Chapter
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Indigenous Technical Knowledge and Climate Change

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Concept of Indigenous Technical Knowledge (ITK)

Indigenous Technical Knowledge (ITK) is the local knowledge – knowledge that is unique to a given culture or society. It contrasts with the international knowledge system generated by universities, fisheries, animal husbandry research institutions and private firms. It is the basis for local-level decision making in agriculture, health care, food preparation, education natural resource management and a host of other activities in rural communities (Warren 1991). ITK is the information base for a society, which facilitates communication and decision making. Indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems.

Indigenous Technical Knowledge (ITK) with respect to climate change in fisheries can be operationalized as the knowledge/cognitive capital of the fisher folk with respect to prediction/forecasting of various weather parameters and prediction of different types of fish availability and their catch based on their mental models with respect to various perceived changes in the weather parameters.

As a summary of various definitions, the term indigenous technical knowledge may be denoted mainly as a tacit type of knowledge that has evolved within the local (grassroots) community and has been passed on from one generation to another, encompasses not only local or indigenous knowledge, but also scientific and other knowledge gained from outsiders.

Indigenous Knowledge (IK): is the participant's knowledge of their temporal and social space. Indigenous knowledge as such refers not only to knowledge of indigenous peoples, but to that of any other defined community.

Indigenous Knowledge System (IKS): delineates a cognitive structure in which theories and perceptions of nature and culture are conceptualized. Thus it includes definitions, classifications and concepts of the physical, natural, social, economic and ideational environments. The dynamics of the IKS takes place on two different levels, the cognitive and the empirical. On the empirical level, IKS are visible in institutions, artefacts and allied technologies.

Indigenous Technical Knowledge (ITK): is specifically concerned with actual application of the thinking of the local people in various operations of agriculture and allied areas.

Belief: change in behavior of insects, animals and vegetation indicating a forthcoming event without any scientific rational but be true in happening.

Innovation: outside the area of ITK, but scientifically based development of practices using the locally available resources to solve specific problems.

In the emerging global knowledge economy a country's ability to build and mobilize knowledge capital, is equally essential for sustainable development as the availability of physical and financial capital. The basic component of any country's knowledge system is its indigenous technical knowledge. It encompasses the skills, experiences and insights of people, applied to maintain or improve their livelihood. ITK is developed and adapted continuously to gradually changing environments and passed from generation to generation and closely interwoven with people's cultural values. ITK is also the social capital of the poor, their main asset to invest in the struggle for survival, to produce food, to provide for shelter or to achieve control of their own lives.

The marine fisheries scenario in India presents a picture of heterogeneity sacrosanct with a population of four million marine fisher folk, residing in 3, 288 marine fishing villages in 9 maritime States and 2 Union territories (**Marine Fisheries Census, CMFRI, 2010**) ceremoniously contributing to the country's total marine fisheries production of 3.32 MT.(Sathiadhas et.al, 2012), accounting for a foreign exchange earnings of Rs. 10,000 crores. (2009-2010)

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Informal research tools for investigating ITK

Semi-structured interviews: Semi-structured interviews allow the participants more scope to investigate what people know and to follow up topics of interest as they arise in the discussion. They can be used with groups and individuals.

Group (focus) interviews: Group interviews provide exchanges between participants with differences of opinion which can often lead to greater insights into people's perceptions. Care is required over the composition of the group so that as many participants as possible feel free to express their opinions, especially those with less status who may be better interviewed in a separate group or individually.

Key informant interviews: 'Experts' – those identified by local people as having specialist knowledge – may be interviewed taking care that they do not only include those with formal education and access to scientific knowledge.

Field visits and transects: These combine observation and discussion and are useful in allowing the farmer or respondent to point things out *in situ*. They may also provide a more relaxed atmosphere than a group meeting, making communication easier.

Field observations These are useful for comparison of actual practice to the 'norms' presented in group discussions or interviews.

Mapping, diagramming, ranking exercises and games: These can be used to elicit farmers' perceptions, including spatial conceptions, definitions, classifications and boundaries. Tools include participatory mapping, ranking of importance, comparing characteristics using pairwise ranking diagrams, seasonal calendars and network diagramming.

Local classification systems/taxonomies: This is quite a difficult area, involving the identification of local terms, then asking local people to sort and group the

categories, identifying common features and contrasts in the context of the wider language and cultural system.

Cultural expression: The content of songs, poetry and speeches on celebrations and public occasions can reflect significant messages and social values. Surveys which relate the respondents' knowledge and attitude to their resulting practices are often known as knowledge, attitude and practice (KAP) surveys.

Structured questionnaires and knowledge tests

Structured questionnaires and knowledge tests have, conventionally, been used by agricultural extension researchers and others to find out about how much local people know. However, such a quantitative approach is not usually a good starting point for studies of LPK, unless the researcher already has an in-depth knowledge of local perceptions and practices. Imposing the rigid structure of a questionnaire implies that the researcher already knows enough about people's perceptions and practices to be able to write specific, unambiguous and comprehensible questions. In practice, these questionnaires may reveal whether the respondents understand scientific terms but provide little information on what the respondents' own ideas might be. Often the results are scored like a knowledge test. If a respondent's answer differs from scientific knowledge or recommended practice it may be classed as 'wrong' and he or she may be considered as having no knowledge. However, structured surveys can have a useful role in following up and verifying hypotheses generated using rural appraisal and other qualitative methods. For example, if it has been found from group interviews that farmers think that certain weeds are good indicators of soil fertility, then a carefully worded questionnaire can be used to determine how widespread this knowledge is.

Methodology

Under the National Initiative on Climate Change (NICRA) Project, it was decided to document the Indigenous Technical Knowledge with respect to climate change. A number of Indigenous Technical Knowledge has been collected in marine fisheries, but none so far has been collected in the realm of Climate Change. The study was conducted from April 2011 to March, 2012 in the eight coastal States of Gujarat, Maharashtra, Karnataka and Kerala along the east coast and West Bengal, Orissa, Andhra Pradesh, Tamil nadu along the west coast. A well-structured interview schedule was used for documentation of the ITKs. Participatory Rural Appraisal methods such as Participatory diagramming,

Participatory transects, Rapid Rural Appraisal techniques, use of Key informants and focused group discussions and interactions were used for the study.

After the documentation of the ITKs at the field level, it was decided to conduct a write shop by inviting scientists, who were involved in the data collection form the eight coastal states, fisher folk from whom the ITKs were documented, fishermen representatives and local leaders. The write shop was conducted at the Mangalore Research Centre of CMFRI from 22-03-2012 to 24-03-2012. The main aim of the write shop was to bring out a publication in a very short time simultaneously ensuring that every possible information collected was verified by the scientists and end users, discussed at length and classified it as an ITK, based on scientific rationale, belief which defies scientific explanation but found/observed to truly occur under field conditions and agreed upon and endorsed by a larger populace.

The following are the list of ITKs collected from the respective coastal States of India.

Karnataka

- During new moon fish availability is more.
- When wind blows from west side to shore, fish availability is more.
- Winds blowing from south to north coupled with appearance of white seagulls is indicative of rough seas and impending cyclone.
- If wind blows from north east direction, sea becomes rough in next few days and few catches are obtained.
- Arrival of black cormorants from sea towards shore indicates the presence of strong water currents.
- When sea water is turbid upwelling may occur.
- Flying of White Sea gull above the sea, is an indication of the presence of sardine shoals.
- When colour of sea is blue it indicates less fish availability.
- Appearance of mud banks (*Pallikhe*) is indicative of plenty of fish availability, beyond *Pallikhe,* sea is rough and inside the *Pallikhe* sea is calm.
- Three days after coastal upwelling more fishes are caught.
- When sea water becomes thick during rains, fishes are not visible.
- Appearance of zooplankton in mud is a prediction of impending cyclone.

- Appearance of White Sea gull (*Thora hakki)* two days ahead, is indicative of rough sea condition.
- When clouds move from east to west direction and when black sea gull is seen with the clouds it indicates impending storms and coastal upwelling.
- Presence of dark patch at sea when observed from the shore, is indicative of higher wind speed.
- Fishermen say that when their feet goes down in sand while walking along sea shore it is an indication of impending cyclone within 2-3 days' time.
- When halo occurs around moon, more water currents observed.
- When stars at night become dim, there will be more wind speed.
- If during night time, fog is present, the following day (next day) temperature will be more.
- Presence of wind blowing from south (south wind) is a prediction of impending rains.
- If windy day is followed by turbidity of waters at sea, the next day, there will be poor fish catch.
- If wind blows from south, fishes will be less, if it blows from north, fish availability will be more, if wind blows from north east, mackerel catch will be more.
- If during rains, Sea otter makes its appearance it is an indication of less fish availability.
- Change of sea colour from green to white is indicative of higher wind speed.
- Appearance of small black heron flying above sea surface indicates arrival of cyclone 15 days later.
- When winds blow from south west direction during the time of rains, more fishes are observed to come ashore.
- Appearance of black worms on sea surface is an indication of occurrence of cyclone two days later.
- When dragon fly (*Erunti*) come in flocks from southern direction and proceeds to north it is an indication of the arrival of storms within two days.
- If shoals are seen arriving from south west direction, than it is an indication of sardine, anchovy and mackerel catch.
- When north wind blows all fishes go into deeper waters.

- When light gnats are seen in bushes and plants at night, it is an indication of impending cyclone two days later.
- When bubbles appear from below the sea surface and burst at the top, it is an indication that cyclones will arrive within 1-2 days.
- When a flock of red coloured birds arrive from south and flies towards north it is an indication of impending cyclone 5 days later.
- When south wind blows, pomfrets and mackerel are got in plenty.
- When more white clouds are seen in the sky, than wind speed will be more on that particular day.
- The appearance of sea snake rolling itself in the waters is an indication of an impending cyclone 2-3 days later.
- The appearance of dragon flies in flocks moving from south to north direction is an indication of impending cyclone within two days.
- When butterflies move in groups over sea shore and sea surface it is an indication of cyclone approaching from the south west direction.
- Black cormorants (*Bangude hakki)* arriving in flocks ahead of rains is indicative of mackerel availability at sea.
- Appearance of White Sea gull (*Bili hakki*) over sea surface is an indication of availability of anchovies.
- If foaming of water is observed near shore, it is an indication of impending cyclones.
- Cattle and goats are seen to break away from ropes and run towards the mountain side two days ahead of Tsunami.
- Flock of greyish black butterflies flying along the sea shore is indicative of oncoming rains within a week.
- When the waters near the shore becomes black, it is an indication of impending cyclones and when the water near the shore turns red, it is an indication of impending rains.
- When White Sea gulls flies away from the rocks at sea towards land, it is an indication of impending cyclones.
- When wind blows from north, more fishes are got. When wind blows from south, fishes aggregate into shoals.
- When wind blows in one direction only, less availability of fishes occurs.
- When wind blows from north, fish is available in plenty and when wind blows from the south, fish availability is less.
- When wind blows from sea towards land, the sea becomes silent and fishermen do not experience any problems in fishing.

Maharashtra

- When the Sun is encircled by a kind of ring which is locally called as *"Vedha"* in Marathi, it is an indication of impending storms.
- Incidence of turbidity of near shore waters is an indication of impending storm.
- When the sea water gives a greenish tinge of colour, it indicates more fish availability.
- Turbidity at sea indicates more fish availability and clear water indicates less fish availability.
- When wind blows towards west or north direction, it indicates more fish availability and when the wind blows towards the south, it indicates less fish availability.

Gujarat

- Fish availability is decided based on water currents.
- With increasing rainfall, fish availability in near shore areas decreases.
- Higher wind speed results in less fish availability, when sea is rough fish catches are less.
- When wind blows from west towards shore, fish availability is more.
- When wind blows from south to north, sea becomes rough and it is an indication of an impending cyclone.
- Reef cod fishes are abundant during winter season especially on new moon nights.
    - On new moon days stars become faint which is an indication of high wind speed.
    - Gathering of birds over sea surface indicates fish availability in that region.
- During full moon period more catch of squids are obtained.
- More fish availability is obtained with increase in temperature.
- Fishers predict the arrival of cyclone by observing peculiar circular movements of birds over the sea surface which thereafter moves towards the sky.

Kerala

- If the current flows from the northern direction, it is an indication of less fish abundance and if the current flow is from the southern direction more fish will be available.
- When the wind blows from the sea side more fish is available and when the wind blows from the land side, less fish is available.

- Very clear water indicates less fish abundance.
- Fish abundance is high when currents are low.
- With rising temperature fishes move to deeper waters.
- If heavy rains are followed by calmer days, than incidence of small pelagic fish catch would be more.

Andhra Pradesh

- Diverse catch of small pelagics, results with incidence of high salinity/decreasing rainfall.
- Wind blowing from north-east direction favours tuna catch.
- Change in water colour coupled with decreasing transparency caused by upwelling results in more catch of small and large pelagics.
- Unidirectional flow of surface currents and wind leads to good pelagic catch.
- Decreasing temperature, moderate sea state and north-east wind favours tuna catch in the months from October – February.
- Increase in catch of crustacean and cephalopod resources are observed with an increase in temperature.
- Inadvertent intrusion of jelly fishes into the coastal waters during summer months results in reduced catch rates of commercially important marine fin fishes and shell fishes.

Tamil Nadu

- When up and down movement of sea water is more, it indicates less fish availability.
- Increased catch of squids is obtained during the summer months.
- During new moon period (*Amavasai*) more fish catches are obtained.
- During full moon (*Pournami*) fish catches are less.
- Bad smell at sea indicates no fish catch.
- When the wind blows from the southern direction during the month of April, fishermen get good fish catch.
- Coastal upwelling brings very good fish catches.
- During the months of October to November, when wind blows from the northern direction, good catches of fish will be obtained.

West Bengal

- Increase in catch of clupeids and mackerel is observed with an increase in temperature.

Odisha

- Increase in catch of clupeids and mackerel is observed with an increase in temperature.

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