Enhancing dairy-based livelihoods in India and the United Republic of Tanzania through feed innovation and value chain development approaches: Final project report

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Enhancing dairy-based livelihoods in India and the United Republic of Tanzania through feed innovation and value chain development approaches: Final project report

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Introduction

Small-scale dairy production is practiced by most farmers in mixed systems across sub-Saharan Africa and south Asia. The twin constraints of access to markets and access to inputs, especially sufficient high quality feed, are a barrier to improved milk yields and, hence, dairy income for smallholders through intensification of smallholder dairy systems.

The MilkIT project was a research for development project focusing on improving smallholder livelihoods through intensifying dairy production in India (Uttarakhand state) and in Tanzania (Morogoro and Tanga regions) through the use of innovation platforms as catalysts for change. The project combined a series of alternative approaches to identifying and dealing with value chain and feed supply constraints in collaboration with value chain partners. This was supported by the application of simple rapid feed diagnosis tools to guide feed intervention strategies, as well as by rapid value-chain assessments.

Grant description and implementation arrangements

Grant goal, objectives, components and target groups

The overall goal of the project was to contribute to improved dairy-derived livelihoods in India and Tanzania via intensification of smallholder production focusing on enhancement of feeds and feeding using innovation and value chain approaches.

The objectives of the project were threefold:

- Institutional strengthening: To strengthen use of value chain and innovation approaches among dairy stakeholders to improve feeding strategies for dairy cows.
- Productivity enhancement: To develop options for improved feeding strategies leading to yield enhancement with potential income benefits.
- Knowledge sharing: To strengthen knowledge sharing mechanisms on feed development strategies at local, regional and international levels.

These components were used to frame a series of project outputs as follows:

Institutional strengthening

1a. Mechanisms for enhancing innovation capacity through local stakeholder platforms to address dairy value chain constraints

Experimentation with ways of enhancing innovation capacity among local dairy and livestock feed stakeholders including the use of local innovation platforms to bring key actors together.

1b. Approaches for involving local stakeholders in analysis of feed-related aspects of the dairy value chain

Through local innovation platforms, develop approaches for participatory value chain analysis with local actors, especially research actors, conducting the diagnoses.

1c. Identification of intervention strategies emerging from dairy value chain analysis

Following identification of key value chain constraints related to feed supply develop an inventory of intervention strategies including on-farm feeding interventions as well as more organizational and market-level interventions aimed at improving feed supply and enhancing use of existing feed.

Productivity enhancement

2a. Strategies for implementing local feed-related innovations emerging from stakeholder platforms with the potential to enhance dairy incomes

Design strategies for identification, evaluation and on-farm testing of feed-related interventions through the activities of local stakeholder platforms. Platform members test promising feed-related interventions to deal with value chain constraints using action research cycles through, for example, agreed pilot interventions run by innovation platform members.

2b. Methods for enhancing diffusion of local feed-related innovations among dairy smallholders with the potential for income benefits through productivity increases

Having identified workable interventions at project site level, use these local successes to influence local decision makers to bring about widespread change in feeding practices for enhanced productivity.

2c. Strategic lesson learning on appropriate dairy feeding strategies and technologies

Using data generated through the monitoring and evaluation process, use quantitative and participatory analysis to assess ex-post the observed success and failure of feed technology and strategy options and determine success factors.

Communication and knowledge exchange

3a. Mechanisms for sharing knowledge at local and regional levels

Existing knowledge pathways by which feed-related knowledge currently spreads at project sites identified and built upon through local stakeholder platforms. Knowledge pathways at local level will be assessed as part of a light baseline survey at the start of the project. At regional level, knowledge sharing pathways assessed as part of planned participatory value chain analyses.

3b. Mechanisms for sharing knowledge across project countries and among global R4D projects

Since the value chain and innovation approaches, which form the core of this project, are also key elements of a range of other livestock R4D projects being implemented by ILRI, CIAT and other partners, especially CRP Livestock and Fish, the project will establish mechanisms to share lessons and experiences across the projects and with global communities interested in these topics.

Benefitting countries

We selected India and Tanzania as our study countries, as they provide interesting and in some aspects contrasting situations, presenting opportunities for comparisons and learning. Dairy value chains in these countries are also a priority focus of the CGIAR research program on Livestock and Fish (http://mahider.ilri.org/handle/10568/3248), providing considerable opportunities for synergies and added value. In both countries, dairy development has great potential to contribute towards reducing poverty: smallholder dairy production can successfully compete with larger scale operations, where the household labour it uses has low opportunity costs, thus, representing a promising option especially for poor households[1].

1. Staal, S.J. The competitiveness of smallholder dairy production: evidence from Sub-Saharan Africa, Asia, and Latin America. South-South Workshop on Smallholder Dairy Production and Marketing -Constraints and Opportunities, 13th to 16th March 2000, Anand, Gujarat, 2001.

Benefitting IFAD investment projects

In India, the links with IFAD investment projects were clear and indeed the location for the project was selected to allow for close association with the then starting **Integrated Livelihood Support Program in Uttarakhand (ILSP)**. ILSP was in its formulation stage during the MilkIT project and close links were established. The ILSP project focuses on livelihoods for poor households in hill areas. The project will up-scale successful livelihood and value chain initiatives of the previous Uttarakhand Livelihood Improvement Project in the Himalayas (ULIPH) (such as vegetables, agriculture, livestock and eco-tourism), and support complementary initiatives to improve access to markets, employment, inputs, and skill development. While ULIPH emphasised institutional aspects such as group formation at various levels ILSP focusses on a value chain and business development approach by identifying value chain constraints and then addressing them through a program of technology demonstration, skill development training, and building of linkages with input and output markets. The value chain approach and focus on input and output markets allowed important synergies with the MilkIT Project.

In Tanzania, the links with IFAD investment projects were less clear although still present. The **Rural Micro, Small and Medium Enterprise Support Program (2007–14)** operates in Iringa, Manyara, Mwanza, Pwani, Ruvuma and Tanga regions and has three goals:

- To improve the awareness of rural entrepreneurs of market opportunities and how these can be exploited through the development and implementation of a communication strategy (including radio linkages to poor and remote areas), and the training of the entrepreneurs to improve their businesses;
- To improve the coordination and cohesion of selected value chains, through the creation and strengthening of backward and forward linkages for the selected chains; and
- To strengthen public and private sector institutions to provide efficient and effective support to rural enterprises.

All these goals align with the research areas addressed by MilkIT providing useful opportunities for experimentation with new approaches and processes for micro-enterprise development, which could subsequently be scaled out through the loan program.

Gender focus

Understanding gender dynamics in Indian and Tanzanian dairy value chains was not a stated research aim within the project although it did become a focus of the research as the project unfolded. Women dairy producers were our predominant beneficiary group in India, as wide-spread migration of adult males and various group-oriented activities had led to the wide-spread establishment of women's self-help groups. Local innovation platforms provided women with a forum to voice their views on dairy intensification to a wider audience. This led to considerable empowerment of women farmers in our study sites both in India and Tanzania. We used the experiences from India to reflect on the gender aspects to the use of innovation platforms and produced an innovation platform practice brief entitled "Tackling gender dynamics within innovation platforms".

Environment and climate change focus

Environment and climate change were not part of the MilkIT research agenda. However, it is generally acknowledged that dairy intensification in smallholder systems can lead to environmental benefits through reduced greenhouse gas emissions per unit milk production and reduced water use per unit milk production[2]. Also, diversifying feed sources by strengthening the use of forages, dual-purpose crops and crop residues will increase the resilience of feed supply under varying climatic conditions. Thus, progress towards the project objective of dairy intensification would likely have spin-off benefits in the areas of environmental stewardship and climate change.

2. Blummel, M., Wright, I. A. and Hegde, N. Climate change impacts on livestock production and adaptation strategies: a global scenario. *National Symposium on Climate Change and Rainfed Agriculture, Feb 18-20, 2010, CRIDA Hyderabad, India*, 2012.

Grant implementation arrangements including formal IFAD supervision

The project was coordinated by ILRI with CIAT acting as a major partner. Details of the consortium can be found here. Overall coordination was led by Alan Duncan. Indian activities were led by Nils Teufel with field support from Thanammal Ravichandran. Activities in Tanzania were led by CIAT and Brigitte Maass was the Tanzania country coordinator with field support from Fred Wassena. National partners in India consisted of two local NGO's: Institute of Himalayan Environmental Research and Education (INHERE) and Central Himalayan Rural Action Group (CHIRAG). In Tanzania, national partners comprised Sokoine University of Agriculture (SUA) and Tanzania Livestock Research Institute (TALIRI). Local oversight of the project took different forms in the two countries. In India an advisory council was formed consisting of key dairy stakeholders in Uttarakhand state including the IFAD Integrated Livelihood Support Program (ILSP). This Advisory Council met twice per year and offered advice on project direction and connections with wider dairy initiatives. In Tanzania, a joint steering committee was formed to oversee two dairy projects under the umbrella of the CGIAR research program on Livestock & Fish. The steering committee had responsibility for the Irish Aid funded MoreMilkiT project as well as the MilkIT project. The committee met once per year. Overall oversight was provided through annual coordination meetings to which a representative from IFAD PTA division along with the country offices in India and Tanzania were routinely invited.

IFAD PTA division conducted a supervision mission for MilkIT in December 2013. This involved attendance at a progress update meeting, which was held in Almora on 3 December 2013. There followed a series of visits to field sites and the mission concluded with a review meeting in the IFAD country office in Delhi. The supervision mission expressed strong satisfaction on project progress in India, but noted significant concerns about progress in Tanzania. Following the review, ILRI worked with CIAT to develop a fast track action alan specifying a series of deliverables to bring the activities back on track in Tanzania. Project coordinator, Alan Duncan, made supervision visits to Tanzania in both April and June 2014. These measures resulted in acceleration of activities in Tanzania, although the late start meant that only one full season of interventions was possible. Nonetheless, useful insights were gleaned from the Tanzanian component of the project. Furthermore, the close connections established with the so-called *Maziwa Zaidi* ("More Milk" in Swahili) initiative along with the various innovation platforms and partnerships that were established have created a strong platform for ongoing work on dairy value chain intensification under the CRP Livestock and Fish umbrella.

Changes in grant implementation context, grant design or outreach

In India, the grant was designed to link closely with the IFAD integrated ILSP in Uttarakhand. Delays in start-up of ILSP meant that the grant could not work as closely with ILSP as first envisaged. However, towards the end of the project, strong connections were made with ILSP including convening of a sensitization meeting on the use of innovation platforms along with an outreach meeting in Almora in February 2015, where various partners including ILSP indicated which elements of MilkIT they planned to take up in their ongoing activities. BK Bhatt of ILSP attended the final project coordination meeting in Tanzania in December 2014 and expressed his strong interest in the approaches developed in MilkIT[3].

In Tanzania, the grant implementation context did not change greatly from what was envisaged at the start of the project. One positive development was the establishment of a network of projects working on dairy value chain development in Tanzania under the banner *Maziwa Zaidi*. This provided excellent opportunities for outreach and connections with the wider dairy stakeholder community in Tanzania including through the newly established dairy development forum. During initial discussions with the IFAD Tanzania country office early in the project, there was a suggestion that MilkIT should link with the IFAD Zanzibar sub-programs of Agricultural Services Support Programme

3. See blog post on this

(ASSP) and Agricultural Sector Development Programme-Livestock (ASDP-L) in Pemba. The MilkIT Tanzania team did some initial scoping of opportunities on Pemba using the FEAST approach. The scoping showed limited opportunities to develop dairy markets outside Pemba and Zanzibar and to develop scalable lessons for the Livestock and Fish Program. For these reasons, the project team opted to select sites based on CRP Livestock and Fish selection criteria on mainland Tanzania. This initial scoping in Pemba occupied some time at the beginning of the project and slightly delayed implementation.

Review of performance and achievements by component

Review of main activities and outputs delivered

Component 1. Institutional strengthening

Mechanisms for enhancing innovation capacity through local stakeholder platforms to address dairy value chain constraints.

At the outset of the project, a process of mapping the various actors involved in the dairy value chain was carried out in project locations in India and Tanzania. This was accompanied by a review of previous feed and value chain interventions in the dairy sector in Uttarakhand in India and in Tanga and Morogoro regions of Tanzania. This laid the ground work for establishment of a series of Innovation Platforms (IPs) in each country. In **India**, innovation platforms were established in Sult block, Almora district, and Bageshwar block, Bageshwar district, areas where the previous IFAD-supported rural development program ULIPH had been active. In each district one dairy value chain (DVC) IP and two feed IPs were established. The constituency of each feed IP was a cluster of 5-6 villages while the dairy value chain IP covered two such village clusters and covering 700-750 households. In Tanzania the scale of establishing IPs was rather different. Village IPs were established in each of eight villages selected by MilkIT Tanzania dispersed across Tanga and Morogoro Regions. These villages were a sub-set of a larger set of villages selected by the Livestock and Fish CRP for start-up activities on dairy in Tanzania. The group of four village IPs per region were each connected to a regional platform. In Tanga, the existing Tanga Dairy Platform was used while in Morogoro a new regional platform was established.

Approaches for involving local stakeholders in analysis of feed-related aspects of the dairy value chain

In both countries local innovation platforms met at intervals of 1-6 months to identify value chain constraints and solutions through dialogue. In **India** this dialogue was conducted at DVC IP level. Here, key constraints related to marketing issues initially identified lack of market links due to distance of the villages from road, the price received for sold milk and the logistics of getting milk to markets. At feed innovation platform meetings, participants initially identified feed shortages, both overall and seasonal, and the heavy labour burden for women because of extensive fodder collection from local forests. In **Tanzania** a more formal dairy value-chain assessment was conducted as part of the CRP Livestock and Fish program's research activities. This was augmented through the implementation of FEAST surveys in all eight study villages; FEAST[4]is a diagnostic feed assessment tool developed by ILRI and CIAT. The dairy value-chain assessment identified seasonal shortages of feed as the major productivity constraint in Tanzania and this was confirmed by the results of the FEAST surveys.

4. For more details on FEAST see www.ilri.org/feast

Identification of intervention strategies emerging from dairy value chain analysis

In **India**, a range of marketing and feeding interventions were identified and applied following the formal and participatory diagnosis of constraints. In Bageshwar, despite opportunities of selling milk through Aanchal (sState dairy cooperative) and the IFAD-initiated self-help group (SHG) federation, farmers preferred to form their own SHG-based dairy cooperative for their village cluster. They established the Jeganath Milk Producer Cooperative and attained a better price for their milk through establishing a milk shop and selling directly to consumers. In Sult, on the other hand, farmers preferred to improve links with Aanchal, state dairy cooperative. They negotiated changes to the cooperative rules that had previously restricted them from joining due to the small size of their settlements. Aanchal now allows the 30 producers required to establish a milk collection centre to come from several settlements. During the course of the project and as initial successes in marketing improvements became visible, new institutions joined the process. For instance, various banks and the animal husbandry department responded to the demand for improved dairy animals with the provision of loans. In fact, IPs allowed farmers to provide group guarantees as collateral. At feed IP level, farmers and local stakeholders agreed to address the feed shortage issue and the feed intervention strategy focused on this issue.

In **Tanzania**, the dairy value chain (DVC) assessment identified lack of farmer organizations as being a key constraint to more effective milk marketing. The establishment of village level IPs was thus partly driven by the constraints identified during the value-chain assessment. At the feed level, seasonal feed shortages were identified as being the key productivity issue. Interventions developed to deal with this constraint included improving dry season grazing reserves (Ololili) in the agro-pastoral villages, and the introduction of improved grasses and forage conservation methods in the mixed crop-livestock system villages.

Component 2. Productivity enhancement

Strategies for implementing local feed-related innovations emerging from stakeholder platforms with the potential to enhance dairy incomes

A series of livestock feed interventions emerged from IP dialogues and the application of the FEAST tool in both countries. The nature of the interventions differed because of the very different contexts in the various locations. In **India**, overall feed shortage was identified as the first priority issue. Observation of existing feeding practices showed that significant quantities of collected feed were being wasted due to the practice of feeding material on the ground. With this in mind, feed interventions focused on methods to chop material so that it could be fed from feeding troughs and the construction of the feeding troughs themselves. Project partners conducted an assessment of existing forage choppers that had been introduced by previous projects and government initiatives. These were found to be lying unused and rusting around homesteads. Women dairy farmers indicated that the choppers were unsuitable since they required considerable labour (two people needed to operate them) and that labour was limited due to out-migration of men to cities in search of work. The choppers were also deemed to be heavier than needed to chop the thin grasses typical of livestock feed in the hills After discussion with stakeholders, two prototypes of simple low-cost forage choppers were sourced from Gandhi Ashram and Gujarat Dairy Cooperative (AMUL). The first consisted of a simple weighted knife while the second took the form of a mechanical mounted scythe. These prototype choppers and associated feeding troughs were tested through participatory research and found to reduce wastage of fodder by around 12%. Although feed savings were not large, when translated into reduced requirements for labour for collecting fodder, the interventions proved popular and were adopted by many farmers even beyond the intervention sites. To enable wider availability of the most suitable chopper a local manufacturer was identified who was soon able to supply the machine at an attractive price. Various other interventions were also tested including dual purpose cereal crops and improved grass varieties. These were found to be beneficial in increasing fodder availability but in many cases wider dissemination was restricted by limited availability of planting material. Traditionally, commercial concentrates are hardly fed in these hill villages. Farmers receive very little cash income from milk sales and considerable transaction costs lead to high market prices. Increased milk sales and discussions at the feed IP encouraged farmers to purchase concentrates directly from a private feed company, especially through Jeganath cooperative, which reduced costs considerably.

In **Tanzania**, FEAST was applied early in the project to support identification of feed interventions. The principal constraints identified through FEAST were land issues, markets for livestock and milk, the genetic merit of existing dairy animals, disease issues and lack of knowledge on dairy animal husbandry. FEAST results were later fed back to IPs and used as catalysts to discuss possible interventions. Through these discussions a series of feed-related interventions were identified and applied. Furthermore, several of the non-feed issues identified by FEAST and in IP meetings were also dealt with, by village-level IPs and by raising them in regional platforms. The technical feed interventions varied depending on location and farming system. In the mixed intensive system villages, cut-and-carry forages were tried. Improved Napier grass varieties were introduced on farmer-owned demonstration plots that were easily accessible by IP members. Once established, plot management became the responsibility of the host farmer. Participatory assessment was conducted and key success criteria identified by farmers included compatibility with intercrops and overall level of biomass production. A further intervention strategy in the mixed intensive system villages was forage conservation aimed at mitigating seasonal scarcity of feed. After technical training, a few farmers in Ubiri/Lushoto (Tanga region) continued to experiment independently with silage making on a small scale. In the villages lying in agro-pastoral areas, interventions focused on improving dry-season grazing reserves (*ololili*). Traditionally, pastoralists protect small grazing reserves to provide feed to lactating and weak animals as well as calves during the dry season when feed is scarce. During this period, most of the herd is moved from the homestead in search of grazing through a system of transhumance. A scoping study of *ololili* in Morogoro region was undertaken and results indicated that around 40% of households maintained *ololili* with each reserve covering around 4ha. The study showed that the most important challenge to the use of *olilili* was uncontrolled, illegal grazing of *ololili* by other producers. Village IPs opted to focus interventions on improving these *ololili* and the project partners supported this effort. The aim was to improve overall fodder availability and to extend this availability longer into the dry season. This was achieved by introducing Buffel grass (*Cenchrus ciliaris*) and hardy forage legumes (*Stylosanthes scabra cv Seva and S. hamata cv. Verano*). Demonstration plots were established in 2 villages and planting was carried out as a training event with all IP members. Due to unexpected drought followed by heavy rain and local water logging, establishment was disappointing. Furthermore, establishment was hampered by uncontrolled grazing of experimental plots by sheep and goats. In retrospect, an early intervention should have focused on agreeing and enforcing bylaws to prevent grazing of *ololili* by neighbours. This might have facilitated a better establishment of introduced forage species that would have yielded productivity benefits to dairy producers.

Methods for enhancing diffusion of local feed-related innovations among dairy smallholders with the potential for income benefits through productivity increases

A series of approaches was used to enhance diffusion of local feed-related interventions. In **India**, IPs were a core mechanism for scaling out. Interventions that had proved popular with farmers such as feed troughs, forage choppers, dual purpose cereals and improved grasses were shared at IP meetings and then spread quickly within communities and also beyond. Videos, leaflets and dissemination workshops were also used to spread successful interventions beyond project sites through other farmers and development actors. In addition, other local development actors took up successful interventions which suited their portfolios. For instance, troughs and choppers were more widely promoted by ILSP and the animal husbandry department. The chief development officer of Almora district recognised the IP approach as efficient, adaptable to local conditions and scalable to appropriate levels which considerably raised the awareness of the project. IPs were also important diffusion mechanisms in **Tanzania**. Technical training at village level involved large groups of IP members and allowed exchange of planting materials and knowledge. Extension workers were also involved in village IPs and they continued to follow up on farmers' plots after training events. The hierarchy of platforms established in Tanzania was also important for diffusion of innovations. Through linkages established across different platforms, from village via regional to national level, communication channels were opened providing opportunities for successes to spread. The project lifespan was too short to allow this to happen to any great extent during the project period but we anticipate that the structures established will prove useful within the ongoing Maziwa Zaidi initiative.

Strategic lesson learning on appropriate dairy feeding strategies and technologies

As a research project, the MilkIT project placed a strong emphasis on learning lessons about dairy feeding strategies in the different project contexts and about the technologies that were tested. In India, a small impact survey was conducted in 24 settlements in which the project initiated activities and the results were compared with 24 control settlements. Results showed that application of project feed interventions such as use of forage choppers and feeding troughs along with exposure to the various market-related innovations driven by the project had strong effects on milk productivity and milk sales. For example, income from sale of milk among households selling milk was 5865 INR /per household in control villages compared to an average of 10319 INR / per household in project villages. Information on net profit is being collated and is currently being incorporated into a journal paper. On the other hand, some tested technologies were shown to be less suitable (e.g. silage) or to have requirements beyond the scope of the project (e.g. grass-land improvements) which was also documented. In Tanzania, a desk study on past successes and failures in implementing feed interventions showed that previous approaches may have focused too strongly on technological interventions without the accompanying institutional/ organizational interventions that would have been needed to provide an enabling context for technical interventions to succeed. The study also indicated that the lack of forage seed and planting materials is a serious impediment to the wider use of improved forages in the Tanzanian dairy sector. Another key lesson emerging from the IP dialogue was that any feed intervention needs to be aligned with interventions aimed at dealing with other limiting constraints. In the Tanzanian context feed interventions need to be associated with interventions to improve housing and general management of dairy cows for them to take root.

Component 3. Knowledge sharing

Mechanisms for sharing knowledge at local and regional levels

As well as generating feed innovations at farm level and marketing and other institutional innovations at higher level, the MilkIT project placed a strong emphasis on knowledge sharing as a route to bringing about improvements to smallholder dairy production at scale. The structure of the project together with the use of innovation platforms and other stakeholder forums at a range of scales was designed to allow knowledge to flow and for project-initiated innovations to spread well beyond project target villages. We identified four ways in which knowledge and innovations generated through innovation platforms moved beyond the platform to have wider impact. Firstly, we noted that some innovations spread through spontaneous diffusion due to interest of IP members and outsiders. This ‘spillover’required little effort on the part of the project. For example, farmers in Sult established a link with Aanchal state dairy cooperative and negotiated at IP level in Besarbagarh and Baseri to allow farmers to sell their milk. This attracted the interest of neighbouring villages (Gahnaheet and Kunidher), which then went on to negotiate similar arrangements for sale of milk to Aanchal. Similarly the forage choppers that emerged from the feed IP in Baseri cluster have now been taken up spontaneously by farmers in Gahnaheet and Kunidher. Secondly, some innovations were taken up by third parties and actively promoted. For example, the feed troughs piloted by MilkIT for reducing feed wastage in Uttarakhand are now being taken up by the animal husbandry department, the ILSP and Aanchal for wider promotion among farmers. ILSP has been ordering choppers of the type piloted in Almora by the Bageshwar IP and are promoting them in other non-MilkIT districts such as Chamoli. Thirdly, vertical scaling was an important route for knowledge to spread and have impact. Thus, key issues were identified at local level and taken to a higher level through regional dialogues with the aim of leading to change in policy or at least increasing awareness. For example, the lack of veterinary drugs was raised by representatives of local platforms in the Morogoro regional platform in Tanzania which led to the profile of the issue being raised in national media and a letter to the Ministry. In another example of local experience being applied on a larger scale Aanchal requested MilkIT staff to investigate the failure of several previously established milk collection centres in the project area. The results showed that insufficient demand analysis and weak governance structures due to limited communication had limited the success of these initiatives. Finally, in some cases the *IP process itself was scaled out* wholesale allowing new innovations to emerge that were relevant to new local contexts. For example, CHIRAG, one of the MilkIT partners in Uttarakhand saw the benefits of the IP process and is mainstreaming the approach within their programs. This is being done in collaboration with another NGO, Himmothan, which operates on a larger scale through a number of local NGOs. Similarly, ILSP in

collaboration with Aanchal are planning to establish the IP process in four non-MilkIT blocks. ILSP also has plans to apply the IP approach to other commodities including vegetables and spices. In other cases, key elements of the IP approach are being adapted for particular purposes. For example, the Tanzanian Dairy Development Forum (DDF) has recognized the promise of regional gairy platforms and now has plans to extend these to regions beyond Tanga and Morogoro, for instance to Mbeya, sponsored under the World Bank East Africa Productivity Project (EAPP). Also in Tanzania, village IPs were replicated by the Tanzania Livestock Research Institute (TALIRI), a MilkIT partner, in other districts of Tanga region, also working around dairy feeds and market issues.

Mechanisms for sharing knowledge across project countries and among global R4D projects

The MilkIT project made strong efforts to ensure that project progress was visible to the wider world through the use of social media. In particular, the MilkIT Wiki (http://milkit.wikispaces.com/) was established early on in the project as a communication space that was available to project participants as well as to a wider audience. The wiki allowed knowledge sharing across the two countries and was a useful reference point for external users. It was viewed over 40,000 times during the life of the project. A further mechanism for making research findings known among the wider research for development community was the use of national/state platforms. In **India**, this took the form of an advisory council that met twice per year during the project lifespan. The advisory council served to connect the project with other ongoing initiatives on smallholder dairy in Uttarakhand and was useful in building wider stakeholder engagement for taking up of project approaches and innovations. In **Tanzania**, a national dairy forum ,DDF, was established by the CRP Livestock and Fish (including MilkIT) and is proving to be an effective platform for national collaboration on dairy value chain development among diverse partners and projects. Also in Tanzania, the branding of the various projects mapped to the CRP Livestock and Fish under the *Maziwa Zaidi* umbrella has helped to ensure that MilkIT lessons and approaches are taken up by other interested parties.

Assessment of effectiveness in achieving component objectives

All project components showed some successes in achieving project objectives, but in some cases and in certain locations successes were more obvious. The following assessment of effectiveness in achieving component objectives focuses on achievement of outcomes according to the three project components:

Institutional strengthening

In both India (Uttarakhand) and in Tanzania, the strong focus on the use of multi-stakeholder platforms led to significant outcomes in the area of institutional strengthening. In **India**, the establishment of local innovation platforms generated some quick wins in terms of innovations around feed and dairy marketing, which quickly caught the attention of a wide range of local dairy sector stakeholders including development and private banks, the animal husbandry department, the IFAD ILSP, Aanchal (State sairy cooperative), development NGOs and the government administration. The project formed a rallying point for these stakeholders and the networking behaviour catalysed by the project will be a strong project legacy. Many of the organizations involved in innovation platforms have taken up MilkIT project approaches and innovations and mainstreamed them into their programs. In **Tanzania**, MilkIT was part of a larger initiative aimed at transforming the dairy value chain in Tanzania under the banner *Maziwa Zaidi* (CRP Livestock & Fish). The activities of MilkIT have strengthened this initiative and contributed to a number of significant outcomes. Perhaps chief among these has been the establishment of the Tanzania DDF, which is becoming a national platform for dealing with higher level institutional and policy constraints to dairy development in Tanzania. Furthermore the strengthening of the Tanga Regional dairy platform and the establishment of the Morogoro regional dairy platform through the MilkIT project provide forums for dialogue and action on dairy development issues at regional level. These will continue to be supported under *Maziwa Zaidi* lending sustainability to the changes stimulated by MilkIT.

Productivity enhancement

MilkIT placed a strong emphasis on identifying and trailing practical feed innovations at farm level with the aim of enhancing productivity. This component showed mixed success. In **India**, some simple but effective feed interventions focused on reducing feed wastage, spread quickly among farmers. Furthermore, various marketing innovations that improved procurement logistics for milk provided strong incentives to invest in improved feeding strategies. The net result was significant enhancement of dairy cow productivity among target farmers (from 2.5 litres/cow per day in control households to 3.5 litres/ cow per day in target households[5]) among producers exposed to MilkIT IPs and associated activities. Milk sales also increased from 0.3 litres per day in control households to 1.3 litres/ household per day in target households[5]. The spread of project- initiated innovations beyond target farmers is likely to have resulted in productivity enhancement of non-target farmers during the project lifetime although this was not measured. Also, the initial success in improved marketing and feed utilization stimulated a fundamental shift towards more intensive dairy production with improved dairy animals and increased use of commercial concentrates. In **Tanzania**, the main innovations emerging from IPs focused on increased feed production and better seasonal supply of feed. Marketing innovations were not catalysed by the project. Perhaps as a result of this focus on feed innovations, market incentives for investment in feed interventions were not strongly enhanced by the project and we saw limited evidence of feed innovations spreading beyond target farmers (although anecdotal evidence suggests that uptake of new Napier varieties in Ubiri was strong). To date, an impact assessment to test the effect of involvement with MilkIT IP's and associated activities has not been conducted in Tanzania.

Knowledge sharing

Knowledge sharing leading to diffusion of innovations beyond target farmers and stakeholders was relatively successful in the MilkIT project. In **India**, at project close, it is clear that the approaches and innovations catalysed by MilkIt have attracted considerable attention for the smallholder dairy sector in Almora and in Uttarakhand in general. Many of the technical feed innovations are being mainstreamed into the programs of other organizations. For example, the feed troughs piloted by MilkIT for reducing feed wastage in Uttarakhand are now being taken up by the animal husbandry department, ILSP and Aanchal for wide promotion among farmers. ILSP has been ordering choppers of the type piloted in Almora by the Bageshwar IP and are promoting it in other non-MilkIT districts such as Chamoli. A further example of this third party promotion of innovations relates to cooperative membership rules, which were changed through IP dialogue and are now being generalized by the state dairy cooperative, Aanchal. In **Tanzania**, the evidence that knowledge sharing has led to outcomes and impacts beyond target producers is variable at project close but we are confident that the structures and partnerships established by MilkIT lay a solid foundation for ongoing work under *Maziwa Zaidi* aimed at dairy value chain transformation. Establishment and facilitation of IPs was more challenging in Tanzania than in India, but the MilkIT project has taken large strides in establishing and supporting mechanisms for knowledge sharing at a range of scales, for example through establishment of the Morogoro regional dairy platform and the Tanzania DDF.

5. These are indicative figures and the data is currently being compiled for publication to build a fuller picture of the impact of project interventions on productivity.

Assessment of impact and of impact attribution

IFAD's overarching goal is: enabling poor rural people to improve their food security and nutrition, raise their incomes and strengthen their resilience. This goal is underpinned by five strategic objectives:

1. A natural resource and economic asset base for poor rural women and men that is more resilient to climate change, environmental degradation and market transformation;

2. Access for poor rural women and men to services to reduce poverty, improve nutrition, raise incomes and build resilience in a changing environment;

3. Poor rural women and men and their organizations able to manage profitable, sustainable and resilient farm and non-farm enterprises or take advantage of decent work opportunities;

4. Poor rural women and men and their organizations able to influence policies and institutions that affect their livelihoods; and

5. Enabling institutional and policy environments to support agricultural production and the full range of related non-farm activities.

MilkIT's main contributions were towards objectives 2-5. Towards Objective 2, MilkIT demonstrated that application of participatory approaches including local IPs was an effective means of catalysing relevant market and livestock feed interventions, which proved popular among local dairy producers, caught the attention of local dairy stakeholders and improved income and resilience levels among target farmers with possible spill-over to other farmers. Due to gender roles in the project area the majority of producer participants in the IPs were women. Towards Objective 3, MilkIT, on a pilot scale, showed that simultaneous development of market and productivity enhancing innovations implemented in participatory mode significantly increased employment opportunities in the fragmented dairy value chains of the hill country of Uttarakhand. For the producers this is achieved through generating more income through dairy production, while various forms of additional employment are created along the value chain, from carrying milk to road-side collection points to selling milk to urban consumers. Towards Objective 4, use of local IPs provided a powerful mechanism for poor local dairy producers, especially women, to communicate with higher-level development actors and thereby influence policies and institutions that affect their livelihoods. For example, producers in Sult district of Uttarakhand were able to persuade Aanchal, the state dairy cooperative to change membership rules that discriminated against isolated farming settlements in Uttarakhand. Finally, towards Objective 5, MilkIT established strong structures for enhanced networking of smallholder dairy stakeholders within the existing development framework in both India and Tanzania laying the groundwork for a much improved institutional and policy environment for dairy development in both locations.

Project costs and financing

Funds received were fully utilized largely in line with plans. The only exception to this was an overspend on the travel budget line. The reason for this overspend was the need for extra supervision of the Tanzanian component of the project during Year 3 to ensure delivery (see following section), which necessitated extra visits to project sites by ILRI's project coordinator.

Assessment of grant management and partners' performance

Grant management was effective as evidenced by delivery against proposed activities in both countries. ILRI as lead centre both coordinated the project and led activities in India. CIAT led activities in Tanzania. Coordination of the project was relatively effective and was achieved through various project management mechanisms. The project held annual coordination meetings alternating between project countries, which were attended by CGIAR staff and staff of project partners in both countries. These meetings were effective in reviewing project progress, planning for the next year and ensuring synchrony of activities across the two countries and some cross-country lesson learning. These meetings were fully documented using the MilkIT project wikispace. Bimonthly skype meetings for CGIAR partners were also held to maintain project momentum and clear up any difficulties. Again these meetings were documented and shared on the project wikispace. All meeting notes can be found here. Annual progress reports were delivered to IFAD Rome as set out in the grant agreement. In addition, semi-annual reports were prepared for the intervening periods and shared informally with the IFAD grant manager (except in Year 3). IFAD Rome organized a supervision mission in December 2013 after two years of project activities. The mission endorsed the excellent progress being made in Uttarakhand but raised concerns on project delivery in Tanzania. As a result, ILRI and CIAT agreed a focused action plan for accelerating project activities in Tanzania in Year 3. The grant agreement between ILRI and CIAT was amended to tie payments to a set of quarterly deliverables in Year 3 of the project. The ILRI project coordinator visited field sites in Tanzania in March and June of 2014 to closely monitor progress. These measures went some way to enhancing delivery against proposed activities in the final year of the project, although earlier delays meant that only one season of feed interventions were tested in the project. There were some mitigating factors to explain the slower progress in Tanzania than in India. In Tanzania the MilkIT project was part of a longer-term engagement in transforming the Tanzanian dairy value chain through the activities of the CRP Livestock & Fish. This left the project less nimble in terms of site selection, survey design and implementation etc. At the same time the project in Tanzania benefited from outputs generated by sister projects, in particular the Irish Aid-funded MoreMilkiT project. Overall, it was always clear that MilkIT Tanzania was part of a longer-term vision that did not finish as MilkIT phased out. Part of MilkIT's role in Tanzania was to establish long-term structures and partnerships and this was achieved well by the project. The slow progress in Tanzania was balanced by faster than expected performance in India and overall the grant performed well.

Innovation, replication, and scaling up

MilkIT catalysed a number of simple but effective innovations, which are already being replicated and scaled up in Uttarakhand. We can identify three types of innovations which have attracted local interest and are being replicated and scaled up. Firstly through dialogue in innovation platforms the project introduced simple technologies to reduce feed wastage through use of lightweight forage choppers and concrete feeding troughs. These simple technologies have been taken up by the local animal husbandry department and are being promoted among non-target farmers. Secondly the project stimulated various marketing innovations to increase incentives and income from small-scale milk production. These included establishment of milk shops, collection centres and village cooperatives. They also included the development of credit schemes for supply of cross-bred cows by development-orientated banks (e.g. National Bank for Agricultural and Rural Development - NABARD). Finally, a key market innovation was the relaxing of membership rules by Aanchal dairy cooperative. The innovations instituted by NABARD and Aanchal are being applied among non-project settlements and have potential to go to scale. The third type of innovation was the establishment of the local innovation platforms themselves which are also being replicated by local stakeholders in Uttarakhand, both for dairy and for other commodities. For example CHIRAG are now establishing IPs in Pitoragarh district following the pattern established by MilkIT. This is being done in collaboration with a local NGO, Himmothan. Similarly, ILSP in collaboration with Aanchal are planning to establish the IP process in four non-MilkIT blocks. ILSP also have plans to apply the IP approach to other commodities including vegetables and spices. Talks are on-going how ILRI can serve as a knowledge and learning partner within the IP upscaling activities of ILSP. In Tanzania, there were less obvious examples of innovations being replicated and moving to scale but the project has laid the groundwork for this to happen as part of *Maziwa Zaidi* through establishment of innovation platforms at local, regional and national levels.

Sustainability/exit strategy

One goal of IFAD large grants is that research outputs should influence ongoing loan projects and contribute to the design of future loans. This goal has often proved difficult to attain but the MilkIT work in India has been relatively successful in forging strong links with the ILSP and feeding ideas and innovations into that program. The sustainability of the work undertaken in Uttarakhand is therefore relatively assured. Among the reasons for success were the synchronized starts of MilkIT and ILSP, a supportive country office team, the location of MilkIT staff in the local ILSP office and proactive engagement with ILSP on the part of MilkIT. In Tanzania, links with loan projects were more tenuous and the sustainability of the work is more likely to happen through the *Maziwa Zaidi* initiative of which MilkIT was a part. *Maziwa Zaidi* ('More Milk' in Swahili) is an initiative of the CRP Livestock & Fish, which aims to transform the dairy value chain in Tanzania. Many of the initiatives of MilkIT will be taken up by other projects under *Maziwa Zaidi*, notably the regional dairy platforms and the DDF. In the case of Tanzania therefore, MilkIT focused less on its exit strategy than on ensuring a strong start to the ongoing *Maziwa Zaidi* Program which is scheduled to endure for many years.

Implementation of knowledge management plan

MilkIT used different mechanisms to manage and share knowledge at a range of scales. First among these were the various multi-stakeholder platforms established and facilitated by the project. These included village feed and dairy IPs, regional platforms (in Tanzania), project advisory council (in India) and the national DDF (in Tanzania). These various forums allowed knowledge to flow at local, regional and state/national level but also allowed connections to be made among these levels. This hierarchy of platforms was a highly effective channel for knowledge flow within each project country. Secondly, social media was used extensively to share knowledge beyond the project. This included the establishment and continual updating of the project wikispace as well as blog posts at key points during the project, which were shared for example across the CGIAR Livestock and Fish community. The process of extending knowledge beyond the project was further facilitated by the convening of a project writeshop after project close to synthesise key findings from the project and translate these into a range of communication products.

Conclusions and major lessons for IFAD

In conclusion, MilkIT has seen significant success in piloting various feed and marketing innovations at project locations, which are being taken up by local stakeholders including ILSP. We can identify five success factors that IFAD could consider in design of future dairy projects:

The use of **IPs** at various levels is a very efficient approach to identify promising solutions to dairy development constraints. IPs have had a strong empowering effect on local communities and have opened up previously stagnant communication lines leading to technical innovation in feeding methods but also organizational innovation at various value chain levels. This has been most pronounced in India where market channels for milk have been revitalized and key decision makers are now working to bring together relevant stakeholders to sort out dairy value chain blockages at wide scale. Local level platforms in Tanzania have been shown to empower local communities that managed to overcome some of the constraints creating an enabling environment for year-round dairy production. In pastoralist project sites, IP's have engendered stronger community cohesion and reduced violent conflict.

Technical feed interventions with marketing interventions need to go hand in hand since they feed of each other's success. However, the **phasing of focus on these two areas is important**. Sometimes there are institutional issues that need to be dealt with before feed interventions stand a chance of working. We found this to be the case when introducing improved forages into Tanzanian traditional livestock exclosures (*ololili*). Our experience was that work on re-enforcing local bylaws was first needed to ensure consensus on and implementation of livestock exclusion practices at community level before any pasture improvement was possible. We also found it was important to prioritize market interventions, which provided the necessary incentives for farmers to invest in feed technologies. Establishment by IPs of milk shops, dairy cooperatives and improved procurement arrangements raised much interest among farmers who were then very ready to experiment with feed interventions such as processing of existing feed material through chopping, introducing feed troughs to reduce wastage, and working on improving supply of concentrate feeds.

Feed interventions are highly context specific. The success of particular interventions depends strongly on the context in which they are applied. **Feed assessment and prioritization tools such as FEAST** have a very useful role to play in helping to understand the context and indicating appropriate technologies that have a strong chance of being adopted. FEAST helps to stimulate discussion and reflection among users and also helps to standardize documentation around feed issues and also allow for a quantitative documentation of change.

We found **capacity development** at a range of levels to be extremely important. We realized that there were basic capacity gaps at producer level around forage establishment, storage and conservation that required close follow up. There was also great demand for exposure to successful dairy intensification. However, we also found that we needed a strong focus on building communication and stakeholder engagement capacity. Those stakeholders we worked with learned a lot about these aspects via experiential learning through involvement in IPs. These capacities can usefully be taken up and out-scaled in educational and training programs in the livestock sector.

Finally, our success in linking with the IFAD ILSP in Uttarakhand was partly related to the similar start times of the ILSP and MilkIT and the conscious effort to locate MilkIT in Uttarakhand as ILSP was being initiated. Active synchronization in implementation of grants and loan projects would help future grants to be more useful to the design and start-up of loan projects.

Annex 1

Enhancing livestock productivity through feed and feeding interventions

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Introduction

The majority of smallholders in South Asia and sub-Saharan Africa who raise both crops and livestock keep dairy animals. Milk is an important commodity in both India and Tanzania, and rising demand, especially in the cities, is an opportunity for farmers to intensify their production. In both countries, many poor livestock keepers produce milk, and a variety of dairy production systems exist. But the lack of sufficient high-quality feed is a key constraint for the sustainable improvement of milk yields and smallholders' incomes. In Tanzania, many farmers face feed shortages and poor feed quality. Production is low: 5–10 litres/day for improved dairy cows, and only 1–2 litre/day for zebu cows. In India, average milk yields are also far below their potential and the national average milk yield is 3.6 litres/cow/day (Blummel et al. 2013). Tiwary et al. (2007) found that the feed given to animals in Uttarakhand, India, is deficient in dry matter, energy and protein. Because the availability of the main feeds, natural grass and other forages depends on rainfall, milk production is strongly seasonal, especially in Tanzania. Such problems are usually addressed by promoting improved feed technologies, but this has rarely been successful and uptake is low, so new approaches are needed.

The project "Enhancing Dairy-based Livelihoods in India and the United Republic of Tanzania through Feed Innovation and Value Chain Development Approaches"—or "MilkIT" for short—was a research for development project (2012–14) that focused on improving smallholder livelihoods through dairy feed innovations in India (Uttarakhand state—Figure 1) and Tanzania (Morogoro and Tanga regions—Figure 2).

Figure 1. Bageshwar and Sult districts in Uttarakhand, India

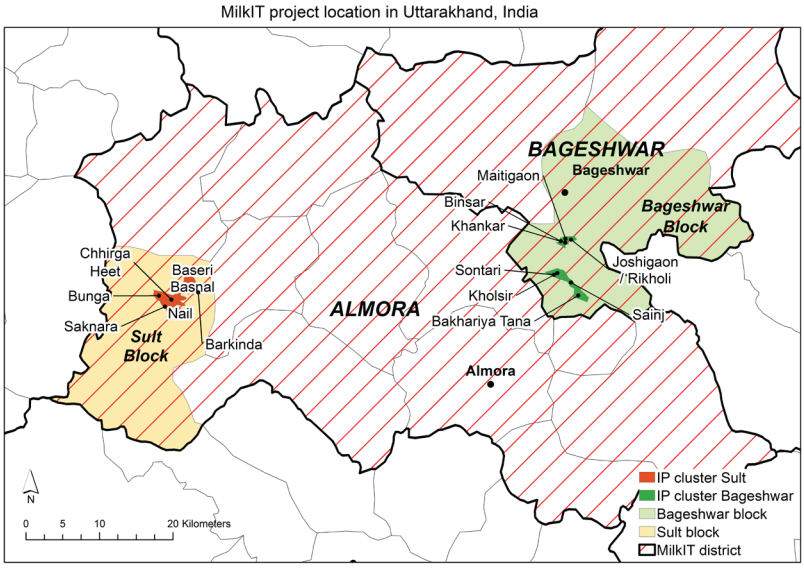
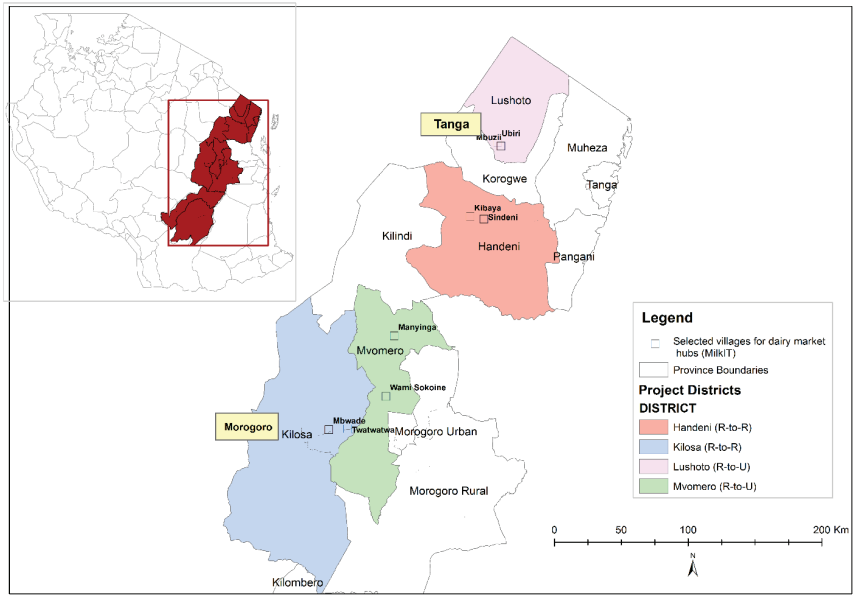


Figure 2. Tanga and Morogoro districts in Tanzania



Source: Pham et al. (2014)

The project combined a series of approaches to improve feed supply, including:

- Organizing producers with other actors in the dairy value chain into 'innovation platforms'(see Box 1)
- Applying simple diagnostic tools for feed within the broader context of the production system to guide intervention strategies
- Identifying and dealing with value chain constraints.

Box 1: MilkIT innovation platforms

MilkIT established a series of 'innovation platforms' in each country (Pham et al. 2014; Subedi et al. 2014). These are forums of different stakeholders who together want to address constraints facing the dairy value chain.

In **India**, such platforms were established in Sult block, Almora district, and Bageshwar block, Bageshwar district. These were in areas where a previous rural development programme supported by the International Fund for Agricultural Development had been active. In each district, two platforms focusing on feed were formed, each covering a cluster of four to six villages. A third platform focusing on the dairy value chain covered both village clusters in that district and involved 700–750 households.

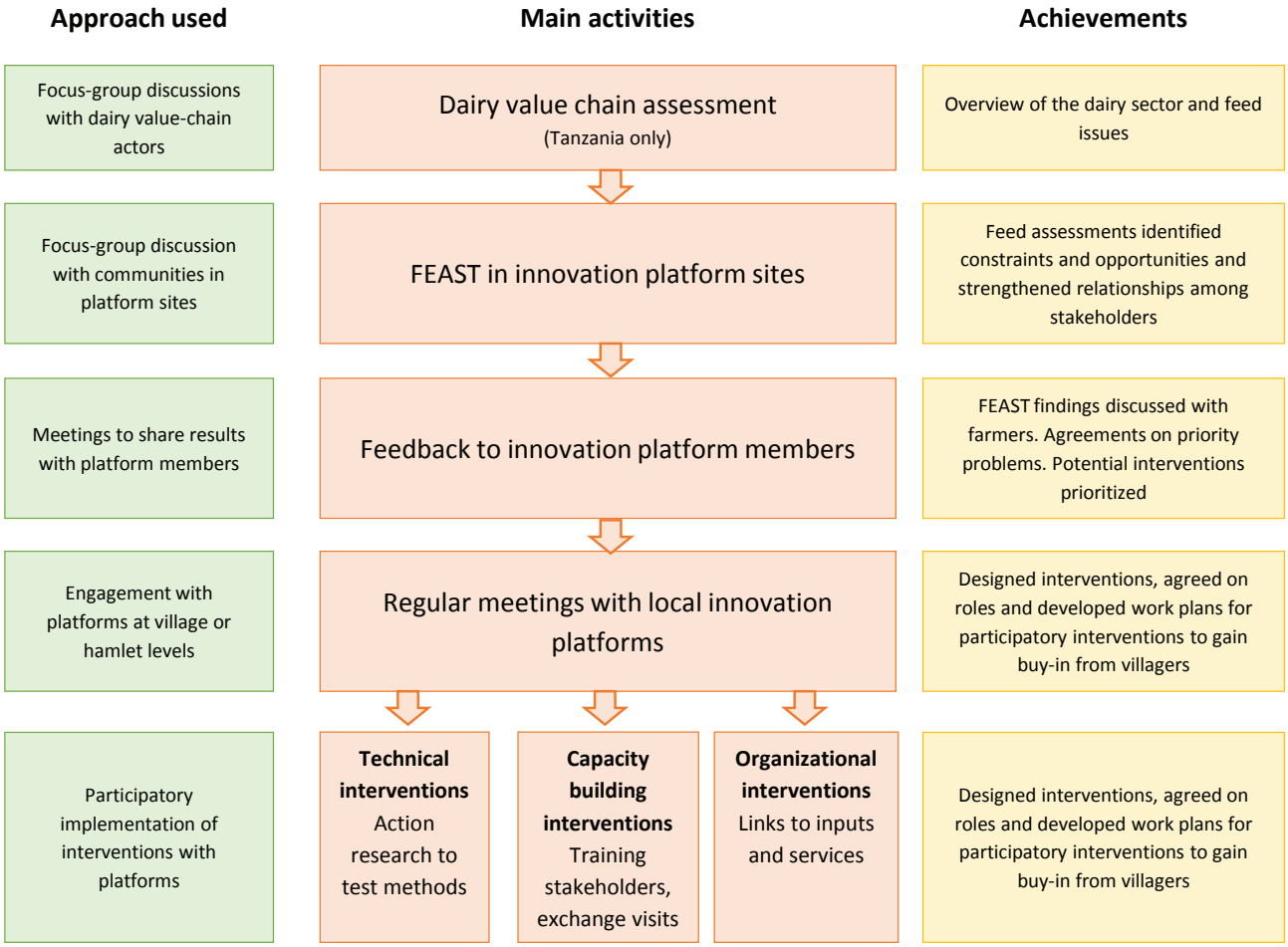
In **Tanzania**, village platforms were set up in each of eight villages selected by the MilkIT project, dispersed across Tanga and Morogoro Regions. These villages were a subset of a larger set of villages selected by the CGIAR Livestock and Fish Research Program (http://livestockfish.cgiar.org/) for start-up activities on dairy in Tanzania. The group of four village platforms per region were each connected to a regional platform. In Tanga, the existing Tanga dairy platform was used, while in Morogoro a new regional platform was established.

The project thus placed feed in a broader context. It recognized that enhancing feed supply has both technical and institutional dimensions.

Process and approach

The study followed a similar approach in the two countries, with minor differences adapted to local contexts (Figure 3).

Figure 3. The research processes in India and Tanzania



In **India**, the Feed Assessment Tool (Box 2; FEAST) was used to collect quantitative data to assess the project impact. A lot of effort went into rigorous sampling; FEAST was used in both target and control communities. This allowed the resulting data to be used as a biophysical baseline. The assessment tool was used again at the end of the project with the same households; this made it possible to assess changes in their feeding practices. Qualitative assessment using focus group discussions helped to identify the most important feed issues and initiated the discussions on how to solve them.

Box 2 - What is FEAST?

The Feed Assessment Tool (FEAST) is a rapid, systematic method to assess the availability and use of local feed resources. It helps in the design of intervention strategies that will optimize feed utilization and animal production.

FEAST differs from conventional feed assessment approaches that focus on the feeds and their nutritive value. FEAST takes a broader approach by taking account of the importance of livestock in local livelihoods, the relative importance of feed problems locally, and the local situation related to labour, input availability, credit, seasonality, and markets. The International Livestock Research Institute (ILRI) along with the International Center for Tropical Agriculture (CIAT) has been developing this tool over the past six years (Duncan et al. 2012). It has been used extensively in sites across Africa and South Asia.

In **Tanzania**, FEAST was used early in the project to characterize the livestock production system and identify the various feeding issues in the study sites. The results of the assessment were reported to the innovation platforms so they could discuss possible intervention strategies. From these discussions emerged a series of feed interventions that were then applied in the project sites. Using the assessment tool stimulated engagement with farmers and other stakeholders and built their sense of ownership for the interventions that were later tried. These interventions included improving private pastures and planting forage.

FEAST is a ready-made tool that poses questions that have been tried and tested, so it could be applied relatively quickly and easily. Although the tool was used differently in India and Tanzania, it allowed project staff and partners in both countries to quickly identify key feed issues and move forward with some practical interventions. It helped to get conversations going and engage local stakeholders in deciding on interventions.

Study sites

In **India**, the selection of study sites took into account variation in the bio-physical and socio-economic characteristics in Uttarakhand (Subedi et al. 2014). Two intervention blocks, Sult (in Almora district) and Bageshwar (in Bageshwar district), were selected based on the extent of dairying and the experience and local integration of potential project partners. Within these two districts, further data were collected on variables such as dairy animal population, cropping patterns, feed availability, accessibility to roads and linkage with dairy marketing institutions. This made it possible to select blocks that are underdeveloped but that have potential for dairying. Two clusters in each block, Baseri and Saknara in Sult, and Sainj and Joshigaon in Bageshwar containing four to six villages were selected.

In **Tanzania**, MilkIT worked with the CGIAR Research Program on Livestock and Fish, which in Tanzania focuses on developing the dairy value chain. Two regions, Tanga and Morogoro, were selected. Four districts from these regions were chosen for their potential for developing dairying and because they represented two types of value chains: those serving urban consumers, and those serving rural consumers (Pham et al. 2014).

- Two districts, Lushoto in Tanga Region and Mvomero in Morogoro Region, were chosen to represent areas where rural producers serve urban consumers. These districts are dominated by semi-intensive/intensive mixed crop-livestock systems. The four participating villages in these districts were Ubiri and Mbuzii (Lushoto district) and Wami Sokoine and Manyinga (Mvomero).
- Another two districts, Handeni in Tanga Region and Kilosa in Morogoro Region, represented areas that serve mainly rural consumers. They have mainly extensive pastoral and agro-pastoral production systems. The four villages in these districts were Kibaya and Sindeni (Handeni district) and Mbwade and Twatwatwa (Kilosa).

Identifying feed constraints in the study sites

In **India**, the innovation platforms in Sult and Bageshwar were convened in all village clusters and used FEAST to assess the feed situation. The main constraints identified in the two locations were shortages of green fodder especially in summer (May, June) and winter (December, January), a lack of concentrate, and fodder wastage. Other constraints identified in Bageshwar were the lack of knowledge on feeding dairy animals, limited artificial insemination service (especially for buffaloes), limited and low-quality grassland for grazing, and the high cost of grass sourced from other areas.

In **Tanzania**, the MilkIT project sites were included in the CGIAR Livestock and Fish Research Program. That made it possible to assess the dairy value chain as a whole.

The major constraints concerned the inefficiency of forage seed systems, inefficacy in the supply of compounded feeds, and limited access to and quality of water. However, the assessment also showed potential opportunities in the emerging feed and fodder markets. On farms, the two main constraints identified were strong seasonality effects and problems in land ownership and use.

The FEAST technique was used in the four districts to investigate major constraints to livestock production at the farm level. It identified four broad key constraints:

- Insufficient forage for livestock.
- Poor livestock housing.
- Land shortage.
- A lack of improved breeding bulls.

These topics were entry points for discussion by village innovation platforms, making it possible to explore their effects on feed availability. The platforms identified several major constraints that limited feed production:

- Strong seasonality, resulting in fluctuations in feed quality, quantity and access to drinking water over time (Figures 4 and 5).
- Overstocking by pastoral communities, resulting in degraded pastures and a lack of grazing reserves for the dry season.
- Poor quality of pasture, fodder and crop residues.
- A limited supply and access to forage seed and planting materials.

Figure 4. Feed resources and rainfall distribution in a semi-intensive and intensive system: estimated by farmers from Manyinga village, Mvomero District, Morogoro Region, Tanzania

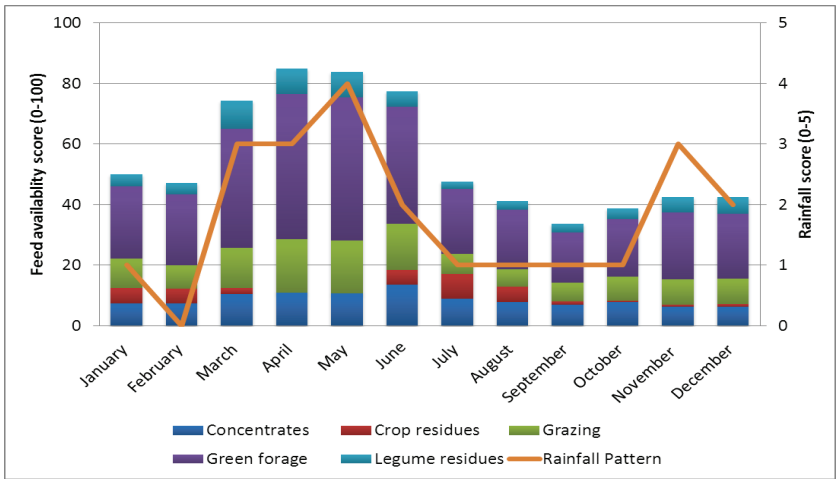
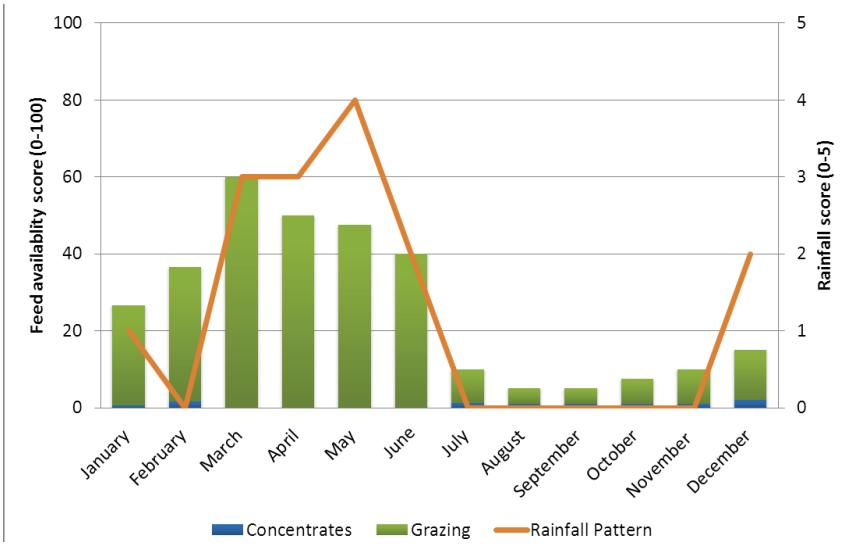


Figure 5. Feed resources and rainfall distribution in an extensive system: estimated by livestock keepers from Twatwatwa village, Kilosa District, Morogoro Region, Tanzania



Identifying feed interventions

In India, a series of village innovation platforms were convened to discuss constraints and conceptualize ideas for interventions to overcome them. The interventions that emerged are summarized in Table 1.

Table 1. Interventions emerging from feed innovation platforms in India

Intervention	Aim
Improved feed troughs	Reduce feed wastage during feeding
Dual purpose crops (winter cereals)	Increase fodder availability in winter
Fodder grasses	Increase green fodder availability in summer Increase milk production
Improved chaff cutters (smaller, women-friendly model)	Overcome problems faced by women in operating the usual mechanized, wheeled model
Training and awareness-raising on using concentrate	Encourage concentrate feeding to increase production
Establishing links with private feed companies	Increase access to and reduce cost of concentrate

In **Tanzania**, the village platforms identified various technical and capacity-development interventions to improve year-round production: The interventions that emerged are summarized in Table 2.

Table 2. Interventions emerging from village innovation platforms in Tanzania

Intervention	Aim
Introducing improved cut-and-carry forages	Improve herbage production in intensive systems
Improving agro-pastoralists' dry-season grazing reserves (locally known as *ololili*) and feed-conservation strategies	Overcome dry season feed shortages in extensive systems
Feeding adequate feed rations	Increase milk production and make use of the cattle's genetic potential
Training on feed rations, forage establishment, management and use	Encourage adoption of introduced technical interventions to increase production
Training on feed conservation	Overcome dry season feed shortages in intensive systems
Introducing new designs of cattle sheds	Improve cattle husbandry and enhance feed utilisation

Implementing interventions

Feed choppers/chaff cutters (India)

Previously, a local non-government organization in Uttarakhand had distributed hand-operated, wheeled chaff cutters to farmers. But the farmers did not use them because the cutters needed at least two people to operate. Labour is limited because many men migrate to the cities to find work, leaving the women to handle farm operations. The chaff cutters were heavy and needed a lot of strength to operate, so many women could not use them.

The innovation platforms identified the need for a low-cost, simple and easy-to-use chaff cutter. Simple chaff cutters in the form of weighted knives and mounted scythe cutters were sourced from Gandhi Ashram and Gujarat dairy cooperative (AMUL). These were tested with farmers, who found them easy to use to chop grass (Figure 6). A local entrepreneur was identified to supply the Gujarat model.

Figure 6. Demonstrating a simple chaff cutter to women in Besar Bagarh village

Improved feed troughs (India)

To reduce feed wastage on farms, the innovation platforms started participatory trials using improved feed troughs. A total of 118 farmers (80% of them women) from seven villages took part. Before the intervention, 99% of the farmers had no feed trough; they put the feed on the ground, leading to very high wastage. They were reluctant to make a trough because of the high cost: about INR 4,000 (USD 67). With help of local builders, the project designed a cheaper trough costing INR 2,000–2,500 (USD 33–42) (Figure 7). The farmers were offered a loan and subsidy through the innovation platforms to encourage them to make such troughs. The IFAD-funded Integrated Livelihood Support Programme and the National Bank for Agricultural Rural Development subsidized 60% of the cost and offered loans to cover the remaining 40%.

The farmers said the troughs reduced wastage by 20–30%, and participatory research also found that the troughs reduced fodder wastage (Table 3). Reducing wastage cut the amount of work women had to do in several ways: they had to collect less fodder from the forest, they no longer had to rearrange fodder around the animals to stop them from trampling on it and soiling it, and there was less waste fodder to clear out from the cattle sheds. Clean fodder, free of urine and dung, reduced the risk of infections (especially respiratory problems) for the animals.

Figure 7. An improved feed trough on a farm in Almora, India

Photo: IFAD, Almora

Table 3. Effects of improved feed trough on feed wastage in Uttarakhand, India

Treatment	Households	Total number of feedings observed	Mean fodder wastage (%)	S.E. for mean fodder wastage
Without feed trough	50	872	22	0.26
With improved feed trough	68	1234	11	0.06

A total of 130 farmers built the improved troughs, and another 225 farmers adopted the women-friendly feed choppers. A cost-benefit analysis of these technologies showed that they were profitable for small-scale farmers (Table 4). A promotional leaflet was developed on the improved feeding practices to create awareness in the neighbouring villages.

Table 4. Cost-benefit analysis of using improved feed troughs and choppers for five years

		INR/year
Costs		
Investment costs	Feed trough, construction cost	625
	Feed chopper	225
Recurrent costs	Maintenance, trough and chopper	300
	Labour cost for cutting chaff	1916
	Opportunity cost of using waste as compost/fertilizer	1825
Total cost		4891
Benefits		
Additional fodder gained through less wastage		3285
Labour saved for arranging fodder		1272
Reduced animal health expenses		600
Increased production		273
Total benefits		5430
Net profit for first year (benefit minus total costs)		539
Net profit for consecutive years (benefit minus recurrent costs)		1389

Improved forages (India)

The innovation platforms discussed the shortage of green fodder in summer (May/June) and winter (December/January). With help of technical experts, the farmers agreed to introduce dual-purpose crops and temperate grasses to increase green fodder in winter, and improved forages (Napier grass, setaria and berseem clover) for the summer (Table 5). The animal husbandry department of the state ministry of agriculture provided seed of temperate grasses, while Vivekananda Parvatiya Krishi Anusandhan Sansthan (a national agriculture research centre based in Uttarakhand) supplied seeds of the dual-purpose crops. Finding Napier planting materials was easy: they came from other farmers and development departments. Some farmers already had received planting materials of Napier grass from the State Animal Husbandry Department and had planted them around their fields and along roadsides and in other public places. Setaria and berseem seeds were sourced from the agricultural university at Palampur, in neighbouring Himachal Pradesh.

Table5. Fodder innovations in summer and winter, Uttarakhand, India

Winter season interventions	**Summer season interventions** (local names in parentheses)
Dual purpose crops	Temperate grasses
Wheat, *Triticum* sp.	Tall fescue, *Festuca arundinacea* (*dholni*)
Oats, *Avena sativa*	Orchard grass or cock's-foot grass, *Dactylis glomerata* (*kucchi*)
Barley, *Hordeum vulgare*	Perennial rye grass, *Lolium perenne*
	Smooth brome grass, *Bromus inermis*
	Other forages
	Setaria grass, *Setaria sphacelata* var. *anceps* (*sita grass*)
	Berseem clover, *Trifolium alexandrium*
	Napier grass, *Pennisetum purpureum*

Although seed of the dual-purpose crops cost 1.5 times more than common local crop varieties (wheat, oats and barley), farmers adopted them quickly because they could collect and sow the seed for three to five years without a significant drop in yield. Also, the dual-purpose varieties could be harvested as fodder at 79–85 days after sowing in the winter to produce bonus green fodder. The crop then re grew and was taken to maturity with no detrimental impact on final yield of grain or straw.

The forage grasses were successful only in the areas where there was enough water. The setaria grass failed to germinate in all sites, and it anyway requires a lot of water. The seed was expensive, casting doubt on its suitability in this area. Farmers also complained that the seed of the temperate grasses was expensive and it performed poorly.

Berseem clover was successful in Bageshwar, where farmers have irrigation, but failed in Sult, where access to water is limited. Farmers in Bageshwar who had crossbred cows preferred to plant more berseem because it improved milk yields. Farmers with local breeds showed less interest in planting fodder because of the cost of seed and the fact that their animals do not produce enough milk to make the investment worthwhile. Table 6 shows that farmers who had planted improved forage were able to feed their cattle for longer than the control group, who relied on local forage. Uptake of the forage depended on farmers having high-yielding animals and their benefiting in monetary terms.

Table 6. Impact of improved forage as planted fodder in Uttarakhand, India

Clusters	No. of households	Mean no. of days fed with improved forage	SE
Non-intervention clusters	96	11[1]	4
Intervention clusters	96	50[2]	8
Total	192	61	5

1 Forage such as Napier grass collected from around wheat fields, along roadsides and other public places
2 Improved planted forage

Linkages to improve access to concentrate feed (India)

Another initiative aimed to improve feeding practices with supplementary commercial concentrates. Concentrate is scarce and expensive in the project area because it has to be transported from far away. Demand for concentrate was higher in Bageshwar because of the high-yielding crossbred animals there. The Jeganath dairy cooperative, a group established through the innovation platform, collaborated with a private feed company to obtain concentrate in bulk at a reduced cost. This additional concentrate boosted milk production.

In Sult some farmers received subsidised concentrate from Aanchal, the state dairy cooperative, through the innovation platform. Here, however, the concentrate did not increase milk production much because most farmers there have low-yielding local breeds and little incentive to feed the concentrate. The farmers did not trust Aanchal and said that the concentrate was low quality, so they did not buy it.

Introducing and improving forages and pastures (Tanzania)

In Tanzania, different technologies were introduced in different types of production systems. In zero-grazed intensive and semi-intensive systems, the innovation platforms decided to plant improved forages on demonstration plots on selected farms. They used various combinations of improved Napier grass varieties and legumes. Fodder trees and shrubs were also planted as hedges. Groups of farmers planted the plots and learned how to establish and manage forages (Figure 8). The demonstration plots served as a source of vegetative planting materials for the platform members and as places for farmers to learn and check on the trials. Silage making was introduced as a way to conserve feed and reduce seasonal fluctuations in availability.

Figure 8. Planting forage grass on demonstration plots in Tanzania

Farmers planting Napier grass in a forage demonstration plot for cut-and-carry production, Tanga Region

Maasai agro-pastoralists planting buffel grass to improve dry-season feeding in a fenced area, Morogoro Region. Photos: F.J. Wassena (left) and W.E. Mangesho (right).

The farmers were interested in forages that produce a lot of herbage and are compatible with food crops. The demand for forage technologies had to do with the farmers' desire to overcome the scarcity of land and labour. They wanted forage technologies that fit in their existing farming systems. Farmers appreciated the new forages because they would save them the work of collecting natural forage from roadsides or fields. The number of farmers who initially received forages in early 2014 and those who had planted forages by the end of the project a year later are shown in Table 7. In Ubiri, the new forages spread rapidly: more than three times the number of farmers planted them a year later, reflecting a strong demand for more feed. In Mbuzii, the platform decided to distribute the planting materials only among its members; other farmers would get planting materials later from these members or from the demonstration plot.

Table 7. Number of farmers planting new forages at two sites in Lushoto district, Tanga, Tanzania

	Ubiri		Mbuzii	
	Early 2014	End of project	Early 2014	End of project
Women	11	38	9	9
Men	14	49	19	19
Total	25	87	28	28

Improved forages introduced:

- Both locations: Napier hybrid, Napier Kakamega II, green leaf desmodium, mulberry
- Ubiri only: Gliricidia sepium
- Mbuzii (demo plot only): Canavalia brasiliensis

A few plants of the local Napier grass used as a local check were infected with stunt disease. This underpins the importance of promoting the improved, tolerant varieties and educating farmers how to manage infected fields to reduce the spread of the disease. Diversifying with other forages would reduce reliance on Napier grass.

In extensive systems, the innovation platforms opted to improve the agro-pastoralists' dry-season grazing reserves. This is a traditional forage-conservation method used by the Maasai and other pastoralists in Tanzania (Mwilawa et al. 2008): they fence off enclosures around their homesteads (Figure 9) so they can use them during the dry season when feed is scarce, normally from August to October (Goldman et al. 2013). The enclosures are usually meant for lactating, heavily pregnant and weak animals as well as calves that are left behind when the herds migrate to greener pastures. The fences are made of traditional materials (Isinika et al. 2010). In Morogoro Region, the reserves are known by the Maasai name, ololili. Because the ololili provides pasture during extreme dry periods it helps to avoid having to graze animals on cropland, which can spark disputes between the crop growers and livestock keepers. The issue of land ownership and rights remains a thorny, unresolved issue in pastoral areas of Tanzania.

The agro-pastoralists were trained in pasture establishment, management and utilization. Buffel grass (*Cenchrus ciliaris*) and legumes were introduced to improve the quality of the conserved pastures for grazing).

Figure 9. Ololili dry-season grazing reserves in a pastoral system in Tanzania

A fenced ololili in Morogoro Region

Outside the ololili

Photos: B.L. Maass.

Adequate feed rations (Tanzania)

Farmers in Tanzania claimed low milk yields more on poor breed quality than on inadequate feeding. A study in Manyinga village, Mvomero district, investigated the idea that the lack of feed was the cause. Researchers from Sokoine University of Agriculture found that lactating cows suffered a deficit of over 30% in both metabolizable energy and crude protein—supporting the underfeeding hypothesis rather than blaming the cattle breed.

A follow-up study in the same village, coordinated by the platform leaders, checked the above issue further. Eighteen lactating cows (in their first to fourth months of lactation) were fed enough to meet their requirements for body maintenance and milk production, assuming a genetic potential of 15 litres of milk per cow per day. The owners of the cows were given training on feeding, a tape measure to estimate their animals' body weight, scales to weigh the feed, containers to measure the amount of milk produced, and additional feed supplements for their cows. As a result, the cows produced about 106% more milk—an increase from initial yield of 6.6 to 13.6 litres/cow/day. The final milk yield was 90.6% of the assumed genetic potential.

Farmers were trained on different methods of feed conservation. One was the use of a box-baler (Figure 10) to make hay from natural grass or maize stover. As a result, some farmers in Mbuzii, a village in Lushoto district, made their own baler and experimented with making hay by themselves. They also demonstrated the technology to other farmers at a district agricultural show. Cross-visits among platform members stimulated farmers in Ubiri, another village in the same district, to make their own hay balers. So far, 28 farmers in Mbuzii and 40 in Ubiri have started using this method.

Figure 10. Farmers learning how to use a hay box-baler

Photo: F.J. Wassena

To improve cattle husbandry and reduce feed wastage, farmers in Manyinga, Ubiri and Mbuzii were given designs for cattle sheds that have feed troughs and crushes to handle animals. Some 24 farmers in Manyinga and 25 in Lushoto have modified their sheds as a result.

Discussion: What worked, what did not work, and why

The importance of context

When implementing interventions, it is important to consider the context. India and Tanzania are dissimilar, and the sites within these countries had distinctive production systems and agro-ecological conditions. So the approaches

used and solutions developed were different in each place. Innovation platforms were a good way to adapt to these different situations, identify entry points and develop context-specific interventions.

In **India**, the two districts had different production systems. Farmers in Bageshwar had irrigation water from local rivers, while those in Sult depended on the seasonal supply of rainwater. This influenced the adoption of feeding practices. The improved feed troughs were adopted widely in both sites, whereas improved grasses and crops were popular only in Bageshwar, where they grew well because they were irrigated. Development workers and researchers provided the required resources, technical backstopping and information to the farmers. This support proved to be a key to the success of the interventions. Marketing was the main entry point: when farmers found they could earn money, they became more interested in increasing their production, so started demanding and applying new technologies.

In **Tanzania**, the big difference was between the extensive and the intensive production systems. Agro-pastoralists in extensive systems were interested in dry-season grazing reserves; farmers in more intensive systems were interested more in planting forage crops. In both locations, production was the entry point: farmers first needed to increase their output, and so got interested in marketing.

Innovation platform participation

The types of institutions involved in an innovation platform will also depend on the context. They must be relevant to the situation. They should not be included just in order to have them there; rather, they should be able to contribute to solving the problems. Having the right stakeholders around the table is key to solving the identified problems. In both countries, it was best to start off with a lot of institutions, then to identify the main focus areas for the platform. Then only those institutions that were relevant needed to become members. As new topics emerged, other members could be brought in as required.

In India, an analysis of the history of innovation around livestock feeding in the area made it possible to select the initial participants in the platforms. In Tanzania, a stakeholder analysis helped identify the initial participants.

Topics covered

The topics identified by the innovation platforms were not obvious. For example, in Tanzania a standard research and development approach might not have identified the issue of land rights or been able to deal with it. In India, conventional approaches might not have prioritized women's difficulties in using the big chaff cutters and the lack of feed troughs. The innovation platforms identified these issues and could do something about them because they brought in the right people and institutions at the right time. They make it possible for interested stakeholders to identify issues collectively and to consider and implement solutions.

Trying things out quickly

It is best for the innovation platforms to 'get their hands dirty' quickly by trying out a range of promising technologies. Some of these will not work—so can be dropped. But other ideas that do work can be tested and adapted further. In India quite a few interventions were tested early on: planted forages did not take off, but forage choppers did. Such early 'quick and dirty' interventions build a lot of momentum that can lay the foundation for future collaboration.

Linking interventions to pull factors

Aligning or linking interventions to 'pull factors' is critical for success. In India, the project first helped the farmers to sell their milk. The chance to earn money acted as a pull factor, making them interested in investing in productivity.

Farmers in Bageshwar became interested in feeding with concentrates, investing in feed troughs and chaff cutters, and improving their breeds once they had got together as groups to sell their milk in the nearby town for a higher price. The institutional improvement in market linkages was important in enhancing productivity.

In Manyinga, the producers received the highest milk prices of the eight villages in Tanzania. Demand was there, and therefore the opportunity to produce more and sell it. This was much less the case in Lushoto district, where producers depended more on the prices set by the only milk factory—Tanga Fresh.

Multiple interventions

In the semi-intensive/intensive systems in Lushoto and Manyinga, improving feeds and feeding practices may have the biggest direct impact on livestock performance. But such improvements have to be aligned with other interventions such as general husbandry, especially housing and feed troughs to avoid feed wastage and related health issues. Animal houses in Tanzania are often very poor, making them difficult to clean and lowering the animals' performance. Poor feed troughs result in a lot of waste. The innovation platforms provided a means to train smallholders on general husbandry and improved structures. In Handeni, some farmers upgraded their cow sheds after they were given improved designs and some training. In Manyinga, all 24 farmer members of the innovation platform modified their cattle sheds and feed troughs.

Seed supplies

The lack of improved seed and other planting materials was a serious constraint in both countries. A shortage of seed meant it was not possible to expand legume growing in Tanzania. A lack of good-quality planting materials at the right time resulted in the poor establishment of fodder crops. The shortages seem to be because of poor coordination in the supply chain, discouraging potential adopters from taking up the technology. Similarly, the high cost of seed and low germination rates hindered the adoption of improved forages in India. Clearly, such constraints need to be overcome to increase farmers' use of forages in both countries.

Demonstration plots

When they visited the forage demonstration plots, the pastoralists in Handeni district in Tanzania had difficulty appreciating the benefits they might obtain: the plots were too small to be of much use to them. In India, financial constraints meant that the research institutions were able to offer only limited technical support in the field. The demonstration plots were also small as a result. This underscores two important points:

- The objective of demonstration plots needs to be clearly explained to innovation platform members beforehand.
- It is important to consider the size of demonstration plots carefully so they can show benefits and catalyse adoption.

In areas where land is a constraint, it might be sensible to use small demonstration plots. But where land is not limiting, it might be advisable to use larger plots that producers can relate to in terms of benefits in feeding cattle. For example, in Handeni district, producers harvested grass from demonstration plots, made hay using a box baler, and fed it to their animals. Such hands-on practice is likely to result in more adoption than if the farmers had no such experience.

The location of some demonstration plots hindered producers from learning about the technologies or feeling they were relevant for them. In one case in Morogoro, demonstration plots were sited on a large-scale commercial farm, forcing the producers to be ferried there. The contrast between the demonstration site location and their own situation meant that small-scale livestock keepers felt the technologies might not apply to them.

Tanzanian pastoralists rarely cultivate land themselves (Goldman et al. 2013): they often rely on hired labour for land preparation, planting and weeding. Where trials were set up on individually owned land, the owner got other members of the innovation platform to help with tasks such as fencing. But where the trials were set up on communal land (for example in Mbwade village in Mvomero district), no one felt responsible for maintaining the plots or for preventing goats and sheep from grazing there. In the ololili dry-season reserves, uncontrolled, illegal grazing was the most important challenge, especially for women-headed households. In Handeni, platform members decided to move a demo plot that had been invaded to another site that was more controllable.

Innovation platform organization

The MilkIT project brought into focus the issue of sustainability of technologies and the innovation platform approach itself. In both countries, participating institutions seemed to concentrate on disseminating the technologies emerging from the innovation platforms, rather than embracing both the technologies and the innovation platform approach itself. This was attributed to institutional priorities and mandates. In India some issues could not be addressed in the project's short time frame. For example, researchers were not interested in addressing grassland improvement because of their own institutional priorities. In Tanzania, the national research partner could not intervene in matters concerning land rights and conflicts because these were not part of its mandate. Organizations that might have been able to act were not represented locally; they were located at a higher regional or national level. Solutions to some problems may not be found among the members of the innovation platform; it may be necessary to involve other actors at higher levels.

Summary

Feed interventions often do not work due to the 'top-down' approach and blanket promotion irrespective of the context. The MilkIT project's innovation platforms demonstrated a new way of addressing feed issues. Rapid assessments and the platform discussions ensured producers were strongly engaged in designing and implementing interventions. Participatory action research and training helped to address the problems identified, while the action research centred on introducing improved forages, pasture improvement, reducing feed wastage, feeding adequate rations, and feed conservation. Producers tested different practices, while local researchers monitored the trials.

The types of institutions and actors involved in an innovation platform will depend on the particular situation. Innovation platforms may identify issues that a standard research and development approach might not. The entry points will depend on the situation and on the needs of the platform members. It may be important to link interventions to 'pull factors' such as markets. As solutions emerge and are tested and accepted, their sustainability must be considered: the trials must be located in the right place, and local communities (and especially women) must have ownership of the process.

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Annex 2

Innovation platforms to improve smallholder dairying at scale

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Introduction

Generating impact at scale has become a mantra for agricultural research for development projects in recent years. Donors want projects to reach not just hundreds, but hundreds of thousands of farmers. In a recent review, the International Fund for Agriculture and Development elevated scaling to the level of "mission critical" (Hartman et al. 2013). But what do we really mean by scaling, and how do we achieve the large reach demanded by donors?

We can distinguish between "scaling out" and "scaling up" (Menter et al. 2004). **Scaling out** involves diffusing successful technologies from place to place by promoting them in "recommendation domains". Defining these domains generally involves mapping key variables (rainfall, soil type, etc.) that need to be within certain thresholds for a technology to work. For example agro-climatic conditions can dictate where a particular crop will grow. Market access may also contribute to define a recommendation domain for perishable commodities such as vegetables. Mapping these variables shows where the technology is suitable; projects can then target their promotion efforts accordingly (Herrero et al. 2014).

The ideas underlying scaling out of interventions can be rather simplistic and do not fully account for the complexity of agricultural systems. The notion that the main constraints to diffusing technologies are biophysical is embedded in a linear and rather technology-oriented development paradigm. It does not take into account experiences with participatory approaches that show the critical roles played by social and cultural factors in determining the acceptance of a technology, and so on (Lundy 2004).

Scaling up involves dealing with the institutional environment that may enable or limit adoption. For a technology to spread, for example, state support may be needed for supply of a key input such as seed. Scaling up would then require sorting out input supply arrangements. Scaling up ideas are more in tune with current innovation systems thinking.

Donors, particularly the new philanthropies, are increasingly interested in the idea of "scalable technologies"—those that are easy to spread so that many people can benefit from them. Again, the idea that certain technologies have somewhat magical properties that will allow their rapid uptake by farmers has a certain naivety to it: one that ignores the social component of technology adoption. New thinking in the health sector acknowledges that blueprint approaches to scaling are unlikely to succeed. Health systems in developing countries share many characteristics of "complex adaptive systems", where issues such as path dependence, emergent behaviour and feedback loops limit the extent to which interventions can be scaled (Paina and Peters 2012). The same can be said for livestock systems in the developing world.

In the case of livestock feed and dairy production, scalable interventions are hard to come by. Why is this? Feed technologies work in particular situations for a range of reasons and tend to be fairly context-specific. For example, results from using the Techfit tool (a way of prioritizing feed interventions developed by the International Livestock Research Institute, ILRI) suggest that factors such as availability of land, labour, cash, inputs and knowledge strongly influence which feed technologies will work in a particular location. This context specificity complicates the scaling issue.

Also, technologies for livestock differ from those for crops in that farmers tend to keep livestock for multiple reasons, but raise crops mainly for income and food. Livestock serve many additional roles including traction, storage of capital, provision of manure, and so on. Milk is perishable, so market access is a key issue in dairying. For farmers in sub-Saharan Africa, livestock are important because they contribute to crop production. Growing feed often competes

with cropping, and farmers may be reluctant to invest land and labour in growing feed if they are not sure of growing enough food for themselves. Smallholder livestock production is complex and multi-faceted; that complicates the adoption of feed technologies and affects the prospect of scaling. All this means that technologies that work in one place may not work nearby.

In this paper we reflect on the potential role of innovation platforms as spaces to identify and spread useful innovations associated with dairy production and feeding. We draw examples from MilkIT, a project to promote milk production in India and Tanzania (Box 1). We first introduce the idea of innovation platforms and show how they can be used to define the key issues quickly. We highlight the various changes in local practices that innovation platforms can stimulate. We then consider how local innovations can move beyond innovation platforms, and classify a series of mechanisms by which this can happen. We outline strategies to ensure that innovation platforms generate wide-scale changes.

Box 1. The MilkIT project

The MilkIT (Milk in India and Tanzania) project was a three-year research for development project funded by the International Fund for Agricultural Development and managed by ILRI to improve productivity of dairy cattle using improved feeding practices and better arrangements for milk marketing. The project worked in India (Uttarakhand) and Tanzania (Morogoro and Tanga) from 2010 to 2014. Its three main objectives were:

- 1. Institutional strengthening: To strengthen the use of value chain and innovation approaches among dairy stakeholders to improve feeding strategies for dairy cows.
- 2. Productivity enhancement: To develop options for improved feeding strategies leading to yield enhancement with potential income benefits.
- 3. Knowledge sharing: To strengthen knowledge-sharing mechanisms on feed development strategies at local, regional and international levels.

Innovation platforms as spaces to exchange knowledge and identify priority issues

An innovation platform is a space for learning and change. It is a group of individuals (who often represent organizations) with different backgrounds and interests: farmers, traders, food processors, researchers, government officials, etc. The members come together to diagnose problems, identify opportunities and find ways to achieve their goals. They may design and implement activities as a platform, or coordinate activities by individual members (Homann-Kee Tui et al. 2013).

Innovation platforms have gained popularity in research for development circles as a way of stimulating meaningful change in agricultural systems. They are a useful space for local stakeholders to come together to jointly identify constraints and devise and implement solutions. Their advantage over conventional methods (surveys, value chain analyses, etc.) is that they can very quickly identify the key constraints by drawing on extensive local knowledge. Furthermore, local people are more likely to own the solutions they themselves identify, increasing their likelihood of success. MilkIT used innovation platforms to catalyse innovations in smallholder dairy value chains in Uttarakhand, India (Figure 1), and in Morogoro and Tanga Regions in Tanzania (Figure 2). A hierarchy of platforms was established in Indian and Tanzanian sites, focusing on feed development for dairy as well as considering value chain issues and potential solutions.

Figure 1. Bageshwar and Sult districts in Uttarakhand, India

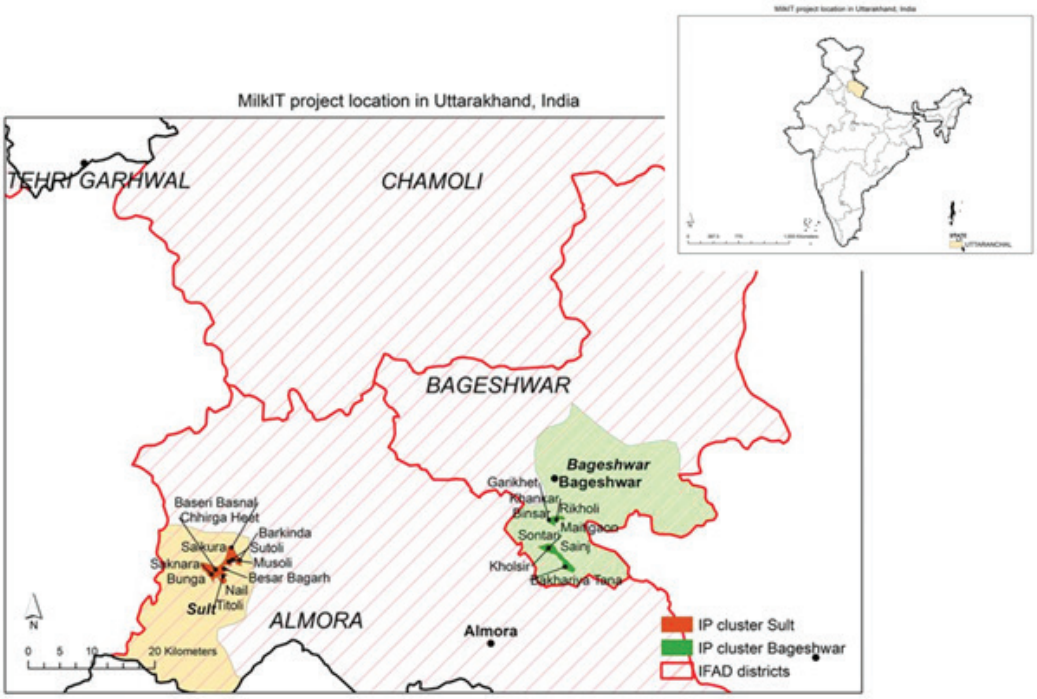
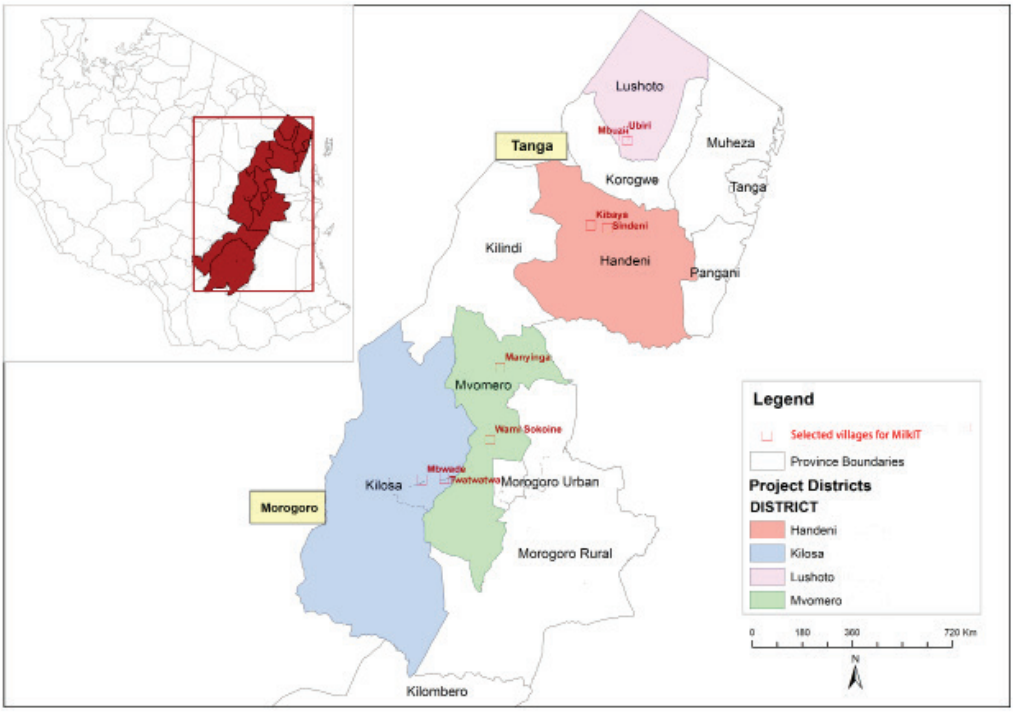


Figure 2. Tanga and Morogoro project districts in Tanzania



In the Indian sites in the MilkIT project, dialogue via the innovation platform very rapidly identified the core issues that were limiting dairy value chain development. Platform members quickly pointed out the amount of work women had in collecting feed from forests. They also complained that the price of milk was too low to justify investment in feed technologies or improved breeds of cows. They highlighted the acute overall shortage of feed as a key constraint to improved dairy productivity.

In the Tanzanian sites, a key concern voiced early in the platform dialogue was that milk prices were unreasonably low and that farmers were being exploited by buyers. The dialogue helped to correct this perception. Land-tenure issues also quickly came to the fore: in agro-pastoral communities, farmers were reluctant to invest in growing forage or improving pastures without assurance about their long-term land rights. A further issue was the strong seasonal nature of feed and hence milk production in Tanzania. Filling the seasonal feed gaps became a key issue to solve.

What kind of changes emerged from the innovation platforms, and what contributed to their success?

In **India**, two types of innovations emerged from the platforms: marketing and simple feed technology innovations. On the **marketing** side, farmers in Bageshwar had the option of selling milk through Aanchal (a state-run milk co-operative) or an IFAD-initiated self-help group federation. But they preferred to form their own self-help-group-based cooperatives within their own village clusters. In Jeganath in Bageshwar District, a producer co-operative was formed which secured a better price for milk. In Sult, on the other hand, farmers preferred to link with Aanchal for milk sales. Here, Aanchal agreed to relax the membership rules for cooperatives following conversations with the innovation platform.

Other organizational innovations followed. The national agricultural development bank, NABARD, developed a credit scheme to promote improved breeds of cows. Banks had been providing loans that required land as collateral; women and marginal farmers were not able to borrow money because they lacked land and confidence. This issue was discussed at a platform meeting. To minimize the risk of payment failure and improve confidence, the banks and NABARD set up a new arrangement modelled on that used by self-help or producer groups. The system worked on the basis of group collateral: any member was allowed to take out a loan of up to USD 1600 to buy two dairy cattle; the group was responsible for paying back the money.

Another organizational innovation in response to the farmers' demands was a memorandum of understanding between agri-businesses such as Tara Feeds and the Jagenath cooperative to supply concentrate feeds.

In parallel to these marketing and organizational changes, various simple **livestock feeding** innovations began to emerge. Development agencies had previously distributed fodder choppers in the area. A study found that these choppers were lying unused and rusting in farmers' backyards. Farmers complained that they were heavy and required a lot of labour to operate. A shortage of labour is a key constraint as many men in Uttarakhand migrate to the cities in search of work, leaving women to handle the farm. The choppers required a lot of force to operate, and they were more heavy-duty than necessary to cut the thin, dry grass that grows in hilly areas.

After discussion with stakeholders, low cost and simple forage choppers were sourced from Gandhi Ashram and Gujarat dairy co-operative (AMUL). These consisted of handmade knives and simple lightweight scythe-type choppers. Small-scale trials assessed the use of such choppers and feeding troughs in six settlements. They resulted in 11% less fodder wastage, as well as significant savings in the labour used to clean up the wasted fodder. The farmers reported the findings in innovation platform meetings, encouraging other farmers to adopt the techniques, even outside the intervention sites.

Shankar Devtalla, INHERE field facilitator, demonstrates a simple fodder chopper to members of an innovation platform in Baseri village.

In **Tanzania**, innovations tended to focus on technical feed interventions. A key priority was improving the agro-pastoralists' dry-season grazing reserves. Agro-pastoralists practise rotational grazing during the rainy season, allowing their animals to graze in one area at a time. Meanwhile, they protect traditional fodder banks. These are enclosures around homesteads for use by lactating females, weak animals and calves during the dry season from August to October, when feed is scarce. In this period, the larger herd moves away in search of pasture (transhumance). The traditional dry-season forage reserves are usually fenced off with traditional materials and used only during dry season. In the Morogoro region, such reserves are known as *ololili* in the Maasai language.

A key challenge raised by platform members was the uncontrolled, illegal grazing of such areas: some herders ignored fences and traditional rules. In Morogoro, village innovation platforms conducted action research on how to improve the ololilis. This aimed to increase the availability of fodder and its quality longer into the dry season. Buffel grass (Cenchrus ciliaris) and hardy forage legumes (Stylosanthes scabra cv. Seca and S. hamata cv. Verano) were introduced. Communally or individually owned demonstration plots were established in two villages.

How do changes move beyond a platform?

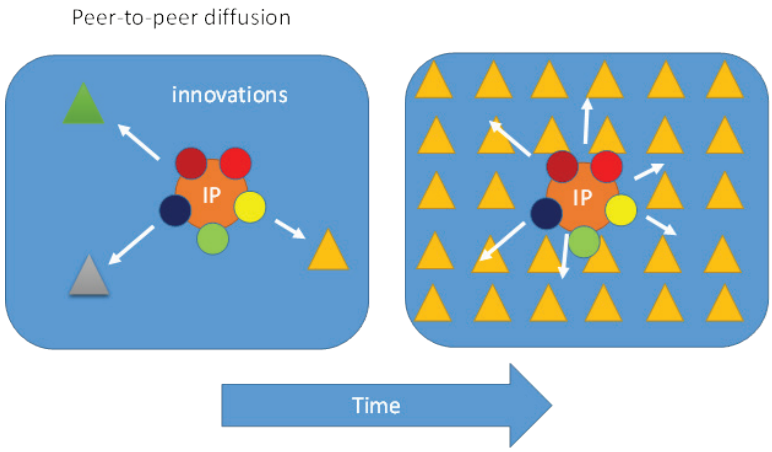
The MilkIT project's innovation platforms stimulated widespread change in the dairy value chain in two main ways: spontaneous diffusion across communities and more guided processes of intentional promotion and change by different agencies. A third way was through the adoption of the innovation platform process itself—as a mechanism to replicate the social processes as well as any specific changes.

Spontaneous peer-to-peer diffusion

Some ideas emerging from the platforms spread spontaneously through the interest of platform members and outsiders. This "spill-over" required little effort on the part of the project. This kind of peer-to-peer diffusion was an example of diffusion of innovations as set out in classical communication theory (Rogers 2010). Rogers identifies four elements required for such diffusion: the innovation, communication channels, time and a social system. The role of innovation platforms in such diffusion is primarily to provide the communication channels but also to create or reinforce social links. We saw many examples of such diffusion in MilkIT:

- In Uttarakhand farmer members of the platform in Sult District established a link with the Aanchal dairy cooperative and negotiated for residents of Besarbagarh and Baseri to sell their milk. This attracted the interest in two neighbouring villages, Gahnaheet and Kunidher; farmers there negotiated similar arrangements with Aanchal. The farmers in these two villages have also spontaneously started using the forage choppers that emerged from the feed innovation platform in the Baseri village cluster in Sult District.
- In Bageshwar, the establishment of the Jagenath Dairy Cooperative through the platform attracted local interest. Now three other villages, Areagarh, Bholnanagar and Raikholi, have spontaneously joined the cooperative.
- A NABARD loan scheme enabled farmers in Bholnanagar and Bhohala villages to buy improved cows. Other farmers have also now independently procured cross-bred cows through their own contacts.

Figure 3. An innovation platform works with three technologies (the triangles). One of them is taken up by other people.



Uptake and guided diffusion by third parties

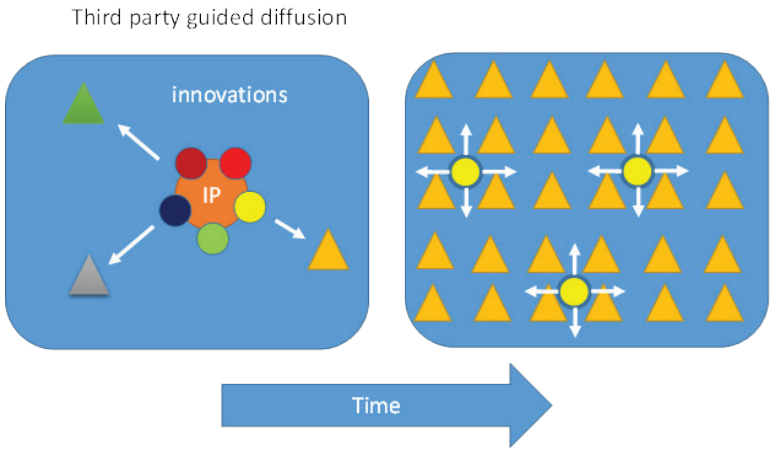
Some innovations coming out of the innovation platform process caught the attention of platform members, which then promoted them more widely across organizations and, in some cases, at regional and national levels. Some examples:

- The feed troughs piloted by MilkIT to reduce wastage in Uttarakhand are now being taken up by several organizations and promoted among their farmer clients: the Animal Husbandry Department, the Integrated Livelihood Support Program (funded by the International Fund for Agricultural Development) and the Aanchal dairy cooperative.
- The Integrated Livelihood Support Program has ordered choppers of the type that the Bageshwar platform piloted in Almora; it promotes them in non-MilkIT districts such as Chamoli.
- The state dairy cooperative, Aanchal, changed its cooperative membership rules as a result of discussions in the innovation platforms. The original rule said that 30 farmers in a village had to agree to sign up before Aanchal would collect milk. The new rule is more accommodating: cooperative members can be drawn from a number of neighbouring villages. The cooperative is now spreading the new rule to other areas.
- Members of local platforms alerted the Morogoro regional platform in Tanzania to the lack of veterinary drugs.

The national media (e.g., *The Citizen* newspaper (2014)), took up the issue; the regional platform sent a letter to the Ministry.

- In Almora in India, discussions at the local innovation platform highlighted the fact that milk-fat testing using the Gerber method was very time-consuming, tempting collectors to short-cut the process. The issue was raised at higher level, and Aanchal agree to pay an additional fee of 4 rupees per litre for the collector for testing the milk properly.
- The problem of sourcing grass seeds and improved buffalo breeds now forms the core of a proposal between the Integrated Livelihood Support Program and the Animal Husbandry Department. They are working with Pantnagar University to acquire improved breeds of buffalo and VPKAS (Vivekananda Parvatiya Krishi Anusandhan Sansthan—the national hill research institute) to get grass seed.

Figure 4. An innovation platform works with three technologies. Someone sees the potential of a technology and it is intentionally spread to other locations and communities.



Scaling of the innovation platform process itself

The examples above illustrate two main ways in which the MilkIT-supported innovation platforms incubated livestock improvements and, in some circumstances, facilitated the diffusion of the promising results and changes initiated through interaction, experimentation and negotiation.

Often, it was generally the actual innovations that attracted scaling attention from other parties. The platforms brought "together the technocrats and market players, with a lot of motivation!", says B.K. Bhatt, a program officer with the Gramya Vikas Samiti in Uttarakhand. Through its platforms, he says, MilkIT helped trial and test some practical, low-tech feed interventions and proved their usefulness (Ballantyne 2015a). Bhatt could then take these innovations out through the wider IFAD-supported programs he managed.

But not always! For more complex innovations such as changes to marketing arrangements, there may be no substitute for going through the innovation platform process, or at least a compressed version of it. MilkIT "sold a mix of demonstrable interventions, maybe also the innovation platforms as one of the interventions," says Ahmed Iqbal, chief development officer for Almora district, Uttarakhand (Ballantyne 2015c). Sometimes there is a need to think beyond merely promoting interventions to spreading the innovation platform process, so that members can come up with their own solutions.

Examples:

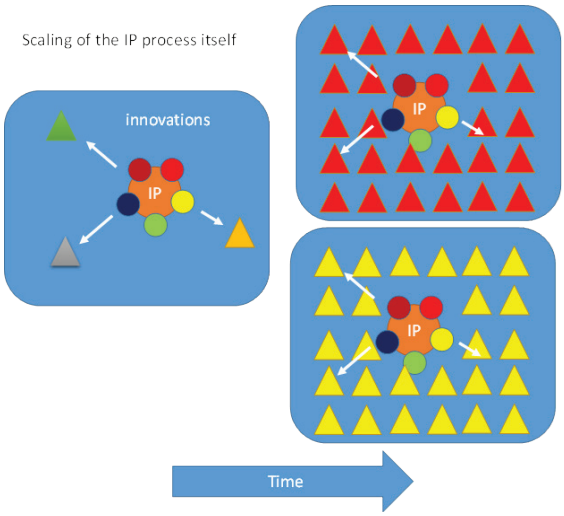
- CHIRAG (Central Himalayan Rural Action Group), a MilkIT partner in Uttarakhand, has seen the benefits of the platform process and is mainstreaming it within its programs. It is establishing innovation platforms in Pitoragarh district, in collaboration with Himmothan, a local NGO.

- The Integrated Livelihood Support Program, in collaboration with Aanchal, plans to establish the platform process in four non-MilkIT blocks. The program also plans to apply the approach to other commodities, including vegetables and spices.

In other cases, key elements of the approach are being adapted for particular purposes.

- The Tanzanian Dairy Development Forum has recognized the promise of regional dairy platforms and plans to extend these beyond Tanga and Morogoro. The Forum recommends setting up further regional platforms in Mbeya.
- Also in Tanzania, village innovation platforms have been replicated by the Tanzania Livestock Research Institute in other districts in Tanga. These also work on dairy feeds and market issues.
- A sister project funded by the US Agency for International Development, Africa RISING, borrowed various approaches from MilkIT in Babati district, including the use of innovation platforms.

Figure 5 Multiple innovation platforms are set up to address different issues.



Working in innovation-platform mode is not trivial—in fact it can sometimes be difficult. It forces researchers and other actors to move out of their comfort zone and think through issues from a different perspective. However, this effort is often central to the successes that emerge. The challenges of working with multiple stakeholders builds ownership and leads to solutions that fit the context.

When it comes to scaling, the temptation is often to attempt to scale out only the successes rather than the processes that led to those successes. One key lesson from MilkIT is that the innovation platform process is important. We sometimes need to scale out the process, and not just the success. This is harder work but will be more effective in the long run.

Strategies to ensure that innovation platforms generate wide-scale changes

The section above identified two main ways that platforms extend and diffuse wide-scale livestock results and innovations. It also illustrated ways that scaling up the use of platforms themselves can be a vehicle to generate wide-scale livestock changes. This section explores strategies to increase the chances that platform actions lead to results, at scale.

Consider scaling early on

Initiating changes is a core objective of most innovation platforms (Ballantyne 2015b). But changes rarely happen spontaneously. Considering scaling early on makes them more likely, and speeds them up. How scaling will work—

how other institutions will take up new approaches—is rarely easy to predict. Nevertheless, considering the platform members' ability to help spread innovations makes it possible to identify and explore opportunities early on. Some opportunities may not lead to wider activities but still allow members to learn something. Keeping an open mind also increases the chance of finding efficient scaling partners.

One indication of whether a partner might contribute to scaling is its willingness to invest resources. An innovation platform can offer technical knowledge, experience and communication links. But the partners themselves have to provide financial resources and staff. For this to happen, they have to see a real benefit of engaging with the platform. Understanding the partners' institutional objectives and constraints can provide a good basis for assessing their potential to scale successfully.

Generally, projects using innovation platforms come and go. To achieve scale it is important to ensure that projects feed into bigger flows, acting as "tributaries" into main rivers. They need to connect to larger initiatives to make sure results are well-directed to reach the mainstream of thinking and action.

Invest in developing facilitation skills

Innovation platforms require fairly high-level facilitation skills. These are often in short supply, but facilitation is a crucial element, especially when establishing a platform. Clarifying the purpose, roles and rules of engagement as well as ensuring the relevant partners and their representatives participate may be critical for success.

The underlying concepts and aims of innovation platforms are fairly simple: multi-actor engagement in identifying constraints and implementing interventions; assigned responsibilities for implementation; regular progress review. Nevertheless, skilled facilitation is needed to ensure that special interests, more powerful actors or louder voices do not dominate (Cullen et al. 2013). For innovation platforms to achieve change at scale, special attention needs to be paid to building sufficient local capacity in facilitation. This may involve identifying local partners who can take on facilitation roles and engaging these partners in facilitation from an early stage. It may also require investing in strengthening facilitation skills through pro-active mentorship (Rooyen et al. 2013).

Nothing succeeds like success

Nothing attracts institutions to scale interventions and approaches as much as initial success. It is important to prioritize interventions which produce very visible impacts. Successful interventions also generate enthusiasm within a platform. Strong communication and exposure to other information sources (e.g., through visits, documents etc.) can help maintain and spread the momentum. For outside organizations to take note, the impact must be visible on the ground—in the form of new milk collection routes, new sales points, new demand for inputs. Considering this when prioritizing interventions and preparing information outputs will increase the chance of large-scale change.

Hierarchy of levels

Using innovation platforms at different levels can connect practical interventions on the ground to the wider stakeholder community. Spreading an innovation does not have to be limited to replicating it at the same level. Platforms may exist at several levels: local, district, provincial and national. Using the insights and connections of a higher-level platform may be a good way to spread the innovation elsewhere. For instance, in Tanzania, regional platforms were effective in bringing together major value chain actors and identifying issues and solutions. However, some issues, particularly in regard to feed, require a more local setting. Even for such issues, the regional platform had the insight and connections to help identify local partners, disseminate information and establish new communication channels.

Sometimes it appears difficult to get apparently relevant actors to engage in local innovation platforms. This may be because higher-level actors have insufficient incentive to invest time in dealing with localized issues. To avoid these difficulties, platform organizers need to target invitees carefully to ensure that the innovation platform is relevant for as many partners as possible. If important partners have to engage in a lot of platforms, perhaps they should instead be part of a higher-level platform. A value chain platform that includes important milk buyers should not cover an area smaller than the buyers' collection areas (such as a sub-district). Buyers of small ruminants may cover much larger areas, so the platforms might best be located at the district or province level.

Exposure visits

Exposure visits by one platform to another can shortcut the scaling process. Visits by Morogoro dairy stakeholders to the well-established Tanga dairy platform helped to accelerate the establishment of a sister platform in Morogoro. Exposure visits are an especially effective means of communication; they can be organized through regional platforms. Producers and other value chain actors are generally far more impressed by seeing actual activities and by discussing with the people involved, rather than just hearing about them second-hand.

Such visits also allow for new perspectives to develop. In Uttarakhand, farmers were very impressed with a village they visited that had embraced dairy development for several years. They saw fodder production, the quality of the animals and the effect of increased milk sales. Here the connection between changes in inputs, outputs and impacts was especially visible. This trip laid the basis for the visiting farmers to reconsider how to develop their farms.

Local champions

For exposure visits and other demonstrations to be convincing, local champions are especially effective. These often have a particular interest in adopting specific innovations, resulting in stronger initiatives, faster implementation and more visible impacts.

Adoption does not stop with successful champions: others also need to take up the innovation. In some cases, champions actually attempt to maintain their knowledge advantage. Nevertheless, they can offer opportunities for other stakeholders who are less open to risk and innovation to learn.

Realistic time horizon

Be realistic when assessing how long it will take to achieve widespread change. Many small steps are involved, and a multitude of individuals need convincing and co-ordination. Institutions need to find information, accept that it is credible, initiate communication, and achieve consensus on how far their interests are met. Even in the MilkIT site with the fastest improvements in the value chain, it took over 18 months from the start of the innovation platform for outsiders to take notice and start doing new activities. For the innovation to move beyond the platform's immediate area, a bigger lag is to be expected. In Uttarakhand the Integrated Livelihood Support Program is putting the innovation platform approach into its roll-out design now that the MilkIT project has come to an end. Considering such timeframes when setting up initial innovation platforms is essential for wider scaling.

Look beyond immediate costs to long-term benefits

A frequent criticism about innovation platforms is that they have **high resource requirements**. However, except for the initial facilitation, most of the required activities can generally become part of the routine mandate of the partners involved (assuming they take ownership and invest in the platform). These partners will follow up on agreed actions if they have a genuine interest in the issue. For instance, if a milk-buying organization promises to start a

collection centre, producer representatives will closely monitor it if they have a strong interest, and the buyer will be eager to communicate with them if they are genuinely interested in expanding their collection system.

The costs of individual platform components therefore have to been viewed against the yardstick of expected results. There need to be clear benefits and results from platform investments. The local village-level Tanzanian platforms, for instance, had difficulties attracting sustained participation by regional and national organizations—who found the regional platforms more useful. In India on the other hand, the market-led approach from the start engaged local representatives of banks and dairy cooperatives who increased their engagement as promising results were banked.

When weighing up the costs of innovation platforms, consider this: an innovation platform generates a high degree of buy-in and ownership of a change, at scale. This is usually more difficult to achieve through classic research-led processes that identify interventions and then try to get them adopted.

Conclusions

Scaling is a hot topic in the agricultural research for development community. Donors and development actors are looking for "magic bullet" interventions which will quickly go to scale. In the case of livestock feed interventions, such a search may be in vain. In many cases feed and market interventions are highly context-specific, and the ideas need to be generated by local stakeholders so that they are locally owned and relevant to the local context. The use of local innovation platforms can play a useful role here since the innovations they generate take the local context and constraints strongly into account.

In the MilkIT project, we noted various routes to scale through the use of innovation platforms. These were spontaneous diffusion, taking up of innovations by third parties, and scaling of the innovation platform process itself. In each case the establishment and facilitation of innovation platforms at a range of scales was central to success. We therefore suggest that innovation platforms are a promising pathway to scale.

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