## Participatory science

providing reliable information for adaptive co-management of NTFPs in India and Nepal

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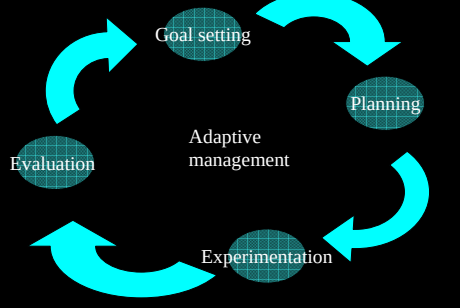
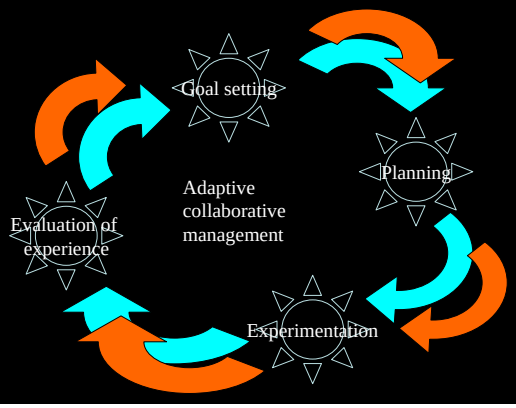
## Context: NTFP markets, harvests, people

## Key question linking forest science and governance

If collaborative NTFP management is to be adaptive:

- Where is the reliable and valid information going to come from to shape the adaptation?
- How can that information be incorporated into decision-making at different scales?
- [and therefore] How can foresters, NGOs and scientists most helpfully interact with these processes?



## Participatory forestry research

Scarce

Criticisms include:
- non-rigorous
- un-replicable
- unreliable
- tends to idealise local knowledge

Need a rigorous methodology that will
- Be relevant to rural communities in many settings
- Bring scientific rigour

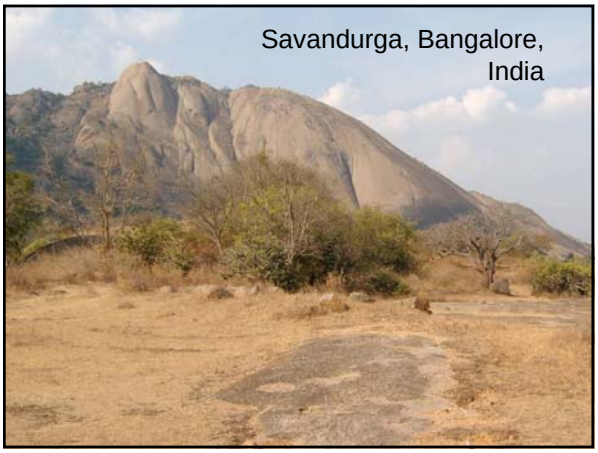
## Key features of our approach

- New knowledge (not just a 'blend' of local and scientific knowledge)
- Context specific
- Reliable – to all the stakeholders – so also plausible

## Which requires …

- Institutional pre-conditions
- Foundation on local knowledge
- New ideas tested through scientific experimental methods
  - Formulating hypotheses about NTFP decline based on local knowledge
  - Rigorous sampling design
  - Rigorous data collection
  - Statistical methods applied and shared with the communities
- Facilitated adaptation of results into management plans






## Defining a hypothesis

- Through PRA and group discussion, define 'usual' harvesting practice ('Business as Usual' or BAU)
  - This in itself can be a challenging task and lead to much reflection among the group
- Propose alternative management regimes that might produce a more sustainable harvest (i.e. formulate a hypothesis)

## Turning a community hypothesis into a scientific hypothesis

*For example,*

Community Hypothesis: If 100% of Kurilo plants are harvested, the yield will be greater in the first year and less from 2nd year onward than if 75% of plants are harvested.

Statistical Hypothesis: There is no significant difference in the yield of the Kurilo tuber when harvested at rates of 100% or 75%

## Testing the hypothesis

- MONITORING: Test the sustainability of 'usual' harvesting regimes
- EXPERIMENTATION: Rigorously design and set up experiments to test:
  - the effect of management on harvest quantity and quality, and on total yield, and on regeneration
  - the usefulness of proxy indicators which will be easier for communities to use in assessing yield, avoiding the need for harvest and measurement.

## Some management hypotheses

| | |
|---|---|
| Species | *Feronia limonia*<br>Tree; fruit |
| BAU | Collect all fruits in one harvest before 2nd week in March |
| Hypothesis | Compared with BAU, collecting only mature and fallen fruits strictly between the last week of March and the second week of April will improve the quality of the harvest and regeneration |

## Some management hypotheses

| | |
|---|---|
| Species | *Cinnamomum macrocarpum* |
| Plant habit / part used | Tree; leaves |
| BAU | Collect all leaves by cutting branches and twigs |
| Hypothesis | Compared to BAU, collecting only mature leaves by plucking individual leaves will improve regeneration and yield |

## Some indicator hypotheses

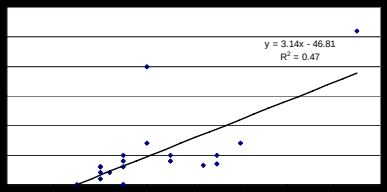
For kurilo:

- Tuber weight is correlated to height of plant
- Tuber weight is correlated to the root collar diameter of the plant
- Tuber weight is correlated to the crown diameter of the plant

## Analysis

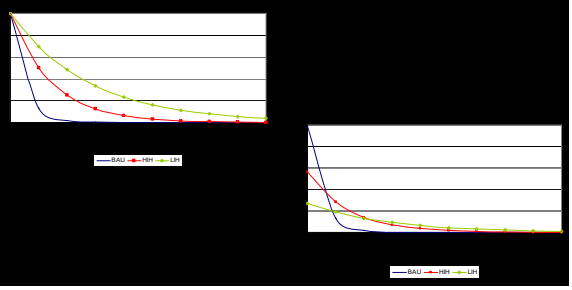
- Explicit comparison of
  - Community hypothesis
  - Community impression of results
  - Statistical significance
    - ANOVA tests for differences between treatments
    - Correlations between indicators
    - Projected harvests in future under different treatments
  - Community's response to statistical significance

## Analysis of *indicator* hypotheses




- We conclude that there is a significant correlation between crown diameter and root weight
- This finding can then be used to predict root weight under different treatments

## Long-term sustainability (very tentative modelling at this stage)




## Some challenges of scientific methods

- Temptation to
  - establish experimental plots in areas where the species is more abundant, and the land easier to visit and monitor;
  - locate control plots in protected area;
  - improve the treatment plots e.g. by seeding with the fruits collected.
- Bias towards harvesting the 'better' plants.
- Desire to test more than one variable in each experiment.

## Outcomes after two years

- Approx. 40% community hypotheses are supported
- In such cases people feel that their knowledge has been validated
- Where hypotheses refuted, villagers often interested in revising the hypothesis (i.e. adaptive management)
- Communities are motivated
  - to observe more data where their hypotheses are not proven
  - to search for information on ecology, life cycle of spp.
- Communities have started to question and reflect on their hypotheses

## Action taken

- Ecological
  - All four participating communities changed their management plans to include new NTFP harvesting regulations, or permanent sample plots
  - Protection and cultivation of NTFPs started
- Intellectual
  - The process of sharing local knowledge, developing the hypotheses and designing the experiments is often more convincing and leads to more action than the statistical results
  - Started experimenting with other species
- Economic
  - NTFP enterprises established
- Social
  - Land allocation for poor to cultivate NTFPs in CF
  - Increased employment opportunities for the poor
- Institutional
  - Increased participation in the CF processes
  - Inclusive decision making process institutionalized
  - State forestry service now providing training in the method, aim to develop yield tables for NTFPs

## Constraints

- Difficulties of defending the forest plots from other communities and from outsiders coming to harvest illicitly
- Frequent changes of the community members in the research process
- Strong partnerships needed with institutions capable of doing the statistics
- Highly uncertain markets
- Improved processing and marketing needed

## Reliability

- Takes different forms for different stakeholders
  - Reflection and sharing of local knowledge
  - Logic of hypothesis formulation
  - Process of replication, randomisation
  - Quantitative data analysis
  - Direct observation and experience
  - Reflexive analysis of experience (‘social learning’)

## Is all of this too reductionist?

Must be facilitated as part of a process which

- Recognises that experiments are sub-sub-systems within subsystems within systems
- Supports learning within complexity
- Supports increased consciousness of nested systems
- Leads to adaptation (of behaviour and rules) as result of learning