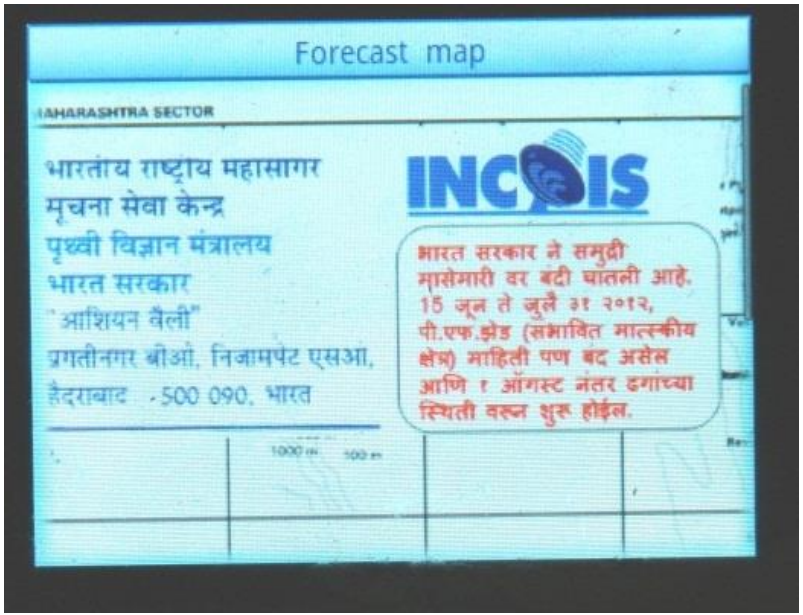
In the lack of the infrastructure yet in the sea, similar revolution though possible, is yet to take off.
India accounts for 6% of global fish production (2nd after China) with 8,000+km of coastline (Exclusive protection is very important from the food security of the country as well as the allied economic development. This is one of the reasons, why China is constantly expanding its reach in South China sea and other part of the Indian Ocean and Pacific Ocean.

Hence, TCS, the Top 10 IT service provider in World, along with Central Marine Fisheries Research Institute (CMFRI) Mumbai Research Center (MRC) have put a proposal to World Bank Global Environment Facility (GEF) funded National Agricultural Innovation Project (NAIP) to work on the "wireless signal expansion (and hence availability of the mKRISHI Fisheries service, too) in deep sea.

Challenges

The private operators yet to see the "business sense" or "cost benefit" for offering a "land like similar wireless service" in sea. It's difficult to convince them to do so, as it would mean, long investment horizon – in network, in other hardware (towers, handsets, etc.) in people (for maintenance and customer support). This had been tough task.

Other services –
Tsunami and Fishing ban alert



Before the service availability

Fishermen fill in their boats with the diesel and go in the sea based on the traditional knowledge or the information shared by other fishermen. Hence, the no. of days to be put in sea is not known and also there is risk to the changes in the sea condition due to gusty wind.

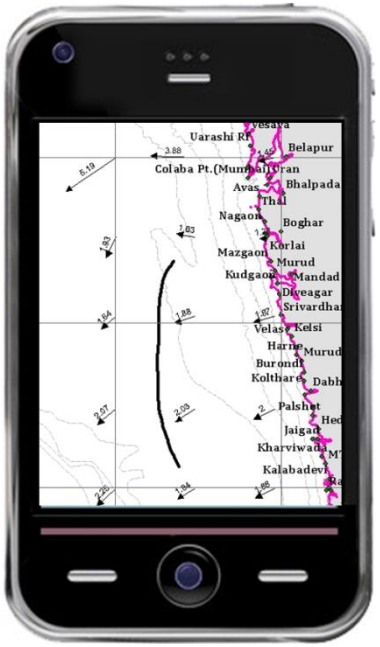
After the service availability

Since the regularly updated information is available on the mobile phone, the fishermen plans the journey based on the PFZ forecast. While planning this, the wind speed and direction maps help him plan his up to next 2-3 days. This is very useful in planning the diesel needed by the fishermen. Also, since the location is known up front of both the fish shoal and the danger zones, the time taken to catch the fish and the safety of the boat, net and laborers are also ensured.

Benefit

- Diesel saving
- Time saving
- Increase in the catch and the catch probability
- Safety – of the life and livelihood investment (boat and the net)

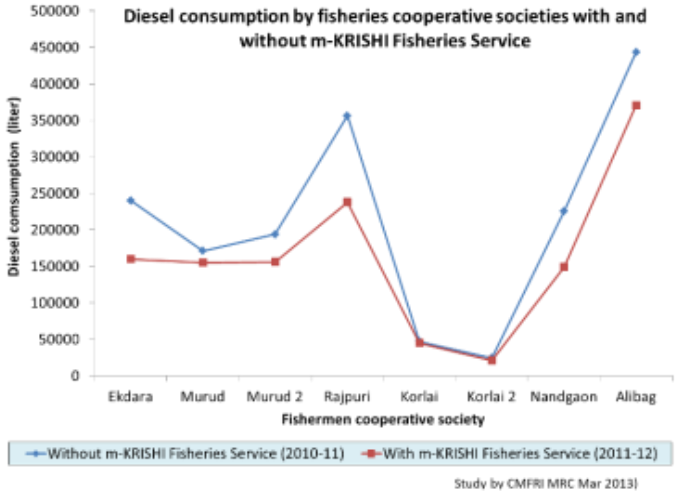
Hence, this service has become a powerful tool for the "reduction in the CO2 gas" as well as "Livelihood enabler" plus "Safety measure" of the fishermen.



Result

Presently 1296 numbers of motorized and mechanized boats are operating in selected 13 coastal villages consuming approximately 200 lakh liters of diesel per year. It is estimated that after following the advisories provided through 'm-KRISHI® Fisheries Service' and fishing accordingly in PFZ areas will save approximately 50% of this diesel (i.e. 100 lakh liters of diesel per year).

Currently 5% of the fishers in selected villages are using the technology which in turn leads to saving of 5 lakh liters of diesel per year costing around Rs. 250 lakhs/year. The government of Maharashtra is providing 23% subsidy on the cost of diesel to fishers (as reimbursement of Tax paid). This costs around Rs. 52.35 lakh/year to the government for the selected clusters. Similarly if the adoption is projected at 5% level for whole district for 2980 motorized and mechanized fishing boats consuming 630 lakh liters of diesel per year, the 23% saving at total cost of Rs. 709 lakh per year will be approximately to the tune of Rs. 163 lakh /year. This saving in diesel and consequent carbon emission will increase at least six fold even at 30% adoption in a reasonable period of 2-4 years.



PFZ Validation cruise by Purse Seine Net

Date of Fishing	21.03.2013
Type of Boat	Mini Purse Seine
Type of Gear	Purse Seine
Journey Start time	5.00 am
Journey End time	3.00 pm
Total diesel consumption	14 to 15 liters
Net release time	11.00 am
Species	Oil Sardine
Net hauling time	1.25 pm
Net hauling GPS point	$19^0$43.690 N 72^0 52.251 E
PFZ area fish catch	4.5 tons
Non PFZ area fish catch	1.5 tons (Purse Seine : Amar)

Case Study – Shri Suresh Pawse (Raigad)

On 19th March Shri Sadanand Govind Pawse, a fishermen with mini purse seine fishing boat "Parvati" saw that the PFZ was going to be near to his location – Bharadkhol (Tal: Shriwardhan, Dist: Raigad). He went for the fishing in the PFZ location accompanied by Mr. Kapil Sukhdhane (SRF from CMFRI MRC).

As per the PFZ location suggested, they laid the net on the GPS position of 180 22'.572" N and 720 50'.950" E. Their catch was surprisingly high i.e. 4.5 tons of oil sardine (Sardinellalongiceps). So much was the catch, that they fell short by 1 ton and has to call their other boat to load the remaining fish. Also, using the phone they got in touch with the auctioneer and got a very good price (almost 20% more) because of the volume and the freshness of the catch.

Hence, availability of the mobile signal in the region, not only help in seeing the information but also helped in managing the catch and linking with the buyer.

At the same time other fishermen who fished in Non PFZ areas of the same village with mini purse seine boat got very little about 1 tons while some came back without fishing due to non-availability of fish in that area

Feedback

Multiple fishermen workshop had been held. Fishermen gave very positive feedback towards the service. Some of these are:

- PFZ information helps them to find out around which location, they can expect the availability of the fish shoals. This helps them to plan the date of the trip, the amount of diesel required depending on the distance of the shoal location, etc.
- The planning of the trip – duration, the distance, the need of the diesel helped reduce the cost of the diesel incurred on the visit, which is almost 40-50% of the entire fishing cost per trip.
- The state government (Maharashtra) provides the rebate of the value added tax (VAT) levied on the high speed diesel (HSD) sold to the fishermen through the fishermen societies. The service lead to the less diesel consumption, leading to lesser rebate given to the fishermen and hence leading to the decrease in the revenue losses to the government due to subsidy.
- Since there were fewer amount of diesels burnt, it eventually meant that less CO2 emission and hence it positively helped the environment.
- Since the PFZ shoal were about the location of the pelagic fishes (with shorter life span), this meant that fishermen are not out for unbound fishing but a controlled fishing, and hence, this lead to a more disciplined fishing. This meant that it helped indirectly in the conservation of the other small fishes, which would have caught otherwise.
- The wind speed and direction service helped them to differentiate between the rough sea and the clam sea. The color of the map, the direction of the wind, etc. helped them to plan when, and where they should be in the sea suitable to them.

Availability of the service in deep sea

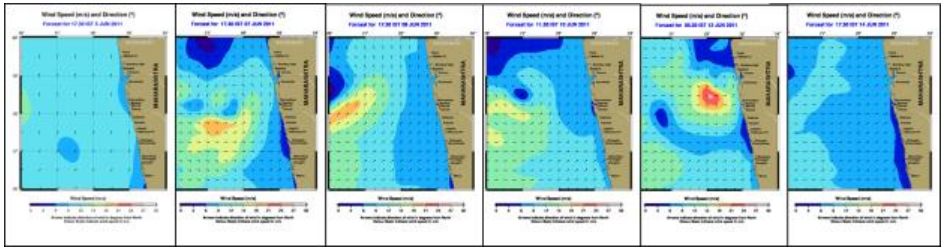
During such feedback sessions, fishermen also highlighted the below:

- Currently the service is available only up to a few kilometers deep inside the sea. Because of this, they can see this information only when they are near shore. But since this information are dynamic and changes every 6-12 hours, they do not have a way to get updated on the changed info. Because of this even if the wind speed and direction has changed, there is no mechanism to find about it.
- They want to have this service available in deeper sea too as most of the time their trip is of more than a day (stretching up to 10 days or so).
- As per the availability of the information in deep sea can help – re-plan their fishing activity based on the location shift of the fish shoal and also can avoid a "rough sea patch" created because of the increased wind activity.

Severity of the need – an example

The sea environment is very dynamic. During the period of 10-12th June 2011, there was a very dangerous shift observed in the Arabian Sea near Raigad district in Maharashtra. See the picture.

The wind speed increased from 27KMph to 81KMph. The green-yellow patch is the high risk area. The Red patch is the area to be avoided completely. Even at a speed of 20-25KMPH a small four cylinder boat can behave like a toy in the ocean. At such higher speed of 81KMPH the chances of sinking of a boat (especially one loaded with catch) increases.



Saving in fuel consumption and carbon emission	14 Pilot co. op. soc. In 13 cluster villages	14 Pilot co. op. soc. In 13 cluster villages
Fuel consumption (in liters/yr.) by the marine fishing boats before the technology	200 lakh liters/yr.	200 lakh liters/yr.
	At 5% adoption level	**At 15% adoption level**
Fuel consumption (in liters/yr.) of boats provided with the service (without using the service)	*10 lakh liters/yr.	# 30 lakh liters/yr.
Likely fuel savings (in liters/yr.) @ 30% of the fuel consumed (by using the service)	3 lakh liters/yr.	9 lakh liters/yr.
Saving in expenditure on diesel consumed (@ Rs. 52/ liter)	Rs.156 Lakh/yr.	Rs. 468 lakh/yr.
Likely savings by Govt. on giving subsidy @ 23% on cost of diesel	Rs. 35.88 lakh/ yr.	Rs. 107.64 lakh/yr.
Savings in carbon (GHG) emission (in tons/yr.) @2.68 kg/lit of diesel burnt	804 tons/yr.	2412 tons/yr.

• Fuel consumption of 5% boats among total (in liters/yr.),
Fuel consumption of 15% boats among total (in liters/yr.)
• Courtesy: Dr. V. V. Singh (CMFRI MRC)