Participatory rice variety selection in Sri Lanka

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Introduction

Hambantota District is a major paddy (rice) producing area in the southern coastal region of Sri Lanka. Communities here have been experiencing salt water intrusion into their rice fields, leading to reduced yields. This has been caused largely by seawater contamination of irrigation systems. Farmers had been using saline-resistant varieties developed at the rice research station, Ambalantota, but in badly affected areas these varieties were still failing. This article focuses on work done to identify traditional rice varieties suitable for cultivation in the degraded paddies through a process of participatory research.

Background

The activities described here were part of a three-year project (2005 to 2007) carried out in four countries of south Asia by Practical Action, a UK-based international development organisation. The work in Sri Lanka was implemented by Practical Action's south Asia office based in Colombo. Practical Action had funding to develop a pilot project. Its objective was to increase the resilience of communities to cope with the impacts of increased climate variability in their localities.[1] In Sri Lanka, these were the likelihood of climate change worsening existing problems of salinisation and flooding.

The project worked with 500 households in Godawaya and Walawa Grama Niladhari divisions in Hambantota district along the Walava river estuary. Most people's assets comprise physical capital: crop harvests, livestock, boats, and other equipment.

The villages were selected to participate for several reasons:

• The majority of people were relatively poor – farmers owned typically less than one hectare of paddy land.

• The site lay close to an area where Practical Action was involved in a post-tsunami reconstruction programme, so manage-

[1] Funding was provided by the UK-based Allachy Trust.

Source: http://images.google.lk/images

Traditional paddy trial locations in Sri Lanka.

ment and travel costs could be reduced. The project site was sufficiently far inland not to have been directly impacted, though fishermen's livelihoods clearly were affected.

• The problems faced by the community (coastal erosion, saline intrusion into paddy fields) were typical of those likely to be experienced by rural Sri Lankan communities under climate change, even if the current problems cannot be directly attributable to climate change.

Paddy cultivation in Sri Lanka is largely a smallholder activity. Rice growing is important culturally for smallholder farmers. So even when faced with problems of salinity, farmers were reluctant to switch to other crops.

Salinisation and soil erosion have led to the abandonment of paddy land along the river estuary. Salts drawn up from groundwater are deposited on the surface, and spread as poorly maintained irrigation channels become polluted from the saline estuary. Coastal erosion also reduces the availability of land and forests that are increasingly – and illegally – used by local people as the scarcity of productive farmland increases across the district.

In future, storm surges and rising sea levels are likely to increase salt water contamination. Combined with intense rainfall these problems are anticipated to increase under current climate change predictions. The main focus of the Rice Research Institute in Sri Lanka is on larger-scale irrigated paddy cultivation. However, it has developed a few varieties suitable for saline conditions faced by small-scale farmers, although without the involvement of farmers. In the experience of farmers in the project area, the varieties only tolerate limited levels of salinity.

Box 1: Community perceptions on changing climate

There were no records of any kind held at the local level. Inhabitants' memories were the only source of information. Groups were formed with participants of similar ages to enable discussions amongst individuals with similar knowledge. Participants were grouped into those over 60 years old, between 45 and 60 years, and the younger generation (below 45 years). Women were included, since their work of firewood collection, farming, and homestead vegetable gardening made them more aware of changes in resource availability and temperature than men.

While people had access to modern weather information, farmers still used a forecasting system known as '*Litha*'. *Litha* is a table prepared by an astrologist, using the phases of the moon and the positions of the stars and planets. A full moon, for instance, is associated with rain. The table indicates times when seeds will germinate, or the best time to plant crops so as to avoid pest attacks. However, whilst respondents reported the *Litha* as still in use, it was judged to have become less effective in recent years. This may suggest that climate change is undermining traditional techniques – or perhaps only that modern forecasts are increasingly reliable.

A variety of other traditional forecasting indicators were used (see table below). Their effectiveness was being debated within the community. It was also reported that traditional techniques are not being passed on to the younger generation, who prefer to rely on modern farming and forecasting practices.

Table 1: Traditional forecasting indicators

Observation	Prediction
Large termites start breeding during a dry period.	Rain will come soon.
Ants appear with their eggs and move to a new nest.	Rain will start within 24 hours.
Small termites start breeding during a rainy period.	Rain will stop soon.
A noise is heard emanating from the sea.	Rain will come within seven hours and last for seven days.
Off-season trees such as tamarind and wood apple give good yields.	Good future rainy season – farmers cultivate large areas.
Dogs and cattle make unusual sounds.	Destructive rainy season leading to disasters is anticipated.

Methods and processes

Understanding the situation faced by the Hambantota communities was essential for designing project activities. Gathering sufficient information was critical. In the first six months, we used a range of data gathering approaches:

• **Secondary data**. To select project sites, we used data from e.g. the Sri Lankan census and statistics and International Union for Conservation and Nature (IUCN) reports on coastal recourses. This showed that the Ambalantota division of Hambantota district was highly vulnerable to floods, sea water intrusion, and natural resource depletion.

• **Focus group discussions**. These were used to initiate discussions in the villages and collect background information to validate the secondary data. We held two

[2] The representatives were the Assistant Divisional Secretary (who reports to the District Secretary, a government appointee, via the Divisional Secretary), local government officials from the area, village farmer group leaders, and officers of the Rice Research Institute in the area.

Table 2: Summary of the data-gathering methods

Participatory method used	Objective	Information gathered
Key informant discussions	To collect information on natural resources, livelihoods, and social and institutional arrangements in the area.	• Sources of livelihood • Use of natural resources • Existing socio-economic systems
Focus group discussions	To collect background information on resource use, vulnerabilities, and capacities to validate secondary information.	• Vulnerabilities • Livelihood system problems
Community resource mapping	To identify the natural resource base and natural resource management methods.	• Vulnerabilities • Availability and use of natural resources • Area landscape
Risk mapping	To identify risks to livelihoods within the area.	• Types and causes of risks and threats • Extent of vulnerable areas
Field observation	To further understand biophysical resources, vulnerability, and existing problems affecting farmers' livelihoods.	• Risks and threats in relation to biophysical resources • Encroachments • Severity of problems identified
Transect walks	To further understand biophysical resource vulnerability and existing problems affecting farmers' livelihoods.	• Linking upstream and downstream farmers • Variation in vulnerability

meetings with government representatives and non-governmental and community-based organisations to discuss problems relevant to livelihoods and to understand resource use and vulnerability.[2] This led to the selection of two paddy farming communities (from Manajjawa and Walawa) for further vulnerability assessment. One key issue discussed with focus groups in the community was knowledge relating to weather and climate. This is summarised in Box 1.

• **Community resource mapping**. Following the focus group discussions, we introduced resource and risk mapping to identify the natural resource base and management approaches. Selected farmer organisations and other community members drew maps of community resources, illustrating natural resources important for livelihoods such as paddy lands, home gardens, plantation lands, settlements, and water bodies.

• **Risk mapping**. The groups involved in risk mapping included community office bearers (such as the president of the village agricultural society) and members of farmer organisations. Using the community resource maps, the groups identified areas at risk from salinisation and flooding, water-scarce areas, and irrigation canals. The main issues identified were flooding, salinity, conflicts between water resource users, and risks due to changing land use patterns (the conversion of coastal forests to paddy land). Participants were not asked to rank risks.

• **Field observations and transect walks**. Practical Action project staff joined community members in village visits to complement the results of the focus group discussions and mapping exercises.

Most families were members of the fisheries or farming society when the project began. Farmer organisations in each village act as the decision-making forum for issues such as the farming calendar, water distribution, and seed selection. In preparing paddy land for sowing, all farmers need to work the land together, since channels between fields are interconnected. The whole system will not operate until all fields and the dividing mud walls are ready. These farmer organisations are also linked with government agrarian services centres. Farmers also reported being involved in informal institutions such as the Yaya (field) groups and Seettu (community-managed revolving fund) groups. In the project villages, association members are primarily small-scale farmers.

The participatory process sought to prioritise the main threats to people's livelihoods that could be attributable to increasing climate variability. The community reached a consensus during the participatory assessment process that floods (leading to crop losses) and salinisation (low yields and crop damage) are the main threats to livelihoods. They expressed a clear desire to reduce the risks of crop failure and unprofitable yields.

After the survey, we developed a strategy to build capacity around resource use and management and, in particular, to establish and replicate best practices in crop cultivation. The main vehicle for training was the paddy farmer group. The group was mobilised to adopt and develop sustainable farming practices, such as compost making from rice husks. However, while farming activities are carried out by men and women, the group trialling the rice varieties was dominated by men. In small-scale paddy farming in Sri Lanka, women and men carry out separate tasks: men prepare the land, and the water control mechanisms; women plant seedlings and weed crops. Pesticides, when used, are applied by men, and harvesting is women's work. In most households, men traditionally make many of the farming decisions, though there are women who take on this role. Women's time commitment to household activities was an obstacle to attendance at meetings. The project team made efforts to accommodate women by finding alternative meeting times, but did not challenge the cultural norm of male-dominated decision-making.

The paddy farmer group consisted of 16 farm families. They volunteered to set aside land in their own fields for the trials. The farmers had some success with saline-resistant varieties developed at the Ambalantota Rice Research Institute. However, in badly affected areas the resistant varieties were still failing.

The farmer group agreed to trial some traditional rice varieties alongside the research station varieties. The trial was supported by the National Federation for Conservation of Traditional Seeds and Agricultural Resources (NFCTSAR), a non-governmental organisation, which supplied farmers with traditional seeds.[3] The Federation selected ten varieties that it thought would tolerate the level of salinity present. The varieties had different characteristics in terms of growth, yield, and flavour.

In the first year, both conventional and traditional varieties were grown. The conventional varieties were treated with chemical fertilisers and pesticides and the traditional varieties with home-made organic compost and *neem* oil.[4] A further trial, in the next rice growing season, was of different varieties of traditional rice. Each variety received the same treatment – *neem* oil and organic compost. The farmers planted up to 5kg of each variety in the saline affected areas of their paddy fields and continuously observed the

[3] Local seed banks had fallen out of use following the introduction of high-yielding hybrids in the 1960s and 1970s.
[4] Homemade *neem* oil is used as a pest-control.

Photo: Varuna Rathnabharathie

Meetings with the community (Bundala).

growth and changes in the plants up to harvesting. Two farmers out of 16 cultivated all 10 varieties while the rest cultivated three or four varieties after seeing how the 10 varieties performed in the first trials.

Which varieties to grow on a larger scale were chosen by scoring each variety from one to 10, based on the farmer's preference, where one was the best score. The farmers chose the criteria e.g. plant height, duration of the crop, grain quality, grain colour, saline tolerance, and yield. The selection process was supported by activities to help improve soil quality (much degraded in the saline-affected areas) and soil water retention, by using organic mulches. Mulches reduce the amount of tilling required, which in turn reduces soil salinity caused by bringing salts up from deeper soil levels.

Outcome of the field trials

The results clearly showed improved yields from the trial varieties. The traditional rice varieties also carried a premium market price of up to 50% per kilogram compared to hybrid varieties. After seeing that some varieties performed well in saline soils the farmers developed confidence in their researching and selecting varieties. Prior to developing this network the role of the institute was to provide seed to the farmers with little or no interaction. During the project, the community were able to form good links between the farmer organisations and the government Rice Research Institute. The project also facilitated contact with local government via the Grama Niladhari (village-level administration) and the irrigation department. This prompted important actions such as sluice gate renovation (to prevent seawater flowing into the paddy fields) and support in improving freshwater irrigation. The farmer groups also extended their network to other farmers in the area. Farmer-to-farmer learning was a major development. Farmers testing traditional varieties shared their findings with farmers from the adjacent village who faced similar problems. This stimulated discussions between farmers on variety selection, increased the knowledge of neighbouring farmers on climate change issues, and


Photo: Varuna Rathnabharathie

'Fertiliser pond' in a paddy slot to provide liquid fertiliser (Bundala).

enabled the farmer groups to become change agents at the community level. By the end of the project a traditional paddy cultivator group had been established and was formally attached to the seed conservation organisation, providing a wider network of contacts and support for the Hambantota farmers and helping sustain the project developments once Practical Action withdrew.

Lessons learnt, critical reflections, and analysis

Methodology for collecting information

This article was written after the project ended and after a change in project staff, resulting in some loss of institutional knowledge. Writing it has highlighted some institutional weaknesses within Practical Action: while there is certainly a high commitment to participatory processes, there is no formal across-organisation manual for training in this area. Evaluations of the organisation's work are generally very positive, but there is clearly room for improvement in the amount and depth of information gathered during the initial stages of project development. For example, very little information was collected on social class or power issues in the community, nor on land tenure – possibly because the situation was so typical of the region, and so familiar to the project managers that it did not seem worth recording. This was a small project, with limited funds. The initial activities, including the baseline study and PRA were limited in scope. It can certainly be argued that improving rice yields under salinisation would need to be part of a much broader strategy for adaptation, for which the project funding was inadequate to develop.

Value of the process

Improved varieties are frequently introduced by research stations, but are not

'Pokkali' a traditional rice variety grown in extremely saline conditions in Bundala.

always suitable for use in different local contexts. The formal research process fails to address farmer needs, does not build their decision-making capacity, and ignores local knowledge in the selection process. Participatory variety selection aims to address these shortcomings. In this small trial, the process was successful. It built connections between farmers'groups and the Rice Research Institute. These connections should be sustainable, and may lead to a more participatory approach within the Institute's main research programme.

The trial was small-scale, due to limited resources. The method was weakened by not having control plots where conventional and traditional varieties both received either chemical or organic treatment. This has since been rectified in subsequent replication in areas also affected by salinity, where the results have also been favourable. The methods and process would need wider testing before concluding on the success of the approach, or the sustainability of the varieties selected by the farmers. The yield of traditional varieties on average has proved slightly lower than conventional varieties. However, traditional varieties are more profitable than conventional varieties. They are in short supply, and are prized for consumption during festivals, for medicinal reasons, and for their taste and aroma. A simple cost-benefit analysis shows that despite the need for greater labour input (to make compost and *neem* oil), it is cost effective, because labour comes from family and neighbours. Women can also participate more fully in the farming calendar where organic products are used.

A key contribution was in raising awareness of local solutions to climate change threats. Forgotten varieties of indigenous rice were shown to offer a solution to the increasing soil salinity. There are around 2,000 traditional Sri Lankan rice

A woman farmer shows her flourishing trial plot of traditional rice varieties.

varieties, many with high nutritional value and medicinal properties, or resistant to particular diseases and pests. Cultivating them has helped a group of marginalised farmers to increase their harvests, whilst the project's collaborative approach has had a positive impact on the attitude of local agricultural institutions. The participatory approach to variety selection overcame the limitations of the conventional research system in meeting the needs of marginalised farmers and integrating local knowledge into the selection process.

Replicability

Other farmers who cultivated saline-affected lands nearby were invited to visit the trials and discuss progress with the farmers involved, and this led to wider adoption. Following the trials, at a meeting in Hambantota, officials from the agricultural department and government researchers shared findings and discussed these in the context of the impact of climate change on farming in the region. Video documentaries have also been shown to agricultural extension officials at workshops where ministry officials and Practical Action staff presented their different approaches. They have been shown to farmer associations in each district, who have also taken part in visits to successful project sites.

Practical Action has since expanded the approach to many other communities around Sri Lanka (see Map 1). Significantly, other communities have adopted it autonomously, through word of mouth and observation. Traditional varieties are grown by one farmer in a corner of a large field, cultivated by many small-scale farmers. The next year, many other farmers are observed growing the crops. Farmer societies contact Practical Action to find out more, and are referred to villages adopting the practice, and organise their own visits. Staff have been surprised by contact from people in distant places who have heard about the trials. This autonomous replication of a successful practice is very encouraging, though of course difficult to assess without independent evaluation.

Uptake is feasible, though farmers are probably not undertaking rigorous trials before adoption. The methodology is however replicable, provided farmers'groups are adequately supported in understanding the need for a rigorous approach. Support could be provided by the national Rice Research Institute, but the mediation of a non-governmental organisation experienced in participatory methods would increase the likelihood of success.

A more farmer-focused agricultural research agenda is crucial for farmers successfully to adapt their food production to climate change. At present, research priorities are defined by national government or even multi-national corporations. The likelihood for change on a large scale is remote at present.

Adaptation to climate change is highly context specific. At present, salinity may not affect the majority of the area under rice cultivation. Nationally, there is no estimate of fields affected by salinity and salt water intrusion and the likely causes. At a local level however, the number of communities that have raised concerns with Practical Action project staff suggests this issue may be seriously underestimated. Communities throughout a wide geographical area are keen to experiment with saline-resistant traditional varieties of rice. This attests to the relevance of this approach and technology – particularly to communities in marginal locations facing many social and economic challenges, in addition to the added challenges of soil salinity and future climate change.

Conclusion

The participatory research approach adopted during this project demonstrates the importance of experimentation for adaptation. Participatory research provided the farmers with a supportive environment with access to the resources necessary for experimentation. It demonstrates the efficiency of locally informed and farmer-led research. Farmers were able to assess threats to their livelihoods and define their own response. Their capacity to experiment in finding solutions to their own problems was strengthened. The network of relationships built up between the farmers, formal research institutions, government extension services, and a national seed conservation body will hopefully ensure continuity of support for further research by the farmers.

This project underlines the importance of biodiversity for adaptation. The farmers of Hambantota could assess and select seeds able to survive in the degraded environment only through the preservation and free availability of many seed varieties. As climate change pressures mount, it will be crucial to ensure that agricultural biodiversity is not sacrificed for short-term increases in yield.

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ACKNOWLEDGEMENTS
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