AN INNOVATION SYSTEMS STUDY
On
FODDER INNOVATIONS PROJECT ON ENHANCING LIVELIHOODS OF POOR LIVESTOCK KEEPERS IN KRISHNA AND GUNTUR DISTRICTS OF ANDHRA PRADESH

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For

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Exploring the Fodder Innovation System in Krishna and Guntur Districts of Andhra Pradesh

The present report is a synthesis of the findings of the initial visit of the Centre for Research on Innovation and Science Policy (CRISP) study team to the project sites in Krishna and Guntur Districts and the observations based on extensive interactions by the CRISP team with different partners in the project. The report, while presenting an analysis of existing relationships between different partners, also explores the potential for strengthening relationships to facilitate the emergence of an effective fodder innovation system.

Aim of the Study

CRISP has consented to partner with ILRI to undertake a study on fodder innovation system as part of ILRI's ongoing project on 'Enhancing Livelihoods of Poor Livestock Keepers through Increasing Use of Fodder'. The main aim of the present study is to provide inputs for the project to establish and strengthen alliances for enabling scaling up and out of fodder innovations. This entails a system mapping in the project area in Krishna and Guntur districts of Andhra Pradesh with NDDB as the main partner. The study would provide insights into the quality of interactions amongst the various actors in the local innovation system and identify the constraints and opportunities that would enable better development, adaptation and use of fodder varieties.

Methodology

The study by the CRISP team of researchers comprising C. Shambu Prasad, Rasheed Sulaiman, Sitaramaswamy and Yoganand, went about the study in the following manner.

1. A few base documents were collated and prepared by the team based on their past experience by applying the innovation systems framework to agriculture. In connection with that a review of literature on soft systems methodologies was undertaken. Specifically it was decided to use the tools of Actor Linkage Matrix (ALM) developed by Biggs and Matsaert (2004) and RAAKS or the Rapid (or relaxed) Appraisal of Agricultural Knowledge Systems developed by Engel and Salomon (1997) as analytical tools for the study.
2. Preliminary meetings and interviews were had with ICRISAT- ILRI staff to appreciate the context of intervention and their perspectives as stakeholders.
3. Field visits to the proposed area of intervention were undertaken in the month of July 2004 with a view to carry out a stakeholder analysis and a system diagnosis.
4. The findings of the interviews and analysis were then synthesized to finalize the report.

The background

The increasing inability of conventional approaches to technology development and transfer in reaching the large number of poor producers is well acknowledged. The importance of recognising the existence of the large number of actors involved in technology development, adaptation, transfer and use (innovation system) and promoting better information flow among them so as to improve the performance of the wider innovation system is getting wider attention at present. The current interest in trying to understand the innovation systems around particular technical interventions emerges from the work of a number of scholars. Notable among them include, the Agricultural Knowledge and Information System (AKIS) ideas proposed by Roling and Engel (1990); Multiple Sources of Innovation model of agricultural research and technology promotion by Biggs (1990) and the National Systems of Innovation approaches articulated by Freeman (1987) and Lundvall (1992). One of the major

contributions of the Innovation Systems Framework (ISF) is that it explicitly recognises the wide range of actors – both research and non-research – who are involved in innovation and the institutional context that underpins the way these actors interact. The ISF also emphasises the importance of linkages, partnerships, alliances or coalition among the various actors, the value of technological and institutional innovations and the role of learning in promoting better innovation systems (Hall et al, 2000).

One of the first tasks in improving the performance of an innovation system is to identify the large range of actors relevant to the particular innovation system. The second task is to map the relationship and flows of information (actor linkages) among the different actors as this would facilitate reflection and action on improving the information flows and thereby the system performance. Tools such as "Actor Linkage Maps" and "Actor Linkage Matrixes" developed by Biggs and Matsaert (2004) have been found helpful in exploring some of these issues. The set of tools developed as part of the Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) of Engel and Salomon (1997) provide useful insights for diagnosing the quality of actor interactions and sensitising the actors on the existing situation.

Actor oriented tools - RAAKS

One of the first steps towards strengthening the capacity of an innovation system is to understand the range of actors in an innovation system and the quality/strength of their linkages. One of the ways of achieving this is using the RAAKS toolbox and windows (RAAKS tools A2 (identifying relevant actors) and A3 (tracing diversity in actor objectives). RAAKS is a methodology that has been designed and tested to help stakeholders gain a better understanding of their performance as innovators. RAAKS provides a way to improve the generation, exchange and utilization of knowledge and information for innovation.

Central elements of RAAKS are teamwork, focused collection of information, qualitative analysis, and strategic decision-making. RAAKS uses a variety of windows to achieve a fundamental analysis, a transparent problem definition and recommendations for action. The important issues addressed in RAAKS include forms of cooperation between actors, actors' objectives and their conflicting and/or shared interests, integration and coordination of activities, relevant knowledge and information networks. As a methodology, RAAKS has a built-in learning process that encourages the use of multiple perspectives and emphasises even insists on group inquiry. The Study Team sought to combine some of the toolboxes and windows of RAAKS but did not follow it strictly appreciating this philosophy of joint inquiry. However RAAKS is a potentially powerful methodology that can be used effectively in the project in workshops, which have diverse stakeholders, involved in planning and assessing strategies and work plans.

One way of starting to map the relevant actors is by looking at the National System and the range of actors involved. Such an exercise has already been undertaken in the project especially in the Country Study Report. Table 1 below gives an outline of actors in the project at the local innovation system level. This is not an exhaustive list but can give us an idea of the kind of actors or groupings of actors that are likely to play a role in the innovation system. Throughout this report, we seek to reiterate that the study team sees itself in the role of a catalyst and facilitator and does not intend to portray a complete picture. In fact, we believe that the complete picture is one that can only be done through joint participation of stakeholders over a period of time. An inventory of actors in a system can and will change during the course of the project depending on the manner of interaction between partners and its quality. Actors might enter and leave the system. Actors can also change their nature of

participation from pro-active to active to passive or vice versa and in a dynamic situation it would be incorrect to try and provide a final picture. An inventory of organisations in the project region (in Krishna and Guntur Districts) and the potential contributions these actors could make to this project is given in Table 1.

Table 1: Actor/organisation-Capability matrix in the Local Fodder Innovation System in Krishna and Guntur districts

Sl. No	Name of the organisation	Potential contributions made/could be made to this Project
1	ILRI South Asia Region, Hyderabad	Key project manager (intellectual oversight, funding, co-ordination of activities and promotion of results) Source of improved varieties of fodder Source of international scientific expertise on livestock production
2	National Dairy Development Board, State office, Vijayawada	Managing partner (leading the implementation team at the region, co-ordination of activities at the two districts) Source of technical, managerial and financial expertise on livestock production (including fodder aspects) and development of dairy co-operatives Has undertaken a situational analysis of the sector recently to plan its activities by ascertaining needs of its stakeholders Started an ovulation synchronisation programme in the two districts to enhance conception rates. Commercial fodder farms supported
3.	Milk Unions	Provider of a wide range of services to dairy farmers. This include procurement of milk through the producers co-operative societies, provision of feed, fodder seeds, veterinary assistance, AI services, insurance (cattle and milk producer), technical support and training on various aspects related to livestock production
	a. Krishna District Milk Producers' Mutually Aided Co-operative Union, Ltd, Vijayawada (Krishna Milk Union) b. Guntur District Milk Producers Mutually Aided Co-operative Union Ltd, Guntur (Sangam Diary)	630 dairy co-operative societies organised so far, covers 960 villages, 118,700 member farmers Strong programmes on fodder seed production and supply 635 societies, 1.33 lakh members, 1-2 women societies (also see Table 3 for a contrast between the two villages)
4	Dairy co-operative societies	Procures milk directly from farmers, supply fodder seeds and cattle feed- an important forum at the ground level to organise learning opportunities
5	Department of Animal Husbandry	Manages a network of veterinary support centres in the districts. This includes: dispensaries, hospitals, poly clinics and livestock units. Promote para vets (gopal mitras) to provide mainly AI services. Larger interest in diagnostic and clinical services. Distributes limited quantity of fodder seeds as part of the state government programmes and organises cattle camps during periods of distress. Has a wide reach and the staff and infrastructure could be potentially used for promotion of fodder
6.	ANTHRA	An active NGO in the fodder innovation sector with a slightly different emphasis on biodiversity, preventive medicine and shaping of public policy in the sector especially in AP. Operations not in the districts. Involved with ILRI – FAO on talking pictures project. Has been requested by the project to undertake socio economic characterisation of the villages but has not been

		finalised.
7	Private dairy plants and milk procurement agents	Procures milk from producers (mainly in those regions not covered by the society)- Limited interest in promoting fodder but has major stakes in increased milk production that can happen through increased fodder supply
8	Agricultural Research Station, Lam	Source of expertise on fodder seed and improved bulls
9	Krishi Vigyan Kendra (KVK) Krishna and KVK Guntur	Potential source for testing and evaluating different varieties of fodder and provision of seeds and planting materials of fodder.
10	Private seed dealers	Supply seeds of crops and fodder crops
11	Media	Print media (newspapers, farm magazines), Radio and Television – can promote technical and institutional innovations related to fodder
12	Women Self Help Groups	There are about 500 women SHGs in each of these districts. Many of them are engaged in crop production and dairying. Some of these groups could be potentially used for commercial fodder production activities at the village level
13	Department of Agriculture	Implements a large number of agricultural development programmes, distributes seeds and planting materials as part of various programmes-the infrastructure and manpower could be potentially used for disseminating information and distributing seeds of dual purpose (food-fodder) varieties and cover crops that are soil enriching and could also be used as fodder.
14	Department of Forests	Controls access to fodder sources inside declared/notified forest areas
15	Panchayat Raj Institutions	Zilla Parishad, Block Panchayat and Gram panchayat are implementing a number of programmes aimed at employment generation. There could be opportunities for linking fodder development with some of these initiatives

An actor-oriented approach concerns primarily with mapping relationships and flows of information to provide a basis for reflection and action. The actor linkage maps and actor-linkage matrixes recognise only persons as actors (based on their function as researchers, extension staff, farmers, middle men, input suppliers, processors etc.) and not the organisation, which they represent.

Evaluation of different kinds of fodder used in the districts

ILRI in collaboration with the NDDB State office, Vijayawada has so far identified 15 villages in Krishna and 10 villages in Guntur to evaluate different kinds of fodder. The introduced varieties are currently being evaluated in a participatory mode and the observations are being recorded meticulously. Our interactions with members representing various stakeholders revealed the following characteristics regarding fodder promotion efforts and fodder choice, availability and use. The observations made by the study team and the emerging issues can be dealt under the following heads:

Cultivation practices and technical issues

It is a common practice that farmers use crop residues for feeding the cattle. Paddy straw is the most widely used fodder variety followed by crop residues from gram straw (green gram, black gram etc) for feeding the cattle. However the quality of fodder varies widely across the varieties. Fodder shortages become acute when there is crop failure like the instances where the limited sowing of paddy due to drought conditions arising from monsoon failure. The

region has faced such crisis during the last two to three years, which has resulted in changes in the cropping patterns, as the farmers are unable to grow paddy. In such conditions, the farmers are forced to look for alternate crops and under these circumstances fodder varieties such as CO3 have become more profitable than paddy. Moreover, farmers' preference for seeds or crops depends on the arrival of monsoon and release of water in the canal irrigated areas, which in recent years has been erratic. It is, therefore, difficult to predict the demand for fodder seeds and dual-purpose seeds before the season. In Guntur they grew dual purpose Jowar for the first time in nearly 50 years.

Farmers are aware of the importance of growing fodder crops and depending on their access to land and irrigation facilities and availability of fodder seed/planting material, they grew a number of fodder varieties. However, farmers have only a very limited understanding of the nutrient status of different kinds of feed and fodder, the correct stage/intervals for cutting fodder and the maximum quantity of some kinds fodder that could be fed in a day. These aspects need to be given importance in farmer education programmes. Moreover the farmers need to be provided with a choice of more fodder options to choose from. Making fodder available and accessible to farmers would necessitate experimenting with different kinds of delivery models for different fodder material and suit different kinds of client needs. Of late, fall in conception and fertility related problems have been observed for which an Ovulization Synchronization Programme has been started by National Dairy Development Board (NDDB) to look into these aspects. Addressing the fodder education needs of farmers and making quality fodder available and accessible to them would continue to be a challenge in the years to come and this would require partnership among a number of organizations and individuals.

Socio-economic and planning related issues

While planning interventions at the district level, the socio-historical aspects of the area and the existing diversity should be taken into consideration. Historically, this region is known for its enterprise in general and the diary sector in particular. The South India Cattle Show was first organised in Vijayawada in 1958 and state intervention through UNICEF has been there as part of the Integrated Milk Project as early as 1960. The first powder plant in South India was later established in Vijayawada. In more recent times, the farmers of the districts have shown tremendous enterprise in growing fodder seed varieties with a reputation that has brought in several private seed companies who have identified villages like Tadikonda in Guntur district for their seed multiplication efforts. When one looks at the cooperatives in these two districts, the overall coverage by cooperatives has been limited. In recent times the number of private diaries have increased especially in Guntur district. Further, these cooperatives have by and large served better-endowed regions and have been more successful in areas with strong market linkages and availability of water.

The ADO (Agricultural Development Officer) or FDO (Fodder Development Officer) of the unions are the key links with the outside world for the unions regarding innovation. They have been responsible for the region getting a name in fodder seed multiplication, a name that has attracted private seed suppliers such as MAHYCO etc. These officers are responsible for the implementation of the project and it appears that they should be taken more into confidence and internalise the project objectives and its poverty focus. Our experience in one of the villages visited showed that the farmers were saying groundnut was not good for cattle. The region has no history of groundnut cultivation especially for cattle and the FDO was unable to explain the reason for groundnut and dual purpose to his farmers. For the FDO to make a shift from commercial CO3 to groundnut is quite a jump and the project needs to address this aspect of delivery. The project needs to link up with the sources of innovation that already exist but slightly differently. There is no explicit poverty or client focus in much of

the enterprise related activities and the institutional mechanisms operate in a supply-based environment and are often unsuited to meet needs of poverty affected producers. Market mechanisms are strong in the region. The recent shift to irrigated fodder varieties from paddy though an innovation does not necessarily constitute a pro-poor intervention. The project on the other hand is meant to be demand driven and poverty focussed.

Organisational characteristics

It was observed that there was considerable variation in the way different organizations promoted fodder. Most of these organisations work in isolation and there is no organisational mechanism for achieving better interaction among the various actors. But a lot of synergy could be achieved if the various organisations interact more frequently and if better information flows could be achieved. Also there is considerable diversity even amongst the unions. Table 2 indicates subtle differences between the two Unions in the district. Interventions in future stages must match the specific organisational contexts (not just soil and village characterisations) of these unions and there is need to recognise the differences in the organisational cultures of these unions.

Table 2: Contrasting Organisational Cultures between Krishna and Guntur unions

Issue	Krishna	Guntur
History	Prior to operation flood set up in 1965, rich history of interventions in the sector	Post operation flood initiative set up in 1978, strong NDDB orientation
Recent organisational changes	Mutually Aided Cooperative society (MACs) but Vijaya	Completely independent of Andhra Pradesh Dairy Development Cooperative Federation (APDDCF)
Coverage	Taken on West Godavari procurement, otherwise more homogenous geographically	Heterogeneous especially between Nagarjunasagar canal irrigated and large dryland areas
Mission focus	Dairying as instrument towards strengthening rural economy, farmers prosperity through technical innovations, consumer focus as well	Cooperativisation of milk producers, increasing output of quality milk production
Public profile	Very high, aggressive	Moderate to low
Statistical profiles	630 societies, 1.18 lakh members, 103 exclusive women societies	635 societies, 1.33 lakh members, 1-2 women societies
Branding	Vijaya	Sangam
Private suppliers	Not many	Large numbers, 25, third badly affected district in state
Producer oriented strategy	Pricing as main strategy	Welfare and insurance focus
Fodder	Satellite fodder schemes	Repuration for seed multiplication villages
Seed processing plant	Move to acquire	In existence for a while
Fodder variety focus	Greater emphasis on CO3, yet to play an important market role, moving towards self sufficiency	SSG production base high, important player in the market
Diversification strategies	More diverse with regard to special market for cows and also product diversification focus	Not many

Based on interaction with the various actors, an attempt has been made to create an actor linkage matrix. The matrix only illustrates the current situation and the purpose of the ALM is to illustrate the kinds of partnerships that need to be strengthened during the project period to maximise benefits of the current interventions.

Actor Linkage Matrix (ALM)

The actors are listed along the vertical and horizontal axes and the cells in the matrix represent flows of information from the actors in the rows to actors in the columns. For instance in Table 3, cell 1B refers to information flows from dairy farmers to fodder seed producers and Cell 3C refers to information flows across fodder seed suppliers in the co-operative sector (in this case the milk unions on fodder issues). Based on our understanding of the situation derived mainly by way of interaction with actors from these systems, we have classified the linkages in terms of strong (S), medium (M) and weak (W) and wherever we don't have information we have indicated it as blank. The representation of linkages as indicated can ideally facilitate a more specific discussion on partnerships and can help in developing a consensus among the coalition members on the need to initiate new linkages or to strengthen existing linkages. However, this does not mean that all actors and linkages need to be pursued together. At the moment, strong relations exist among only the following major partners. This include:

a. ILRI staff involved in the Project at Hyderabad
b. NDDB staff directly involved in the project based at Vijayawada
c. Fodder officer of the Krishna Milk Union
d. Fodder officer of the Guntur (Sangam) Milk Union
e. Participating livestock farmers of the 15 villages in Krishna district
f. Participating livestock farmers of the 10 villages in Guntur district

Table 3 Actor Linkage Matrix in the fodder innovation system in Krishna and Guntur district

Actors	Dairy farmers	Fodder seed producers	Fodder seed suppliers		Staff of AHD	Fodder officers	Union supervisors	Milk society Secy	PEWs Gopal Mitras	Private milk collection agents	Women SHGs	Media representatives	Staff of DoA, DRDA, ZP, Block and panchayt	People representatives at various levels	Project team
			Co-operatives	Private sector											
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1 Dairy farmers	M	W	S	M	M	M	M	S		S					W
2 Fodder seed producers	W	M	S	S	W	S	S	S							M
3. Fodder seed suppliers co-operatives	S	S	S	W	M	S	S	S	W	W			M	M	S
4 Fodder seed suppliers private sector	W	S	W	W	W	W	W	W	W	W	W				W
5 Staff of AHD	M	W	W	W	M	W	W	W	M	W	W	M			W
6 Fodder officer	S	S	S	W	M	M	S	S	M	W					S
7 Union supervisors	M	M	S	W	W	S	S	S	W	W					M
8 Milk society secretary	S	S	S	W	M	S	S	M	W	W				W	W
9 PEWs (Gopal mitras)	W	W	W	W	M	W	W	W	W	W					W
10. Private milk collection agents	M	W	W	W	W	W	W	W	W	W					W
11 Women SHGs											M				W
12 Media representatives	M	M	M		M						M	S	M	M	W
13 Staff of DoA, DRDA, ZP, Block and Panchayat	M	W	M	W	M	M	W	W	W	W	M	W	S	S	W
14 People representatives at various levels	M	M	S	M	M	W	W	M	W	W	M	S	S	S	W
15. Project team*	W	W	S	W	M	S	S	M	W	W	W	W	W	W	S

Note: 1. *Project team comprises at the moment ILRI staff and NDDB staff directly involved with the project
2. Quality of linkages are represented by Strong (S), Medium (M) and Weak (W) and blank columns indicate, "don't know" (or in other words it indicate that we need more information on these relationships)

Potential Actors

There are a number of actors the project could potentially partner with to make a stronger impact on the current interventions. Several poverty focussed employment programmes implemented through the District Rural Development Agency (DRDA), Zilla Parishad (ZP) Block Panchayats etc could be utilised for promotion of fodder innovations. It would be appropriate at this stage to keep the peoples' representative and officials representing these organisations informed about the on-going interventions and seek their knowledge and perspectives on some of these issues. Similarly, involvement of some of the women SHGs at this stage would be useful in testing and evaluating some of the fodder development options. Private sector seed companies and some of the organised private sector dairy firms can positively influence fodder availability by way of contributing to better awareness on fodder seeds and in reaching locations currently not reached by the dairy co-operatives.

The key managing partner, the NDDB in this case should ideally spend more time on developing relationships with different kinds of stakeholders at the macro level, to start with at the district level. The project may need to think on how to develop relationships at the meso and macro levels, i.e. at the block and panchayat levels where the interventions are currently going on. NDDB could also consider having to undergo some sort of institutional innovation regarding its outlook towards the sector. Again building from its own strength and their situational analysis, the next stage would probably be for them to try and broaden the mandate, to first introduce a targeted poverty element in interventions and second to try out pilot projects, which allow for these linkages to express themselves. Working with private vendors, not private diaries, seems an interesting option. These vendors are linked to markets in interesting ways and probably in some cases even cater to specialised markets. For example there is a market for cow milk, which cannot be serviced by NDDB- private diary set up, how can NDDB for instance capture that? It is also known that NDDB has not been very successful in its attempts to reduce the toxin levels of inputs with the unions. While NDDB has been sensitised to high level of pesticide intake in milk and other issues it has not been able to get the unions to start a process of converting themselves towards newer and more organic processes. It is likely that women SHG groups can be part of that? Rather than get SHGs to grow commercial fodder, which they might get crowded out of, this could be another option.

Developing systems to make a wide range of fodder options available to farmers necessitate experimenting with a wide range of institutional innovations aimed at fodder delivery. These are equally or perhaps more important than finding out the most effective fodder options for the region. One of the institution innovations in this regard has been the "satellite fodder farms" initiative of the Krishna Milk Union. "Krishna Milk Union" selected 100 progressive farmers for this purpose, who were given a monetary aid of Rs.500/- each to establish 25 cents of Co-3 fodder plots. Co-3 slips were distributed to them and all the 100 farmers have established plots of 25 cents each, with the technical assistance provided by the Union Fodder Development Officer. After 60 days of cultivation, the farmers are distributing the fodder slips at the rate of 10 beneficiaries from each satellite farm and thus helped in establishing 1000 fodder plots of 25 cents each in just two months time"

Actor linkage matrix (ALM) only explores the current state of the project and this would undergo change as the project evolves. It would be ideal to modify/reconstruct similar ALMs in project meetings (where most of the partners are present) as the project evolves and expand its interactions. At the moment this ALM is only a first generation matrix for this project.

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Appendix 1: Preliminary Inventory of Actors in Fodder Innovation System in India

Actors	Organisations	Identified Linkages and potential
International Research Institutes	ICRISAT	Linkages to APRLP
	ILRI/ ICRISAT ICRAF	Improved dual-purpose groundnut varieties ICRAF initiatives planned for tribal areas
	ACIAR	Strategic research issues supported through NARS, has worked with NDDB in the past
International Agencies	FAO and CALPI	Policy activities - Success of past Indo-Swiss projects working mainly at the micro grass roots level. Now building through a focus on organizational, institutional and social issues rather than technological issues, CALPI (Capitalisation of Livestock Programme Experiences India) aims to focus on livestock based livelihood systems in India
	SDC – IC	
National Public Sector Research Institutes	IGFARI – Jhansi	Mandate is to improve forage productivity for improved livestock production with an emphasis on technology generation not transfer. Technology transfer occurs through implementing agencies with the IGFARI role being to train state and dairy federation officials. Centre distributes breeder seed for multiplication by institutions such as NDDB, Kerala Livestock Development Board and state departments, including forestry. One activity is countrywide field-testing of forage crops
	Agricultural Research Station, Lam, ANGRAU	Source of expertise on fodder seed and improved bulls
	CRIDA	Two livestock scientists have recently joined the staff; there is also some work on pasture legumes, such as *Stylosanthes hamata*, for degraded lands.
	CAZRI	
	NCAP	Worked on policies related to livestock sector, especially on Research Priorities in the Livestock sector, demand and supply scenario in livestock products
State Government Departments	Livestock policies of Orissa and AP - APLDA	With a wide reach of staff and infrastructure, the govt dept manages a network of veterinary support centers in the districts, which includes dispensaries, hospitals, polyclinics and livestock units. Provide AI services to the total `breedable' cattle and buffalo population at farmers doorsteps through Gopalamitras. Overriding focus remains breeding, with emphasis on the introduction of exotic blood. Larger interest in diagnostic and clinical services; also undertakes distribution of fodder seeds in limited quantities and organizes cattle camps during periods of distress.
	SMILDA	Part of the Animal Husbandry department and are an

		Andhra Pradesh State government-training group that are working increasingly on an independent base. The group was established during an Indo-Swiss collaborative project and developed appropriate curricula and training courses in extension methodologies, gender sensibilisation and technical subjects. They offer an interesting range of modules including on change management, participatory extension and liberalization as well as technology options.
	APRLP and WORLP	
Autonomous Public Agencies	NDDB	Operates in 17 states of India and in 174 districts. Link in terms of seed production contracting seed production through the NDDB network Seed cleaning factory or to supply chaff cutters for village level operation. Number of cooperative societies to more than 100,000 with member ship exceeding 11 million. Since 1983 they have invested in fodder seed production and the unions are now marketing around 50,000 quintals of improved fodder seed, produced from breeder seed obtained from the Ministry of Agriculture/ICAR. 9 seed processing units. Initiative to promote fodder production, milk unions have established 907,000 (9.07 lakhs) varietal demonstration plots of 0.1 ha where seeds are provided free of cost. NDDB also promotes urea treatment of straw, chaffing of fodder to avoid wastage and have implemented silvipasture on a total of 19872 ha of land.
Non Governmental Organisations	BAIF	National NGO working in 111 districts in 8 states mostly covering semi-arid areas. The main features of BAIF's approach are; a) integration of breeding, extension, training, fodder resource development and health control, planned according to local conditions; b) delivery of services to the doorstep; c) targeting the underprivileged, and sensitivity to social and gender issues; d) close follow-up and monitoring of the results of the programme. Their general approach is to establish village level groups and invest in community activities to gain individual confidence. After around 6-8 months of building a rapport, conducting baseline surveys and engaging in entry point activities they then start to address main issues. The main activities are in livestock production, with a focus on large ruminants, although in recent years there have been initiatives with goat-keepers in Udaipur, Gujarat and Karnataka in collaboration with the Natural Resources Institute (NRI) based in the UK.
	ANTHRA	Alternative view to fodder research, exploring the potential for indigenous varieties. Strong pro-poor focus with emphasis on pro-poor livestock species such as goats. They are key players in the fodder forum.

	RDT	*Stylosanthes hamata* and *S. scabra* are being used on bunds. They have also established 2 milk cooling centers to allow marketing of milk produced by the poor. Only Anantapur
	AFPRO	6 field units and 2 task forces in 9 states. Coordination of the Livestock and Pastoral Development network.
	Seva mandir	
Other actors	Farmers Federations	250 farmer associations with 1.5 million farmer members in 19 districts of AP.

Adapted from Dannie Romney 2002.

ICRISAT : International Crop Research Institute for Semi Arid Tropics
ILRI : International Livestock Research Institute
ICRAF :
ACIAR : Australian Centre for International Agricultural Research
FAO : Food and Agriculture Organization
CALPI : Capitalization of Livestock Programme Experiences in India
SDC – IC : Swiss Agency for Development and Cooperation – International Cooperation
IGFARI : Indian Grassland, Fodder and Agroforestry Research Institute
CRIDA : Central Research Institute for Dryland Agriculture
NCAP : National Centre for Agricultural Economics and Policy Research
APLDA : Andhra Pradesh Livestock Development Agency
SMILDA :
APRLP : Andhra Pradesh Rural Livelihood Programme
WORLP:
NDDB : National Dairy Development Board
BAIF : Bharatiya Agro Industries Foundation
RDT : Rural Development Trust
AFPRO : Action for Food Production

Appendix 2: Checklist of Questions from RAAKS Tools and Windows and Possible Answers

Note: We have sampled below a few questions from the rather exhaustive list (of over 100) that can be collated from the RAAKS tool box and windows. The attempt here is not to be exhaustive and final about these questions and answers. In keeping with the spirit of RAAKS, which is essentially a tool of joint inquiry, there were serious limitations in answering many of the questions from the RAAKS toolbox and windows. However the study team strongly believes that RAAKS offers a systematic methodology to problem identification and solving. Our own limited experience in using RAAKS toolbox and windows is that it is an excellent project tool, which helps focus and synthesise perspectives. It also enables articulation of otherwise difficult questions that could for instance remain unaddressed such as problems within the project partners etc. The reason for providing a sample list of questions is to encourage its more systematic use by project teams in future.

1. How diverse is this area (with respect to production, utilisation of fodder in sustainable fashion)?
   Quite diverse in terms of producers (landless and landed) and production conditions (irrigated and non-irrigated conditions), for consumption and for sale

2. What actors are involved in this (problem) area?
   Listed in Table 2.

3. What general problem or problems can you identify (w.r.t. the whole objective)?
   Availability and accessibility of fodder.

4. Who thinks there is a problem? What characterizes these actors?
   Most of the stakeholders – ILRI, farmers, NDDB, milk unions

5. Who is affected by the problem? What characterizes these actors/constituencies?
   Milk producers. Milk unions and consumers

6. What is the history of the problem?
   Changing livestock use from cows to buffalos, local to improved varieties all of this as part of the green revolution paradigm of agricultural change where there was an emphasis on grains over fodder and the production of short strawed cereals. Further there are additional issues relating to the increasing cost of fodder, its decreasing availability, reduction of common grazing lands, concomitant increased pressure on land etc.

7. What are possible causes of the problem?
   Possible mismatch of supply and demand.

8. What problems or aspects are seen as urgent? By whom?
   Cost effective and nutritious fodder throughout the year.

9. Which actors play a significant role in technological (Fodder) innovation, policymaking, research, or exchange or utilization of new or existing knowledge? Why and how? (Include gender aspects too).
   Universities, fodder research organisations (governmental and non-governmental), livestock farmers in technology, NDDB, animal husbandry department, milk unions, BAIF and Anthra in policymaking and research and milk unions and fodder officers in exchange and utilisation of knowledge.

10. Who else could make an important contribution? Why and how?
    Voluntary organisations, Krishi Vigyan Kendras in providing good fodder and progressive farmers or farmers who innovate both technically and institutionally
    .
11. Which actors can be seen as key actors? Why?
    Milk unions. They are important links in managing the procurement and supply to farmers
    .
12. Is the system flexible enough to respond to changes in its environment, including the market, policy targets, users and/or consumer demands?
    No

13. To what extent do the key actors know what other actors have to offer with respect to knowledge, skills and technology/resources?
    The ALM in Table 4 indicates the extent of knowledge information by each actor.

14. Do actors who are within the same system or subsystem see themselves as interdependent? As complementary?
    No there are parts that are complimentary and parts that are not. The ALM indicates this more clearly.

15. Which of the key actors share a need for the perceived interventions? If they work alone, could they make changes?
    Needs investigation, which the study could not undertake to the desired extent.

16. Which external actors put direct pressure – either positive or negative – on the actors within the system with respect to developing technology and/or supplying services? How?

Questions of this nature need closer scrutiny in project workshops and meetings.