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Project title

Human and social capital aspects of soil nutrient management, semi-arid India

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Organisation

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NRSP Production System

Semi-arid

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List of acronyms

AP	Andhra Pradesh
APRLP	Andhra Pradesh Rural Livelihoods Project
BIRD	BAIF Institute of Rural Development - Karnataka
CF	Chemical Fertiliser
CPR	Common Pool Resource
CRIDA	Central Research Institute for Dryland Agriculture (ICAR)
DDS	Deccan Development Society, Hyderabad
FYM	Farmyard Manure
ICAR	Indian Council for Agricultural Research
INM	Integrated Nutrient Management
KAWAD	Karnataka Watershed Development Society
KVK	Krishi Vigyan Kendra (Agricultural Knowledge Centre)
LEI	Low external input
NRM	Natural Resource Management
OM	Organic Matter
PIA	Project Implementing Agency
SFM	Soil fertility management
SHG	Self-Help Group
WSM	Watershed Management

1 Executive Summary

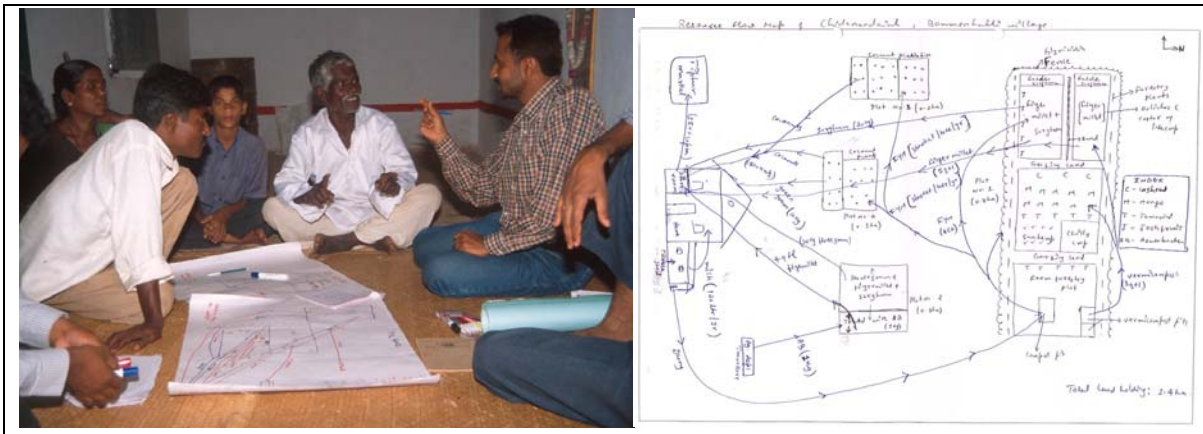
This research project aims at contributing to an understanding of the role of human and social capital in catchment management in order to provide a sound basis for the development and validation of new approaches to natural resources management that benefit the poor. These new approaches are to be developed in a second phase.

Soil fertility management is a key component of peoples' overall management strategies for natural resources. Both landed and landless households are involved in various ways of producing, processing, and transporting soil amendments, and in managing soil fertility in-situ through crop and livestock management.

It is commonly assumed that rainfed areas face a soil fertility crisis. While there are concerns, the project challenges the view that farmers are not managing soil fertility carefully, and that simply more chemical fertilisers will improve livelihoods for the poor. It offers alternatives based upon consultation with farmers and analysis of a wide range of case studies. It also provides detailed information on a neglected but important aspect of these farming systems – the importance and expansion of income-generating opportunities from the trade in organic fertilisers. The research findings have implications for development programmes, future research and policy.

Research methodology

The research included a combination of reviews and fieldwork using both quantitative and qualitative methods, such as farm resource flow mapping. The fieldwork covered four villages each in both AP (Medak District) and Karnataka (Tumkur/ Hassan Districts). These were selected to include 'intervention' villages, where NGO-implemented NRM programmes have been active, and 'non-intervention' villages.



Picture 1 Resource flow mapping exercise in Karnataka (Photo by Barbara Adolph)

Key findings

1. No decline in soil productivity

In the study areas there is little evidence that soil productivity is in decline. In fact, yield trends and the views of farmers suggest that productivity is stable or increasing, and that soil fertility is only one of several important constraint faced by farmers.

2. Rich indigenous knowledge on soil fertility management (SFM)

Farmers are actively managing soil fertility and other soil properties through a wide range of practices and significant inputs of labour, knowledge and capital. Farmers are both adapting so-called 'modern' methods, like combining chemical and organic fertilisers, and using practices based on long experience and a rich knowledge of the locally specific conditions.

3. Re-distribution of livestock

The overall number of livestock is decreasing in the study areas due to labour shortages, decline in grazing lands, and increasing mechanisation. But the proportion of landless and small farmers owning livestock is increasing as a result of a number of government programs promoting livestock ownership, which opens up new opportunities for the poor.

4. Emerging markets for organic matter

The strong demand for organic inputs (including the preferences of many big farmers growing specialist crops like ginger, betel nut and coconut) and redistribution of livestock have led to a rapidly expanding market for organic fertilisers.

5. Concern about impact of chemical fertilisers

Farmers expressed concern about negative impacts of chemicals on soils such as hardening and compaction, the soil becoming 'addicted' to fertiliser applications, and the scorching of crops. They are also concerned about their dependency on external inputs. *(Word count: 509)*

2 Background

This project is a first phase project aiming at understanding livelihood aspects of SFM and identifying key constraints. It is intended to be followed up by a second phase that will take the recommendations forward to undertake action research on alternative strategies for SFM.

The project's goal is the NRSP semi-arid systems logframe output 2: "Strategies for the integrated management of crop and livestock production systems which benefit the poor developed and promoted at the catchment level". Understanding the role of social and human capital, and validating new approaches to soil nutrient management, are OVIs for this output.

The project builds on the earlier NRSP project R7458, which explored the relationship between nutrient management and livelihoods. The realisation that a livelihood approach was necessary to take the exploration of soil nutrient management forward in semi-arid India grew out of R7458 and is central to the livelihood orientation of this project.

During a pre-project meeting with partners in India in January/ February 2001, a strong interested in working on the "neglected" aspects of SFM was expressed. Both project partners in India (DDS and BIRD) have a history of working on low-external input agriculture, with a pro-poor focus, and were keen on adding value to their practical experience through systematic research on key aspects of SFM.

3 Project purpose

The project's purpose is the NRSP semi-arid systems logframe activity 2.1: "The role of human and social capital in catchment management understood and new approaches to NR management that benefit the poor developed and validated".

Most SFM research does not take account of human and social capital, which is one of the reasons why farmers have often not taken up recommendations based on such research. In particular, the importance of farmers' own knowledge and experiences has been

underestimated, with the conventional view being that farmers mine their soils because of their ignorance of soil properties and plant nutrient requirements.

However, social and human capital alone do not explain farmers' decision-making processes. The project realised very early on that it is necessary to broaden to a wider livelihood perspective in order to fully understand farmers' SFM practices. Previous research often did not look into the wider implications of SFM for the livelihoods of poor people - such as employment generation, sustainable use of natural resources, and links to other NRM initiatives such as WSM.

The project achieved all anticipated outputs and the OVIs at purpose level. A second phase is now required to take forward the recommendations that were developed in close collaboration with partners and stakeholders in India.

4 Outputs

4.1 Output 1 - Understanding the role of social and human capital in SFM

The first output aims at gaining an "enhanced understanding of present livelihood strategies of the poor in relation to the interactions between nutrient and soil management." This output has been fully achieved for the two study areas through the fieldwork, and partly for other parts of SAT India through a review of the literature and discussions with stakeholders from other parts of the region. Nevertheless, the research team is aware that most of the aspects explored in this study vary considerably across semi-arid India, and therefore the findings from three districts are not necessarily representative for the whole region. In particular, trends in land and livestock ownership depend on a range of local conditions and factors, and those documented in the three districts might or might not be widespread in other parts of SAT India.

4.1.1 Overall scenario

When analysing soil fertility in a livelihood context, it becomes clear that decisions about SFM are a sub-component of the overall livelihood strategy of a household and are inter-linked with a number of other activities and desired outcomes. SFM decisions depend not only on the assets available to a household, but also on the structures and processes that characterise the environment within which the household takes decisions.

Figure 1 illustrates the trends that the team identified in the two study areas, and that were confirmed to apply to large portions of SAT India. These are overall trends and do not necessarily apply to every individual household or farm. The main elements are as follows:

- Low external input SFM practices are overall on the decline because of:
  (a) abandonment / decrease of certain practices (e.g. sheep penning, tank silt application)
  (b) replacement of LEI practices by chemical fertiliser application.
- Use of chemical fertilisers is increasing, because of its easy availability (including on credit), easy handling / application, and competitive price due to subsidy on nitrogen fertiliser. Research and extension are strongly promoting chemical fertilisers, giving them an additional advantage over LEI practices.
- However, based on the findings from the case studies undertaken during this project, it appears that overall more nutrients in dryland farming still come from organic sources / low external input practices than from chemical fertilisers.

- Initially farmers' response to the increasing availability of chemical fertilisers was positive and enthusiastic, and the use increased rapidly. After a certain period of time, farmers began noticing decreasing response to chemical fertilisers - they had to use more fertilisers to sustain crop yields and became disappointed. At the same time, fertiliser prices increased due to the lifting of subsidies on compound fertilisers in 1992.
  Currently many farmers are worried about their dependency on chemical fertilisers and would prefer to use LEI practices (especially FYM). However, they feel that their soils have become "addicted" to chemical fertilisers and that they cannot afford not to apply any, as it would result in complete crop failure. Many farmers are very worried about this and are looking for options to reduce chemical fertiliser use, while increasing organic inputs.
- A number of innovative farmers have started to reverse the trend by reverting back to LEI/ organic practices either on their own, or with support from NGOs. SHGs play an important role in promoting such innovations, because they provide the social network required to access information, and because they promote self-confidence and initiative.

These main trends will be explained in the next section. A more detailed analysis of the various livelihood aspects of SFM is given in Annex E.

4.1.2 Main findings

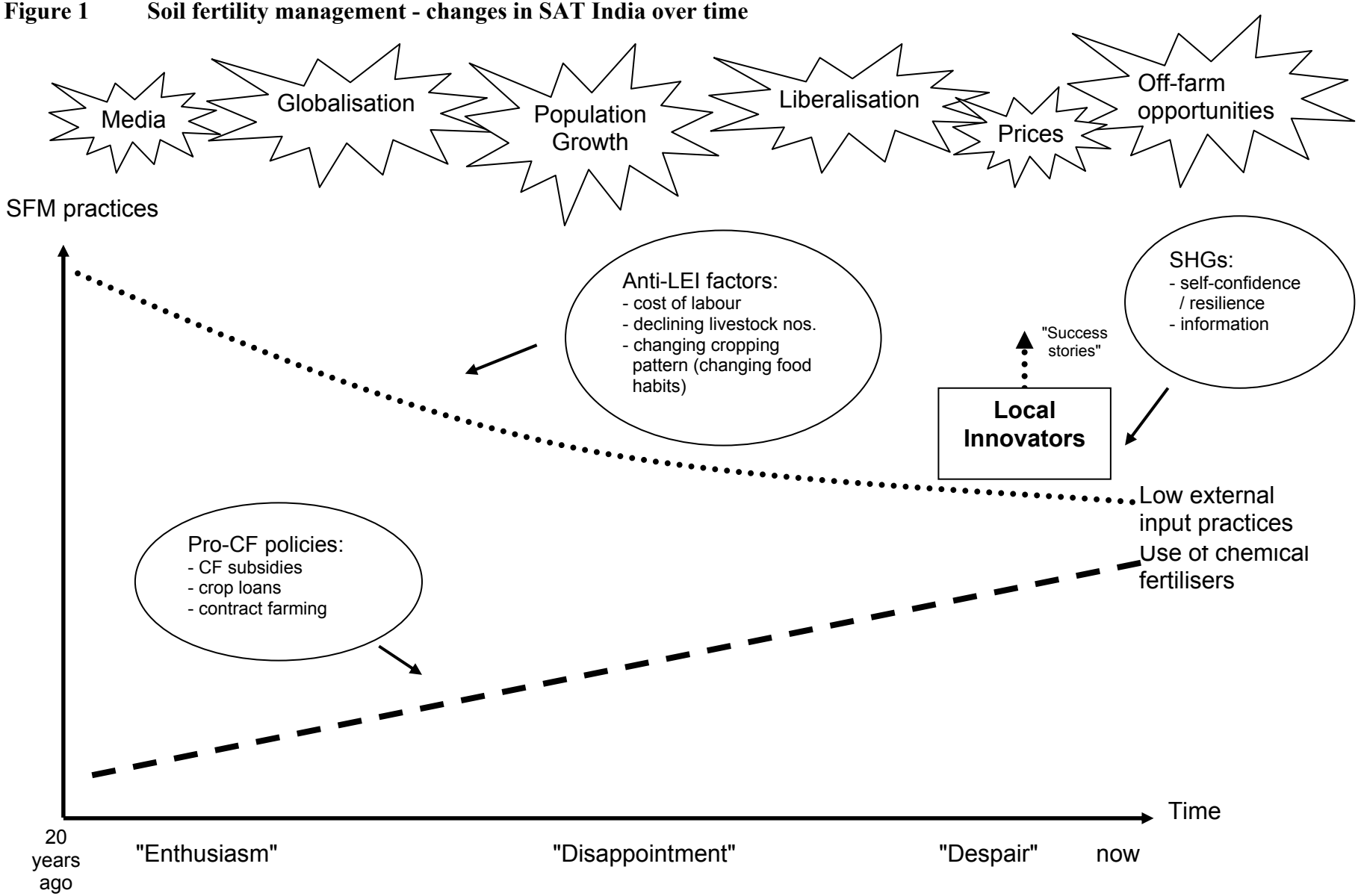
4.1.2.1 Trends and dynamics of rainfed farming systems

While the important role of rainfed farming is acknowledged by national and state agricultural policies, the visions of future agricultural development differ between central government, state governments, and various interest groups including small and marginal farmers. Both Andhra Pradesh and Karnataka state governments are promoting high external input farming, with the aim of competing with producers on the international market. Contract farming and corporate farming is on the increase, relying on monocropping of cash crops under high input regimes. At the same time, farmers are voicing their concerns about these developments; a recent farmers' jury in Andhra Pradesh voted for (1) Food and farming for self-reliance and community control over resources, (2) Maintaining healthy soils, diverse crops, trees and livestock, and building on peoples' indigenous knowledge, practical skills and local institutions (see http://www.poptel.org.uk/iied/agri/IIEDcitizenjuryAP1.html).

Many farmers in semi-arid India are suffering from the effects of reduced subsidies and trade liberalisation, which have resulted in higher input costs and low prices for agricultural outputs. For example, groundnut prices decreased in real terms since 1997, while fertiliser subsidies on compound fertilisers were lifted in 1992. Coupled with erratic rains and pest problems, groundnut cultivators in Anantapur District of AP became heavily indebted and many committed suicide. Suicides by farmers who became indebted as a result of taking loans for agricultural inputs have become a common headline in the local newspapers.

The number of marginal and small farms (owner-operated, leased, or sharecropped) appears to be increasing in parts of semi-arid India. This is a trend that runs parallel to the general diversification away from farming and increase in off-farm employment that can also be observed. Not everyone has the opportunity to get such employment, and those people staying behind in the village might not have the skills or initiative to leave. Among them are often families whose traditional (caste-based) occupation has become non-viable due to the influx of industrial goods and services. Many of these farmers are now seriously engaged in agricultural activities, rather than pursuing off-farm employment, and constitute a new target group for agricultural research and extension.

Figure 1 Soil fertility management - changes in SAT India over time



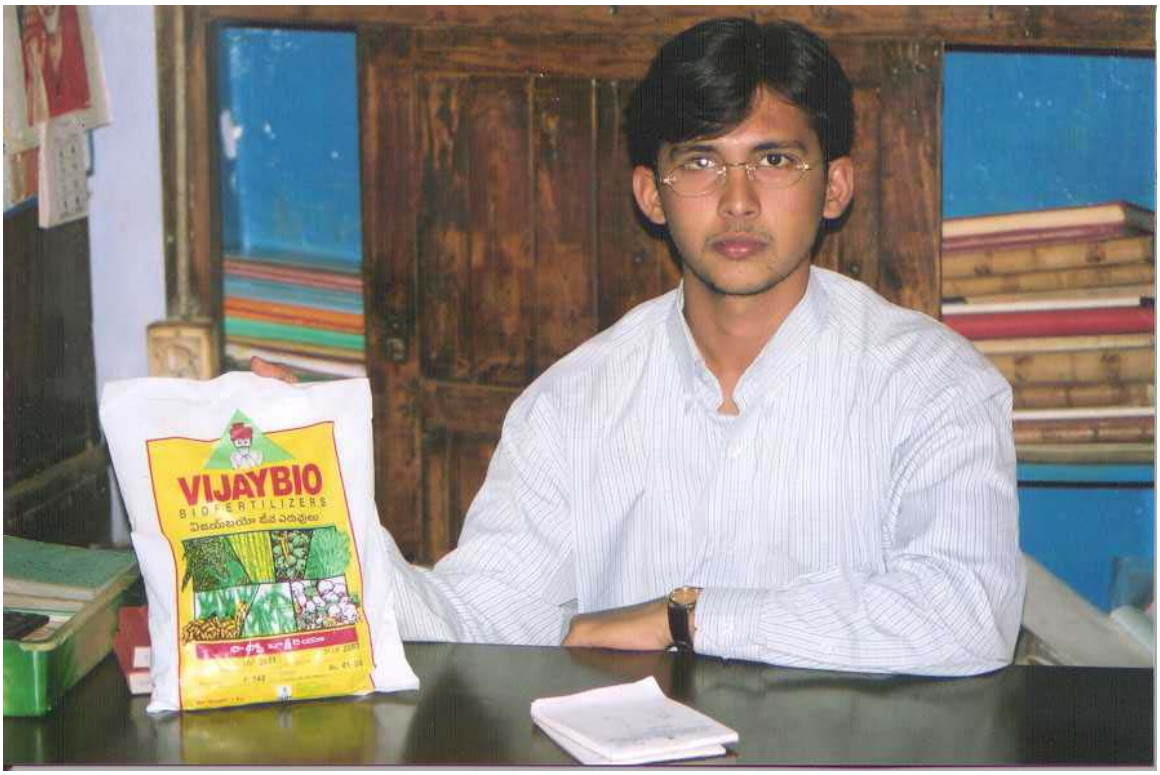
Picture 2 **"Traditional" compost, containing mostly FYM, household waste, crop residues, and sometimes leaf litter, is being loaded onto a bullock cart in a village in Anantapur District, AP. (Photo by John Butterworth)**

Picture 3 **This shepherd in Anantapur District of Andhra Pradesh is grazing his sheep on crop residues in this drought-prone area. (Photo by John Butterworth)**

Picture 4 **A woman watering her vermicompost bed in Medak district, Andhra Pradesh, where NGOs and the KVK are promoting vermicompost. (Photo by Barbara Adolph)**

Picture 5 **Tank silt application is an important SFM practice in coconut orchards of Tumkur district, Karnataka. The state governments of AP and Karnataka are subsidising tank de-siltation to increase irrigation capacity - but they do not support transport of silt to fields. (Photo by Barbara Adolph)**

Picture 6 **Agricultural extension material displayed during BIRD's "Green Day", Tumkur, Karnataka. The material is written in Kannada and informs about a range of agricultural practices, including vermicomposting and tree planting. (Photo by Barbara Adolph)**



Picture 7 **This fertiliser dealer in Zahirabad town of Medak District, Andhra Pradesh, is not just selling fertilisers, but also advising farmers on dosage and application. (Photo by John Butterworth)**

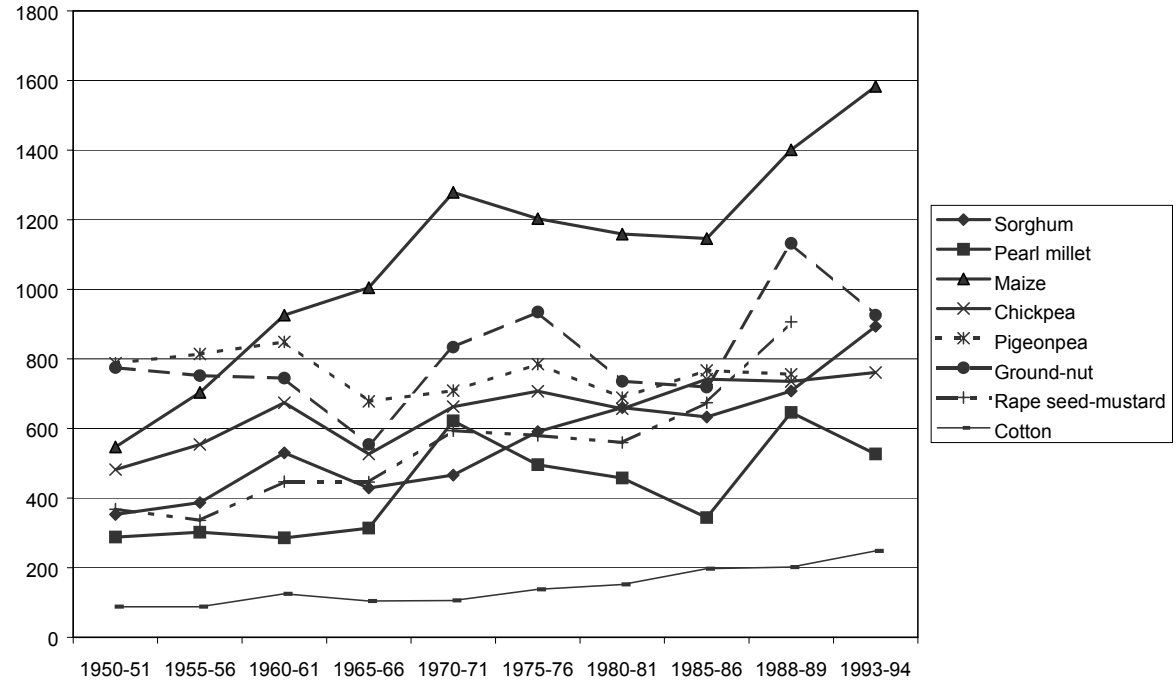
An overall decline, coupled with a re-distribution of livestock - especially cattle - was observed in the study areas with more landless and small farmers owning livestock. This results in new livelihood opportunities for them. The trade in FYM as a soil amendment is increasing. In the study areas, landless people obtain fodder for their livestock from CPRs and, probably more importantly, from green fodder (weeds, sugarcane leaves) cut and carried from the fields on which they work as wage labourers. Green fodder, unlike dried fodder like sorghum straw, is generally not sold within the village, but is available free of charge to whoever needs it.

FYM is used both for SFM and as a fuel. It is also used to plaster the floor and yard of homesteads. In areas where firewood is in short supply, and other options such as gober gas are not available, the use as fuel can substantially reduce the quantity of FYM available for SFM.

4.1.2.2 No decline in soil productivity

In the study areas there is little evidence that soil productivity, defined as *"the overall productive status of a soil arising from all aspects of its quality and status"* (Stocking M and Murnaghan N 2001: Handbook for the Field Assessment of Land Degradation), is in decline. This is contrary to the prevailing wisdom that soils in rainfed areas are being significantly degraded. In fact, yield trends and the views of farmers suggest that productivity is stable or increasing (see Figure 2), and that soil fertility is only one of several important constraints faced by farmers. While farmers do not generally report soil fertility decline as a major problem, soil management is an important aspect of their farming practices.

Figure 2 Productivity changes of principal dryland crops



Source of data: Singh, H.P., Sharma, K.L., Venkateswarlu, B., Vishnumurthy, T & Neelaveni, K. (1998) Prospects of Indian agriculture with special reference to nutrient management under rainfed systems, In Swarup, A, Damodar Reddy, D., & Prasad, R.N. (Eds), Proceedings of a national workshop on Long-term soil fertility management through integrated plant nutrient supply, pp 34-53 Indian Institute of Soil Science, Bhopal, India

The yields of all crops except pigeon pea have shown steady improvements. However, yield increases are not based on soil fertility alone and reflect many other factors that have changed significantly over this period such as better seed, better soil and water conservation, and use of more chemical fertilisers. They may also be based upon 'mining' of nutrients with important long-term consequences. Also, the trends shown have been calculated across large areas, and it is well possible that areas with productivity decrease exist, but the overall trend is still positive due to high increases in other areas.

4.1.2.3 Rich indigenous knowledge on soil fertility management (SFM)

Farmers are actively managing soil fertility and other soil properties through a wide range of practices and significant inputs of time, knowledge and capital. As well as adapting so-called 'modern' methods like combining chemical and organic fertilisers, practices based on long experience and a rich knowledge of the locally specific conditions and constraints are alive and vibrant. These indigenous and dynamic SFM practices are largely unknown and undocumented by the official research and extension system.

In study villages of Medak district, Andhra Pradesh, farmers named at least 20 practices during focus group discussions, and could describe the advantages, disadvantages, and applicability of each practice. In Tumkur District of Karnataka, somewhat fewer practices were mentioned, partly because here cropping patterns have changed more drastically in favour of cash crops and bio-diversity has been reduced. This resulted in less crop rotation and intercropping - both practices that can enhance soil fertility.

It is possible that the high levels of input use in the form of both OM and CF by farmers in the study area, as well as in-situ recycling of nutrients, are responsible for the stability of crop yields and the lack evidence for land degradation on a large scale.

There are a large number of options available to farmers to improve soil fertility management. They include strategies to

1. Add more nutrients into the farm system,
2. Minimise unproductive losses of nutrients from the system (through processes such as volatilisation, and leaching)
3. Maximise the recycling of nutrients within the farm
4. Increase the efficacy of nutrient uptake.

Other practices improve other aspects of soil fertility e.g. water-holding capacity. Many practices do not easily fit into just one category.

Practices are generally location-specific, for example they are used on a particular type of soil for a particular crop. There are also practices used to treat problem soil, such as ash application on certain types of black soils. Practices are dynamic and change over time, because of changes in input availability and cost (especially labour) and because of continuous innovations made by farmers. While Table 1 gives an overview of the most commonly found practices, Annex E explains the various practices in more detail.

Table 1 SFM practices found in the study districts

Medak (Andhra Pradesh)	Tumkur/ Hassan (Karnataka)
Adding nutrients (many of these practices also have other benefits e.g. improved soil physical properties)	
• Manure – FYM/ compost, Sheep manure, Goat manure • Chemical fertiliser (DAP etc.) • Vermicompost • Sheep penning • Tank silt application • N-fixation through growing legumes – short-term benefits to crop and long-term benefits through leaf fall/ incorporation of legumes • Incorporation of ash from sugar cane processing • Neem cake application • Applying soil from ant hills • Incorporation of *calotropis/ cassia tora/ bavanchalu* • Adding *pongamia/ cassia auriculata* and *subabul* to cattle bedding (used in compost)	• Manure – FYM/ compost • Chemical fertiliser • Red soil application • N-fixation through growing legumes in rotation • Vermicompost • Tank silt application • Sheep penning • Incorporation of green leaf (*cassia fistula, cassia siamea, pongamia*)
Minimising losses	
• Soil and water conservation – bunding/ tree planting	• Field bunding
Maximising recycling	
• Niger cultivation and incorporation (roots/ high leaf fall) • Sunhemp	• Incorporation of ash (burning of crop residues/ weeds) • Growing of trees • Green manuring (sunhemp, sorghum)
Increasing utilisation	
• Cultivation of legumes • Mixed cropping/ Crop diversity • Crop rotation • Tobacco cultivation?	• Crop rotation • Mixed cropping
Other	
• Summer ploughing	• Ploughing

Source: DDS and BIRD fieldwork reports

4.1.2.4 Re-distribution of livestock

The overall number of livestock is decreasing in the study areas due to labour shortages, decline in grazing lands, and increasing mechanisation. But the proportion of landless and small farmers owning livestock is increasing as a result of a number of government programs promoting livestock ownership. Livestock ownership opens up new opportunities for the poor, including trade in farmyard manure (FYM) and compost, and offering ploughing services.

Trade in FYM is an important livelihood opportunity for many poor families. In the study villages, almost all landless families were involved in it to some extent. In Pastapur village of Medak district, a household survey showed that it the overall value of FYM can be quite substantial; in the case of Pastapur, the value of all FYM produced in the village in a year showed to be equivalent to more than 75 % of the annual Panchayat's budget.

Distress sales of FYM as a coping strategy for the poor have been observed throughout the study area and reflect both the overall shortage of this sought-after resource and the need for cash by poor people. FYM thus constitutes an asset that can be used in times of crisis to meet urgent cash needs, e.g. for medical or school fees. Even though all farmers would like to meet their own FYM needs first before selling compost, especially small and marginal farmers are often coerced by bigger landlords or FYM dealers into selling their whole heap.

Ownership of bullocks for ploughing is another livelihood opportunity for the landless and poor, and can be a crucial factor in determining whether someone is able to lease in or sharecrop land. In Medak district, some small farmers and landless are now offering ploughing services to larger farmers, who are unable to keep the large number of bullocks required for ploughing their land.

In Karnataka, there is a shift towards mechanised tillage and tractor ploughing by farmers from all farm size categories. A main factor is the need to plough quickly after the first monsoon showers, and tractors reduce the time for ploughing substantially.

Table 2 Trends in the numbers of livestock owned by the rich or poor in study villages of Medak district, Andhra Pradesh

Type of animal	Poor	Rich	Reasons
Cows	Less	Less	Rich have still 1or 2 cows more than the poor.
Buffaloes	Slightly more	More	More owned by bigger farmers due to dairy co-operatives in the villages.
Bullocks	More	Less	The number of bullocks with the poor/small farmers has increased mainly due to the fact that they are more actively involved in farming, whereas earlier they used to leave their lands fallow and work for landlords. While the actual numbers of bullocks owned by bigger farmers are still greater than those of small farmers, they have decreased when compared to the previous situation.
Sheep	Less. Only shepherds own them		Sheep rearing requires special care and management skills. With the younger generation being now more involved in education, and a lack of experienced people to look after sheep, people are disinterested in sheep management. Another important thing is that the sheep are more prone to theft and diseases.
Goat	More	Less	The number of goats have increased with the poor as they serve as cash in hand and are easy to manage when compared to sheep. Each poor household maintains 1or 2 goats. Their rate of reproduction is fast. Although the number of goats owned by the bigger farmers has decreased, they still own more goats when compared to the total goats owned by the small and marginal farmers in the villages.

Source: DDS field report

4.1.2.5 Emerging markets for organic matter

The strong demand for organic inputs (including the preferences of many big farmers growing specialist crops like ginger, betel nut and coconut) and changes in livestock numbers and ownership have led to a rapidly expanding market for organic fertilisers. With improved

access to the supply of FYM as a result of changes in livestock ownership (see section 4.1.2.1), some of the poor and landless are in a strong position to benefit from this trade. However, there is currently no support for this market and formal credit is not available to purchase FYM or compost (unlike chemical fertiliser). There is also no mechanism in place that helps farmers to get a better deal for their FYM, e.g. through co-operative marketing.

Vermicompost is picking up rapidly in areas where training and worms have been made available by NGOs. A woman can produce 400 to 600 kg of vermicompost per month, with around two hours labour input per day. The compost is sold at a rate of 200 to 250 Rs per 100 kg to farmers growing spices, vegetables, and fruit. It is increasingly being used on other crops, including coconut, sugarcane, paddy, and some dryland crops. The income derived from an established vermicompost unit is thus substantial, and there is no sign of the market being saturated. However, vermicompost is still not being promoted on a large scale by agricultural departments, partly because their staff are not always familiar with the method. The DDS-run KVK in Zahirabad is training NGO and government staff in vermicompost production, and a number of pilot units have been established in the district.

4.1.2.6 Concern about impact of chemical fertilisers

Farmers expressed concern about negative impacts of chemical fertilisers on soils, such as hardening and compaction, the soil becoming ‘addicted’ to fertiliser applications, and the scorching of crops. Interestingly, this concern was not just voiced by small and marginal farmers, but also by large farmers with a more commercial orientation. Farmers also noted negative changes in food quality including smell and taste.

Researchers from ICRISAT and CRIDA argue that Integrated Nutrient Management (INM) would not result in any damage to soil physical and biological properties, provided that enough organic material was added. However, this is exactly what farmers are doing - they use both organic and chemical fertilisers in varying proportions and quantities, depending on their needs and resources. The question is why farmers are still observing these negative effects of chemical fertilisers, and what could be done about it. The observation of soils becoming "addicted" to chemical fertilisers has a scientific explanation, as such fertilisers only provide nutrients to a plant for a short period of time, after which a new application is required to sustain growth.

While it would be worthwhile to explore further the exact circumstances (soil types, SFM practices, crops grown) under which farmers experienced these negative impacts of chemical fertilisers, it is understood that they are also concerned about dependency on external inputs that have to be purchased - often on credit. Being able to buy inputs on credit is an attraction in itself, but non-ability to pay back has often led to indebtedness (see section 4.1.2.1).

4.2 Output 2 - researchable opportunities and constraints

Output two aims at identifying *"researchable opportunities for and constraints (technical, social, institutional and policy as required) to the improvement of livelihoods of the poor through better soil and nutrient management."*

The project identified a number of opportunities and constraints, and the team developed recommendations to address them (see Table 3). These recommendations were presented to several stakeholders in March 2002 (see Annex J and K). This strategy had been agreed with the programme manager in January 2002, to replace the end-of-project workshop that had originally been planned, as it was felt that specific key stakeholders are easier to reach through individual visits to their office.

Table 3 Constraints, opportunities and recommendations

Researchable opportunity and / or constraint	Emerging recommendation
Agricultural research and extension agencies are not sufficiently aware of the wide range of effective local SFM practices. Partly as a result of this, they focus their activities on chemical fertilisers, which do not offer livelihood opportunities for the poor and landless or match their SFM needs.	Raise awareness among agricultural research and extension agencies on the wide range of effective local SFM practices by involving them in an audit / manual of farmers' SFM practices (see section 7.1 for details).
Currently there are not enough organic fertilisers available, and therefore prices for FYM and vermicompost are relatively high, making them unaffordable for some farmers. Causes of low OM supply include biomass shortage in some areas (however, this does not appear to be a problem everywherel, because intensification has lead to more biomass production), high cost of labour, decrease in livestock numbers, lack of other cash sources leading to distress sales of FYM, and lack of support (knowledge, inputs) for alternatives (e.g. vermicompost). As a result, chemical fertiliser use is increasing and farmers are reporting soil quality concerns. Chemical fertilisers are being promoted through subsidies, credit, extension advice and research, whereas little support is available for organic / low external input methods.	Create a 'level playing field' for both organic and inorganic SFM methods by promoting and supporting farmers in using organic methods (such as livestock loans, improving seed availability, loans and training for organic inputs, and agroforestry). This would give the poor an unbiased choice in the type of SFM strategy they want to use.
There is a lack of easily accessible and balanced dissemination materials on low external input SFM practices that have been tested by farmers. On the other hand, the first phase of the project has shown that farmers are using a wide range of SFM practices, but some of these are not widely known and have not been validated scientifically. Likewise, current extension material does not point out the disadvantages and inputs required for each practice (such as labour requirements), thus making it difficult for farmers to identify the practice suitable for their own conditions.	Undertake an audit and develop a manual of low external input SFM practices combining farmers' and researchers' knowledge on various methods.
The findings from this research suggest that there is no soil fertility "crisis" and farmers are by and large sustaining crop yields in dryland farming systems, while investing in a wide range of SFM methods. However, it is not clear to what extent the overall increase in productivity (which depends on many factors) is overshadowing an overall deterioration in soil quality, and negative nutrient balances on some fields. This can happen when nutrients are being transferred from one part of the farm, e.g. the dryland fields, to another, e.g. the irrigated coconut orchards, via FYM (as is happening in the Karnataka study sites).	Research on farm nutrient balances that include adequate assessment of organic inputs and recycling of nutrients to address concerns about long term soil fertility decline.

Table 3 - continued

Researchable opportunity and / or constraint	Emerging recommendation
Widespread concerns over the negative impact of chemical fertilisers were expressed by farmers from different farm size categories in both study sites. At the same time, the use of chemical fertilisers is widespread and appears to be increasing. It is not understood what exactly is happening to the soils that are effectively under INM, as most farmers are using both OM and chemical fertiliser.	Undertake research to better understand the impacts of chemical fertilisers on soil quality on-farm and develop alternatives with small and marginal farmers
Farmers from all farm size categories were very keen on using organic practices, in particular FYM. However, FYM is in short supply and its price is increasing. Alternative other low external input practices such as vermicomposting, tank silt application, or incorporation of green manure crops are labour intensive. There are currently few incentives in place that would encourage farmers to engage in such labour intensive practices. In several places in India (among them Zahirabad town), demand for organically produced food has triggered the emergence of community marketing and certification efforts that are based on trust rather than formal controls. Such schemes could provide the price incentive required to make the use of labour-intensive low external input SFM practices viable.	Develop local and community certification and marketing opportunities for organically produced rainfed crops, and develop and test models to link small and medium organic farmers to these markets
The study has shown that it is impossible to look at SFM in isolation from other factors such as livestock, labour, social networks, local knowledge, power relations and dependencies, and gender aspects. However, in most agricultural research institutes in India, SFM research is still carried out with a very strong production orientation, which results in technically sound, but environmentally, socially and economically inappropriate options.	Mainstream the use of a livelihoods perspective in SFM research in order to address poverty, and to better understand household-level constraints and opportunities.
Trade in organic matter, especially FYM and traditional compost, is often motivated by cash needs rather than conscious marketing efforts. Poor people are even coerced into selling FYM, which they would rather use for their own land. There is no community marketing system for OM, and buyers rather than sellers dictate prices because they are the once in a relative power position (big landlords versus landless / small farmers).	Undertake action research to identify the best options for poor people to produce and market organic fertilisers, and to engage in trade on more favourable terms.
During this first phase, the research team used a combination of PRA tools and resource flow exercises (including farm flow maps), based on a tool kit developed by KIT (Royal Tropical Institute, Netherlands). While this toolkit provided many inspirations for this project, the tools have been developed for and tested in African conditions, and are therefore not always appropriate for Indian conditions and farming systems. However, the tools, they could be adapted to Indian conditions quite easily and made available to a larger research community.	Further develop and adapt the methodology used for this study into a package of methods suitable for participatory research on SFM in India.

In order to make the projects' recommendations accessible to a larger number of stakeholders, a briefing sheet has been produced (Annex H) and this has been circulated electronically or as hard copy both in India and elsewhere. Project reports are soon going to appear on the NRI web page for downloading in PDF format.

4.3 Output 3 - raising stakeholders' interest

Output 3 attempts to motivate and inform stakeholders through a video documenting farmers' SFM practices and their livelihood implications. It reads: "Interest of stakeholders raised with respect to the interaction between livelihood strategies and soil nutrient management strategies through the use of audio-visual media."

This output was fully achieved. The women's grassroots video group from Pastapur (Community Media Trust) accompanied the team throughout the project and documented both project events and, more importantly, farmers' SFM practices in both study sites. Being small farmers themselves, the women were able to capture very well the concerns of small and marginal farmers, as well as landless people. Being familiar with the local languages and customs, the video team was even able to film sequences that an outsider would have been unable to capture.

A one-hour video (with English subtitles) has been produced and submitted with the FTR. (Parts of) the video were shown to key stakeholders in Andhra Pradesh and Karnataka in March 2002 (see Annex J and K) as part of the video dissemination strategy (Annex I). The video received very positive feedback, especially from CRIDA. Many scientists and policy makers admitted not being aware of the large range of practices that farmers are using. It triggered interesting debates about the issues the project is most concerned with, i.e., how some of the constraints to the use of LEI methods can be overcome, and whether or not chemical fertilisers need to play an increasingly important role in dryland farming systems of SAT India.

The short version (15 minutes) is still being edited and its final version will be submitted to NRSP by 30 April 2002.

Provided that funds are made available through NRSP or other sources, the video can be distributed in CD form (which is inexpensive to produce, easy to post, and easy to use) to a larger number of stakeholders in India and elsewhere.

5 Research activities

5.1 Output 1 activities

Activity (as per logframe)	Description and achievement
1.1 Partner organisations (including NRI) to write issue papers on specific aspects of soil and nutrient management and its relevance for the poor, and how this relates to the institutions' way of operation.	All five issue papers were written and presented during the inception workshop. The papers are included as Annex F to the FTR.
1.2 Conduct an inception workshop with partners and selected stakeholders to: - discuss the issue papers identified and commissioned at the pre-project meeting; - address and resolve concerns arising regarding project focus and process; - expand the outline work plan into a programme for the evaluation phase; - assign roles and responsibilities during the evaluation phase	A three-day inception workshop was held in Bangalore (30 April 2001) and Tiptur (1 and 2 May 2001), and was attended by Dr Mike Carr. During day one, **the issue papers were presented to and discussed with a number of stakeholders from Karnataka and Andhra Pradesh (government departments, NGOs, farmer representatives, researchers).** The research questions were developed and refined by participants. During day two and three, the team agreed on the methodology, work plan, and responsibilities for each member.
1.3 Undertake a literature review and key informant consultations on SNM and poverty (including project reports and grey literature), and synthesise findings in the form of hypotheses.	The literature review was undertaken by J Butterworth and P V Satheesh, and key informant consultations took place parallel in both AP and Karnataka. The research questions were further refined accordingly
1.4 Develop fieldwork methodology and select study sites.	The fieldwork methodology had been outlined during the inception workshop and was pre-tested and further refined during joint field visits to the study sites by partners and NRI staff in June and July 2001.
1.5 Undertake pilot fieldwork in selected areas to validate hypotheses on factors conditioning SNM strategies affecting the poor and undertaken by the poor	Fieldwork was carried out in four villages each (two NGO intervention villages and two non-intervention villages) in Medak district, Andhra Pradesh, and in Tumkur district of Karnataka, from July to October 2001. Fieldwork reports were produced by each team by December 2001.

Activity (as per logframe)	Description and achievement
1.6 Undertake a policy review on policies influencing soil nutrient management strategies of poor farmers.	The policy review was originally contracted to B Sudhakara Reddy from IGIRD. However, because the numerous suggestions and comments from the team were not reflected in his review, M Indira from Mysore University was commissioned to complete it. The final version of policy review was completed in March 2002.
1.7 Synthesise findings from 1.1.to 1.6. into a working "livelihoods and SFM" document.	The final version of the working document, based on findings from the literature review, stakeholder consultations, policy review, and - most importantly - fieldwork, was completed in March 2002. While the first version of the working document was written by NRI staff, **subsequent interactions with other team members (culminating in a one-week working session in Hyderabad in March 2002) resulted in the working document being a real team product.**

5.2 Output 2 activities

Activity (as per logframe)	Description and achievement
2.1 Working with collaborators, develop brief concept notes (2 pages each) of at least 2 potential areas of researchable options for the second phase	The concept notes were developed with partners in Hyderabad in March 2002, following intensive discussions of key findings and recommendations.
2.2 Validate options in meetings with key stakeholders	**Stakeholder meetings were held in Andhra Pradesh and Karnataka** on 11 and 14 March (see Annex J and K).

5.3 Output 3 activities

Activity (as per logframe)	Description and achievement
3.1 Meeting with grassroots level video team held by month 2 to agree on contents of video documentation.	Meetings with the video group were held in May and a work plan for the video team to film both in Andhra Pradesh and Karnataka was agreed.
3.2 60 minutes video produced by month 10.	The 60-minute version has been completed and will be submitted to NRSP together with the FTR
3.3 15 minutes condensed version produced by month 12.	The 15-minute version still needs some editing and will be completed and submitted to NRSP by 30 April. The video team is currently travelling (UK - IIED and Peru) and were unable to complete the final edits before their departure.
3.4 Videos presented to key stakeholders	During stakeholder meetings Andhra Pradesh and Karnataka on 11 and 14 March (see Annex J and K), **parts of the video were shown to most stakeholders, and their feedback was recorded. The overall response was very positive.**
3.5 Videos distributed to stakeholders by month 13 (subject to availability of funds)	Distribution of the video (in the form of VHS cassettes or CD) requires additional funds from NRSP or other sources. The team is currently exploring different distribution mechanism (see Annex I).

6 Contribution of Outputs

The goal of NRSP's semi-arid systems logframe is: "Livelihoods of poor people improved through sustainably enhanced production and productivity of RNR systems". The outputs of this project contribute to this goal by providing donors, policy makers, and researchers with a better understanding of the relationship between soil fertility management and livelihoods of the poor, thus enabling them to take informed decisions about future research and development initiatives.

If the project's findings are taken forward, it should have a beneficial effect on the landless, who are relying on OM trade for a living by acknowledging their contribution to SFM. Supporting the use of organic / low-external input practices widely with the same vigour as chemical fertilisers would benefit not only these OM producers, but also small and marginal farmers who are reluctant to rely on external inputs. The mainstreaming of vermicompost production and use would have a positive impact on households that are unable or unwilling to migrate, but require some cash income to cover their daily expenses.

The two OVIs at purpose level have been fully attained:

(1) "By the end of project year 1, soil fertility management strategies of the poor in selected study areas in Andhra Pradesh and Karnataka determined and their role for the livelihood of the poor understood."

    This understanding has been obtained and documented. The main MoVs are the video and the Working Document (Annex E). The latter summarises the findings from the two field study sites and from other sources (literature review, policy review).

(2) "By the end of project year 1, all research collaborators and key stakeholders acknowledge a holistic understanding of soil fertility management issues and their implications for the livelihoods of the poor, and have identified options for research on soil fertility and farm land management benefiting the poor."

    Research collaborators certainly acknowledge the holistic nature of SFM, which is in line with their overall understanding of the complexity and dynamics of SFM and livelihoods of the poor. Some key stakeholders (especially APRLP) share this view, and appreciate the contributions it can make to their development endeavours. However, others are still having difficulties in arriving at a wider vision of soil fertility related issues. For research institutes with a track record of bio-physical research along subject matter / disciplinary lines, it is difficult to accept a perspective that basically challenges their traditional approach. It will require more than one project to influence such stakeholders and to assist them in mainstreaming the livelihood approach in their research agenda.

The project had an impact on several key stakeholders, especially the collaborating partners and those participating in the policy review. By working together systematically on a topic that had been of interest to them for a while, and by exchanging experiences from the two states where fieldwork took place, everyone's horizon was widened and a clear picture emerged from the large range of evidences.

The dissemination of the videos is just starting now and it is expected to have a strong impact on a range of stakeholders (including researchers, extension staff, NGOs) through the channels outlined in Annex I.

When the project was designed, it had been agreed that the first year was meant to generate the understanding required to move to the next phase, and that the existing project team, subject to approval of the FTR by the reviewers and the programme manager, would be

invited to submit a non-competitive proposal for a second phase of two years. During this second phase, the research recommendations identified during the first phase would be pursued.

While both NRI and research partners have been working under this assumption, recent communications with other partners in India revealed that the second phase will be lead by an institute hitherto only peripherally involved in the project. This could lead to a loss of momentum, and there is a risk that key recommendations are not taken forward, limiting the impact of the first phase.

7 Concept note ideas for next phase

7.1 Audit / manual of SFM practices

Justification:

There is a lack of easily accessible and balanced dissemination materials on low external input SFM practices that have been tested by farmers. On the other hand, the first phase of the project has shown that farmers are using a wide range of SFM practices, but some of these are not widely known and have not been validated scientifically. Likewise, current extension material does not point out the disadvantages and inputs required for each practice, thus making it difficult for farmers and extension agents to identify the practice suitable for their own conditions.

Purpose of proposed project:

By undertaking an audit of farmers' SFM practices in semi-arid parts of Karnataka and Andhra Pradesh, and possibly other semi-arid states, the project would document these practices from the farmers' perspective. Scientists and extension staff could be involved in the process to raise their awareness of farmers' knowledge and perception of SFM practices and their effects on soils. The style of the manual should encourage local adaptation and innovations.

The resulting manual could also include a decision making tool (to be used by farmers on their own, or with the support of a facilitator) to help identify suitable options for different farm and household conditions (see FACTS - Fertiliser advisors' certification and training scheme in the UK, which is based on such a decision making tool).

Parameters to include could be:

- Opening chapter on soil quality indicators (such as indicator plants, simple tests) that are being used by farmers
- Description of practice (with photos / drawings, or video documentation)
- Types of soils and crops associated with the practices
- Environmental impact beyond the farm
- Types and location of farmers using it currently
- Inputs required (materials, labour, etc.)
- Advantages and disadvantages from farmers' perspective, including impact on soils
- "scientific" aspects: types of nutrients added, chemical composition of organic and chemical soil supplements, effect on soils explained scientifically
- Trends in use and reasons for trends

- Assessment of future potential by farmers

Activities to achieve this:

- Search in (grey) literature and any other sources (ICAR is doing a database on ITK)
- Inform key stakeholders (including farmers' networks, Honeybee Network, universities, research institutes) about the project and ask for their contributions (possibly include questionnaire - see WOCAT - World Overview of Conservation Approaches and Technologies (http://www.wocat.org/quest.htm)
- Undertake extensive field visits with partners to identify practices (Alternatively: train partners, e.g. WSM programme PIAs, to identify and describe practices)/
- Identify practices to be included in the manual (decide on criteria for inclusion / exclusion)
- Photo- and video documentation, field recording (voice)
- Interact intensively with individual farmers / groups of farmers to find out about their specific methods
- Use many feedback loops / validation to cross-check the information / add to it / validate.
- Investigate mechanisms to protect the intellectual property rights of farmers

Final output:

- Length: around 200 pages, 3 to 5 pages per practice
- Book form or field manual with pictorial laminated cards to take out
- Telugu, Kannada and English
- Pictures, photographs to be included throughout

Potential partners

- BAIF, DDS, NRI
- Other NGOs that are involved in WSM projects (e.g. APRLP partners)
- CRIDA, CSWCRTI, ICRISAT (one scientist per institute) for validation

7.2 Supporting alternatives to chemical fertilisers for small and marginal farmers

Justification:

Currently many farmers in rainfed areas are using chemical fertilisers together with organic inputs. However, farmers are concerned about the negative effects of chemical fertilisers on their soils and pointed out a number of negative effects of chemicals, such as soil compaction, pest problems, etc.

On the other hand, more "serious" small farmers are emerging as a result of shifts in employment and rising labour costs, making it less feasible for landlords to employ a large number of labourers. Some of these small farms could be managed fully organically, if the right information and support was made available to farmers. The emerging organically produced food could be sold more profitably, if certification and marketing systems for these foods were established (see section 7.3).

Purpose of proposed activity:

The aim of the proposed project is to better understand the impacts of chemical fertilisers on soil quality and to develop, together with farmers and researchers, alternative management system that are suitable for scaling up. The project would explore the types of support required for such alternative management system and pilot them by carrying out action research with farmers in specific areas. Linkages with TC projects (especially APRLP and KAWAD) would be an integral part of this activity.

Activities to achieve this:

- Explore the circumstances and causes for the perceived negative impact of chemical fertilisers
- Action research to work with small / marginal farmers to:
  - adapt organic methods to their specific needs and constraints;
  - develop and test support mechanisms for farmers, e.g. livestock / OM loans, seed banks for cover crops / green manure
- Encourage policy makers to create a level playing field for organic / LEI practices and chemical fertilisers by giving similar support (loans, extension advice, research) to the former.

Potential partners

- DDS, BAIF, NRI, WSD programmes

7.3 Markets for organic produce

Justification:

The argument used for promoting high external input agriculture is the need to increase the competitiveness of Indian agriculture in order to achieve a price advantage over imported agricultural products. The strategy adopted by the government is therefore to promote mechanisation, hybrid / high yielding varieties, chemical fertilisers, and crop loans for particular packages aimed at enhancing the production of specific crops (e.g. oil seeds). This strategy is pro-rich, because often only larger farmers with more resources at their disposal can make the drastic changes to their cropping systems that are required to make use of the support services given.

An alternative strategy requiring no changes in cropping pattern, and even helping to preserve bio-diversity in the rich mixed cropping systems of small and marginal farmers, could be to increase the returns to agriculture for these farmers by developing certification and marketing systems for organic foods. Improved marketing systems for organic produce could reduce the risk and improve the viability of dryland farming for some poor farmers, who cannot afford expensive external inputs and are unable to benefit from government "modernisation" schemes.

Purpose of proposed project:

To develop certification and marketing opportunities for organically produced rain-fed crops, and ways of linking small and medium organic farmers to these markets.

Activities to achieve this:

- Explore / describe existing system, such as the one operating in Zahirabad town

- Develop certification system (e.g. community certification) system and possibly link this system to mainstream organic markets
- Work with private sector buyers to explore the options of linking urban consumers to rural producers

Potential partners

- DDS, BAIF, NRI, APRLP (community service centres), private sector

8 Publications and other communication materials

Journal articles

- Article for "Experimental Agriculture" planned (authors: Barbara Adolph and John Butterworth, to be submitted by June 2002)

Extension-oriented leaflets, brochures and posters

- One flyer (Annex G) and one briefing sheet (Annex H) produced and distributed among stakeholders in India and the UK.

Media presentations (videos, web sited papers, TV, radio, interviews etc)

- Two videos produced: One 60-minute version (submitted with FTR), and one 15-minute version (final editing to be completed and film to be submitted to NRSP by 30 April 2002)

Reports and data records

Annex A: Literature review (John Butterworth and P V Satheesh)

Annex B: Policy review (M Indira)

Annex C: Field work report - Andhra Pradesh (P V Satheesh et al.)

Annex D: Field work report - Karnataka (G N S Reddy et al.)

Annex E: Working document (Barbara Adolph, John Butterworth, P V Satheesh, G N S Reddy, et al.)

Annex F: Issue papers (various authors)

Project web site: http://www.NRI.org/IndiaSFM

9 Project logframe

Narrative summary	Objectively verifiable indicators	Means of verification	Important assumptions
Goal			
Strategies for the integrated management of crop and livestock production systems which benefit the poor developed and promoted at the catchment level	By 2002 in two targeted catchment areas: - the role of social and human capital in natural resources management understood. - new approaches to rainwater harvesting, conservation tillage and small scale irrigation validated. - new approaches to soil nutrient management validated. - new approaches to the selection and management of plant and animal genetic resources important to the poor validated. By 2003 an improved strategy for the integrated management of natural resources at catchment level adopted by target institutions in two targeted countries.	Appropriate dissemination products. Local, national and international statistical data.	Budgets and programmes of target institutions are sufficient and well managed.
Purpose			
The role of human and social capital in catchment management understood and new approaches to NR management that benefit the poor developed and validated	• By the end of project year 1, soil fertility management strategies of the poor in selected study areas in Andhra Pradesh and Karnataka determined and their role for the livelihood of the poor understood. • By the end of project year 1, all research collaborators and key stakeholders acknowledge a holistic understanding of soil fertility management issues and their implications for the livelihoods of the poor, and have identified options for research on soil fertility and farm land management benefiting the poor.	Working document on livelihood strategies for soil fertility management Brief outline CNs for identified options included in FTR	
	(To be revisited after the phase 1 project is completed)		
	• By the end of year 3, all research collaborators and key stakeholders have developed a comprehensive understanding of opportunities to improving SNM for the benefit of the poor and this understanding is reflected in their work plan / strategy. • New approaches to soil nutrient management incorporated into the agricultural research and extension programmes of two States projects by 2005. • Demonstrable impact on thinking of key national and state agricultural policy makers achieved by 2005	Training records from target institutions Policy papers and briefs issued by target institutions	

Outputs **Phase 1:**			
1. Enhanced understanding gained of present livelihood strategies of the poor in relation to the interactions between nutrient and soil management.	• Soil fertility and soil amendment management strategies of the poor in selected study areas in Andhra Pradesh and Karnataka, and their role in the overall livelihood strategies of the poor, understood and documented by month 8.	Draft literature review Working document / review paper on livelihoods and soil fertility management Policy review	
2. Researchable opportunities for and constraints (technical, social, institutional and policy as required) to the improvement of livelihoods of the poor through better soil and nutrient management identified and validated by stakeholders.	• Researchable opportunities and constraints identified and validated by research team and stakeholders by month 11. • By month 12, agreement reached with research collaborators and key stakeholders on at least 2 areas of research that have the potential for enhancing livelihoods of the poor through improved nutrient management strategies.	Brief CNs (2 pages each) of at least 2 potential research areas	
3. Interest of stakeholders raised with respect to the interaction between livelihood strategies and soil nutrient management strategies through the use of audio-visual media.	• By month 12, two films documenting soil nutrient management strategies of the poor produced: a 15 minutes condensed version, and a 60 minutes version. • By month 13, videos disseminated to and promoted with stakeholders.	Video, records of distribution, records of feedback from stakeholders	
Phase 2: (Outputs 4 and 5 to be revisited after the phase 1 project is completed)			
4. Participatory development of, adaptive research into, evaluation and documentation of practical methods and strategies completed.	• Policy, institutional, social, economic and technical research conducted in Andhra Pradesh and Karnataka over 18 months (2002 – 2004) and completed by month 30. • Evaluation completed by end of month 32. • Generic strategies and situation specific methods and strategies for overcoming constraints documented by month 32	Quarterly reports Stakeholder workshop /meeting reports Draft methods and strategy document	
5. Target institutions to incorporate practical methods and strategies in policy, research and extension planning processes secured, and broader dissemination effected.	• Strategies and methods incorporated into research and extension planning process of target institutions by month 36	Target institution work programmes and reports	The link between planning and implementation in target institutions is robust enough to ensure a level of impact commensurate with project purpose OVI.

Activities Phase 1:	Budget and milestones	Assumptions
Output 1: 1.8 Partner organisations (including NRI) to write issue papers on specific aspects of soil and nutrient management and its relevance for the poor, and how this relates to the institutions' way of operation. 1.9 Conduct an inception workshop with partners and selected stakeholders to: - discuss the issue papers identified and commissioned at the pre-project meeting; - address and resolve concerns arising therefrom regarding project focus and process; - expand the outline work plan into a programme for the evaluation phase; - assign roles and responsibilities during the evaluation phase (year one of the project). 1.10 Undertake a literature review and key informant consultations on SNM and poverty (including project reports and grey literature), and synthesise findings in the form of hypotheses. 1.11 Develop fieldwork methodology and select study sites. 1.12 Undertake pilot fieldwork in selected areas to validate hypotheses on factors conditioning SNM strategies affecting the poor and undertaken by the poor 1.13 Undertake a policy review on policies influencing soil nutrient management strategies of poor farmers. 1.14 Synthesise findings from 1.1.to 1.6. into a working "livelihoods and SFM" document.	**Milestones** 1. All partner institutions to submit issue papers by end of month 1 2. Inception workshop held and report completed by end of month 2 3. Literature review and key Informant consultations to be completed and findings synthesised by month 4 4. Pilot fieldwork completed and written up by month 7 5. Working document completed by month 9 6. Two videos produced by month 12. 7. FTR, including 2-page concept notes for at least 2 future research areas, completed by month 13 **Budget Summary:** **Phase 1: March 2000 - March 2001** UK Staff Costs: £ 17,292 Overseas Staff Costs £ 10,205 Overheads: £ 21,793 T & S Overseas: £ 0 Miscellaneous: £ 15,600 Video documentation: £ 3,600 Workshops: £ 5,300 **Total (excl. VAT): £ 73,790**	
Output 2 2.1 Working with collaborators, develop brief concept notes (2 pages each) of at least 2 potential areas of researchable options for the second phase 2.2 Validate options in meetings with key stakeholders		

Output 3 3.6 Meeting with grassroots level video team held by month 2 to agree on contents of video documentation. 3.7 60 minutes video produced by month 10. 3.8 15 minutes condensed version produced by month 12. 3.9 Videos presented to key stakeholders 3.10 Videos distributed to stakeholders by month 13 (subject to availability of funds)		
Phase 2: (Activities for outputs 4 and 5 to be revisited after the phase 1 project is completed)		
Output 4 4.1 Conduct training and pre-test field methods and approaches 4.2 Undertake policy, technical, social, technical desk studies and fieldwork over 2 kharif and 2 rabi seasons 4.3 Conduct a series of meetings with selected stakeholder to validate findings of fieldwork 4.4 Draft final report setting out strategies and methods to alleviate SNM constraints.	8. Fieldwork reports completed by month 30 9. Draft methods and strategies report completed by month 32 10. Strategy document completed by month 36 11. Dissemination workshop report completed by month 36 12. Final technical report completed by month 36	
Output 5 5.1 Conduct a series of meetings with key technical and policy level staff of target institutions to develop strategy document for incorporating approaches to SNM management into planning processes 5.2 Present project findings and implications at major dissemination / uptake workshop with a broad spectrum of possible uptake institutions 5.3 Disseminate project results through printed and radio media and on the internet		Key policy makers and technical staff in target institutions are available and receptive

10 Keywords

Soil fertility management, FYM, fertilisers, organic matter, indigenous knowledge, rural livelihoods, semi-arid tropics, India, natural resource management policies, natural resource management institutions

11 Annexes

Annex A: Literature review

Annex B: Policy review

Annex C: Field work report - Andhra Pradesh

Annex D: Field work report - Karnataka

Annex E: Working document

Annex F: Issue papers

Annex G: Flyer

Annex H: Briefing sheet

Annex I: Distribution strategy for video

Annex J: Notes from Stakeholder meetings in AP

Annex K: Notes from stakeholder meetings in Karnataka

Annex L: Final project inventory

Annex M: Interview schedule / tools for resource flow map