Capacity building based on local risk mitigation strategies and value chain analysis may lead to better management of food-borne disease

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Abstract

Food is a major source of exposure to health hazards such as chemicals, microorganisms and drug residues and a leading cause of sickness and death in poor countries. The disease burden imposed is justification for intervention and the imposition of top-down, command-and-control regulation. Regrettably, in poor countries these measures have mostly proven unworkable, unable to ensure safe foods, injurious to the livelihoods of the poor involved in the informal sector, and liable to capture by vested interests. We describe an innovative way of addressing a food-safety failure in Assam, North-East India, through risk-targeted capacity building in the informal sector. The central innovation is training and certification of informal sector actors. Training covers hygienic milk handling and business skills and needs to be adapted to the local context and set up in such a way that the programme continues after the end of the initiating project. Placing the problem of adaptation and sustainability in the context of a sectoral innovation system helped us to identify critical aspects, namely information genesis and flow, incentives for behavioural change and coordination between actors. We investigated these through an ongoing baseline study, due to be completed by April, 2009 and the use of Outcome Mapping, a novel approach to project planning and evaluation. The baseline comprised: a study of the knowledge, attitude and practice related to milk safety of nearly 900 value chain actors; value chain analysis identifying the incentives required for innovation through focus group discussions in the project areas; a training needs analysis with potential trainees and a participatory risk assessment (200 households) to identify the critical control points where milk-borne disease can be most effectively managed. Methodologies are described together with some initial findings and how the results will be used.

Introduction

This paper summarises the importance of food-borne disease in developing countries, describes the failure of current management and suggests how an innovation system approach may be more effective. We illustrate this hypothesis by a case study of a project aiming to enhance the traditional dairy sector in Assam, North East India. We describe how a sectoral innovation system approach is leading to new ways of understanding and addressing food safety. We identify three key areas - information generation and flow, incentives and coordination – and describe how we are collecting information to better understand these in order to aid in the design of a sustainable and appropriate mechanism for improving the quality and safety of milk while assuring the livelihoods of those in the informal milk sector value chain.

Food-borne disease is a serious problem in poor countries. More than 200 diseases are spread by food: hazards potentially present include viruses, bacteria, parasites, toxins, metals, allergens and prions. Indeed, food and water borne illness is believed to be the single most common disease of humanity; it is also a leading cause of chronic illness and death in less developed countries, killing an estimated 2.1 million people annually, most of whom are children (WHO, 2001). Moreover, there is general consensus
that food safety systems in developed countries not only fail to deliver food safety but succeed in imposing onerous constraints on smallholder farmers and value chain actors trying the livestock pathway out of poverty (Grace et al., 2008). The situation in India conforms to this general pattern as illustrated by comments from the recent discussion regarding Food Safety Legislation on ‘Solutions Exchange’ a United Nations initiative for development practitioners in India (Box 1).

**Box 1: Problems with the current food safety system in India identified by stakeholders**

There are no stringent and effective food laws in the meat, fish and poultry sector. We call the most ugly, unorganised and unhygienic place a ‘fish market’.

- Regulation isn’t working: every study on informally marketed food in India finds problems.
- Regulation opens doors to “rent seeking behaviour”:
- Regulations can easily be used by people in a profession or trade to keep others out and enable them to keep prices high at the expense of the consumer

When corruption is rampant, enforcing a law tends to result in more corruption and the law provides another opportunity for corrupt officials. Both certification of food preparer and food server will result in sale of certificates at a price. Already there are labs and inspectors... How successful are these?

A major problem is that most regulations and policies meant to assure safe, unadulterated food are simply not enforced and that the emphasis is on “getting certificated/permission,” rather than on improving product quality.

Solution exchange, 2008

Better ways exist: studies by the International Livestock Research Institute (ILRI) and partners have shown that low-cost and feasible interventions in the production chain can radically improve food safety. They also investigated the institutional mechanisms needed for their adoption in the absence of effective regulation. For example, encouraging the use of metal churns rather than plastic jerry cans for milk storage in East and West Africa dramatically improved milk quality, but were not adopted until policy changed so that farmers were confident that the more expensive metal churns would not be confiscated (Omore et al., 2001). In East Africa, ILRI and partners developed and tested an accreditation scheme for informal sector producers operated through business development services, training guides for hygienic production, collection, transport, processing and marketing of milk, and minimum standards for clean milk production. Impact assessment has shown that these innovations work and are highly cost effective with significant welfare benefits spread along the whole production-to-consumption chain. In the project for enhancing traditional dairy sector in Assam, we proposed the extension of a similar model.

However, past experience shows that the adoption of new, tested and apparently better practices is by no means automatic; innovations that are highly successful in one context can fail dismally in another. In this case study in Assam, we explore how the sectoral innovations systems concept can improve understanding of the processes favouring innovation and increase likelihood of successful uptake.

**Case Study – traditional dairying in Assam**

In Assam, as in much of India, the traditional milk market (unprocessed milk and traditionally processed dairy products) predominates. The informal sector sells 97% of all milk and dairy products produced in the State and pasteurised milk accounts for less than 1% consumption. While the informal sector is expanding, the 7 chilling plants (constituting the formal sector) are non-functional or operating at 3-34% capacity. Meanwhile, Assam imports a considerable quantity of milk from other States. The combination of preference for local milk with a demand that exceeds local capacity to supply, suggests an opportunity for the traditional dairy sector. Our extensive situational analysis has shown that some smallholder farmers were poised for ‘dairy take-off’; these high potential farmers consider dairying the first or second source of farm income and are also more likely to sell milk for more than 6 months in the year (34% of
non-poor and 23% of poor farmers) keep cross-bred cattle (3%) and/or follow improved feeding practices, have higher use of veterinary services and sell to traders rather than neighbours. We estimated there were around 750,000 high potential farmers in Assam (around a fifth of the total cattle-keeping population) (ILRI, 2007).

But while our studies agreed with other assessments that the dairy sector had high potential, they also supported the consensus that milk from the informal sector is of low quality and unsafe. In our surveys of milk at the point of sale and point of consumption we found that the majority of milk samples was both contaminated with unacceptable levels of bacteria and adulterated with water. A parallel consumer survey revealed that consumers were both concerned over the quality and safety of milk and mistrustful of their purchases. We concluded that despite the undeniable benefits to value chain actors, unless informally-marketed milk could achieve at least minimal safety and quality sectors, it was unlikely to be supported by government with increasing risks of being rejected by consumers, who are becoming ever more quality conscious.

The innovations we hoped to bring to this system were firstly the training, tools and methods used to improve efficiency, quality, safety and credibility of the traditional milk sector in East Africa. The central innovation was training and certification of informal sector milk chain actors. The second set of innovations was processes of engaging with policy and decision makers to ensure a more enabling environment for the informal sector. We considered that innovation systems theory could help in achieving the objective of ‘seeding’ these innovations and in the second half of this paper we describe the methodologies and tools used to understand the traditional milk value chain and identify strategies and entry-points to increase the likelihood of success.

Conceptual framework

The conceptual framework for identifying methodologies and tools was that of a sectoral innovation system. While this has been variously defined, in this context we consider the milk innovation system to be “the various actors that operate in the sector, their interactions, the environment in which they operate, which together and individually produce and/or transfer economically and/or socially useful knowledge.”

Our starting hypothesis, based on innovations systems theory, was that enhancing the performance of the traditional dairy sector and, more specifically, supporting the innovation of improved food safety through training and certification would depend on improvements to knowledge/information genesis and flow, and incentives for behavioural change and co-ordination of actors in the dairy sector (government, civil society, private sector (formal and informal)).

1. Knowledge/Information failures and methodologies to understand them

The poor quality of milk in the informal sector and the observation that understanding and practice of hygiene was poor indicated a knowledge/information failure. We had two critical assumptions concerning knowledge and information, both well-supported by the literature and generally accepted (though less generally observed) in the design of development/research for development projects. The first was that generic, un-adapted, supply-led information was unlikely to be useful and the probability of uptake and use would be greatly enhanced if the training material was adapted to the context through an in-depth understanding of the existing knowledge, attitude and practice, needs and desires for information and a comprehensive and multi-disciplinary assessment of the type of information most likely to achieve improvements in food safety. A second hypothesis was that there is already a wealth of indigenous technical knowledge and local expertise and that disseminating or building on this was likely to be successful in supporting innovation.

We are using three evolving methods to understand the situation in order to develop strategies to address knowledge/information failures.
- Participatory Risk Assessment is used to find out what food-borne diseases are present and their likely impact on human health in order to develop training material that targets the problems which are actually present and most important.
A Knowledge Attitude and Practice survey will help identify the good and bad practices (including indigenous technical knowledge) which again will allow preparation of tailored learning materials.

A Training Needs Assessment has been developed to understand the activities carried out by prospective trainees and also to assess learning preferences of potential trainees; this will help ensure relevance and appropriateness of training material, as well as understanding the activities.

**Participatory Risk Assessment**

Participatory Risk Assessment (PRA) is a method being developed by ILRI to rapidly, cheaply, and appropriately imprecisely understand what the most important hazards are in a given context and so to allow a risk-targeted strategy. This method involves testing milk and dairy samples for a range of pathogens while taking into account the exposure pathway which may decrease or increase risk. (For example, if most people boil milk then this will reduce risk, on the other hand if raw milk is given to children this may increase risk). The concept underlying the participatory risk assessment is that of ‘risk-targeting’. This differs from conventional capacity strengthening in hygiene and food-safety which is generic, that is, consists of training on general good practice rather than being tailored to specific problems which are known to be present in a given situation. Risk-targeting can maximise the scarce resource of investments into training. For example, if health risks are mostly associated with diseases harboured by cattle then a strategy aimed at cattle health is appropriate; on the other hand, if health risks are mainly associated with addition of water then a different approach is indicated. Participatory Risk Assessment uses methods derived from Participatory Learning and Action, Risk Assessment and Syndromic Surveillance.

The Participatory Risk Assessment exercise started with a screening process to identify the hazards most likely to be present in milk and dairy products in Assam. This was done through a combination of literature review and expert opinion. The systematic screening enabled us to narrow the list of 60 hazards potentially present in milk to 12 which are of highest priority in Assam. In the next step we will survey 200 households and sample milk at point of consumption; this will be analysed for the presence of these 12 top-priority hazards. The survey will also capture information about the health problems in the community (Syndromic Surveillance). Because some health problems are associated with specific pathogens (for example adult onset flaccid paralysis is strongly associated with *Campylobacter* infection), syndromic surveillance will allow us to link hazards in milk to disease burden in people. The result will be a better understanding of the most important hazards present in milk, allowing us to target interventions directly at these hazards.

**Knowledge, Attitude and Practice Survey**

Knowledge, Attitude, Practice (KAP) surveys were developed by human health practitioners as a rapid yet systematic methodology which seeks to elicit a cogent and coherent set of responses related to a concrete problem. The underlying behavioural model assumes knowledge does not always lead to behaviour change (practice) and that attitude is helpful in understanding this gap. Although KAP has been little used in agricultural research or livestock research, our experience suggested that it could be a useful tool for understanding existing knowledge, attitude and practice of dairy hygiene. This would allow us to identify the most problematic in terms of milk-handling practices and also the good practices which could be promoted.

The survey consisted of *knowledge* questions (for example, “*Can you get diseases from milk? If yes, name 3 diseases*”) and *attitude* questions. The latter used a Likert scale, which is the most widely used method for measuring attitude. In this respondents are given a statement and asked to indicate the strength of their agreement or disagreement (e.g. “To what extent do you disagree or agree with the following statement: “Consumers prefer cheap milk to good quality milk””). Milk hygiene practice is being assessed by direct observation using a check-list (e.g. observers indicated if milk was free of all specks of dirt or foreign bodies). Including direct observation is essential in studies of hygienic practice as there are strong societal norms around cleanliness and hygiene which makes people reluctant to admit to any deviations. For this reason we included a hand wash-test in the protocol which tests if there are any faecal bacteria on hands. Their presence indicates inadequate washing after using the latrine or after contact with animal or human faeces.
In all, 898 value chain actors are being surveyed in the KAP. We are also collecting milk or other dairy products from each actor which will be subjected to bacteriological and physical examination. This will provide an objective measure of milk hygiene and allow us to examine the relation between good and bad practices and safety of milk. Figure 1 shows an example from a pilot phase. In this we identified good and bad practices by milk-sweet handlers and then compared these with the bacteriological quality of sweets. Comparing shops with good food safety outcomes and those with poor outcomes showed there was greatest difference in the areas of selling area hygiene, ingredient storage, cold storage and cleaning regime, suggesting that efforts to improve sweet safety should focus on these aspects. This information allows us to concentrate on promoting practices which are most important to food safety.

Figure 1 Differences in hygiene practices between shops producing safe and unsafe sweets

Training Needs Assessment

Training Needs Assessments (TNA) are widely used in the formal sector where they are considered essential to ensure that training is relevant and offers a good return on resources. An innovation of our project is in applying TNA to informal sector activities. The TNA, which as for the other methodologies is ongoing, has four components:

- Questions about learning preferences such as time of day, venue, whether continuous or part-time, preferred language, level of literacy. This helped plan the format of the course and address any barriers to attending by socially-excluded groups (e.g. women, migrants, the poorest)
- A job analysis to look at typical activities carried out by different value chain actors, how often they were carried out and what they required for carrying them out. A ‘need’ is not a ‘want’ or ‘desire’ and job analysis is helpful in the not uncommon cases where trainees request training that is not in fact relevant to their job or vice versa.
- A perceived needs assessment in which the focus group reviewed the topics in the training courses delivered in Africa, plus other suggestion from local stakeholders to determine how relevant they were. They also had the opportunity to add any other topics they would like included.
- An assessment by trainees of literature in which they were given examples of material from the courses delivered in Africa plus other courses and asked to comment on the appearance, relevance layout etc.

The TNA consists of Focus Group Discussions (FGD) with each of the 11 distinct sub-groups of informal sector actors identified (e.g. women farmers, traders, large farmers, small farmers etc.). This helped ensure that training will be relevant to a wide range of potential trainees including those who may have difficulty in accessing training.
2. Incentive failures and methodologies to understand them

Knowledge is not enough: an underlying assumption of our project was that lack of incentives is a major reason for the failure of existing food safety systems, as managed by the public sector, to deliver safe milk. The current food safety system is one of ‘control and command’ built on rules, inspections and sanctions. That is to say, the public sector sets certain rules which value chain actors are supposed to follow, because they ‘should’ and are under threat of punishment for non-compliance. This incentive has proven ineffective as the rules are not internalised by market actors e.g. our survey showed nearly all marketed milk is heavily adulterated; although traders are aware of the law against adulteration they see deviation from rules as a normal and acceptable behaviour. Other actors have adapted accordingly (e.g. sweet-makers do not buy milk by the litre but according to the amount of solids after evaporation) – thus tacitly agreeing with the practice of adulteration. A major incentive built into the project was consumer demand for safer, higher quality products expressed in baseline surveys. We planned to both increase demand for locally produced, safe milk through a social marketing strategy and to make customers aware of simple tests for quality. However, there was concern that this was insufficient to change behaviour and we wished to investigate what other incentives might exist for changing behaviour.

While the issue of incentives was covered to some extend in the KAP and TNA, the major methodology for elucidating this was Value Chain Analysis (VCA). Value chains are a recent and important concept; definitions vary but a value chain can be said to comprise all the activities needed to create or add value to products or services. This includes design, production, marketing, delivery, and customer support. ILRI is currently involved in adapting value chain analysis to the special requirements of developing countries.

The methodology developed for this project has four components: mapping the value chain, identifying quality criteria used along the chain, eliciting how key quality criteria are influenced, ranking of key incentives, and investigating interventions on training, certification and marketing campaign. The Value Chain Analysis is being carried out through FGDs in the four project areas with groups organised around a value chain (e.g. producers, traders, processors, retailers) identifying the incentives required for innovation. The analysis looks beyond the financial to include incentives related to higher status, self esteem and social capital. Box 2 shows an initial list of incentives identified by stakeholders. During the process of the VCA, these will be further elaborated, ranked and used to develop strategies for sustainable improvements to the dairy sector. Interestingly, FGD indicated social benefits were considered as or more important than financial benefits.

**Box 2 Some incentives for participating in the training and certification programme for improving quality and safety in the traditional dairy sector in Assam identified by value chain actors**

- Achieve higher prices because more money is paid for good quality milk
- Employment opportunities because vendors are trained and have a certificate
- Vendors don’t lose consumers because of perceived poor quality
- Save on post-harvest losses by using better storage and handling practices
- Be sure of being able to sell all the product volume at a good price
- Increase the volume consumed by consumers
- Identify new business opportunities – diversify into new markets or new milk products
- Chance of getting access to business development and credit services.
- Learning on better ways of doing business – e.g. learning book keeping --- Profit
- Less losses from spoilage
- More societal approval
- Less harassment and unofficial payments
- More say on milk / milk product price ( riding on goodwill in the market )
- Self satisfaction of doing something good for the society
- Augment fellowship and thus can help in preventing bad elements within the trade
- Encourage people to move away from formal market’s products
- Encourage people to switch to informal market products that are safety-improved
- Restrict the growth of negative demand for informally produced milk arising out of TV tetra pack
• Protect your own health or that of your family
• Group photograph in the local newspaper (this is very attractive for them. The local newspapers carry these kind of ‘advertisements’ at no or very little cost)

3. Co-ordination failures and methodologies to understand them
Coordination is a key mechanism for reducing transaction costs; however, informal markets are typically characterised by coordination failure due to lack of official recognition which creates instability and distrust. As is generally the case, the informal dairy sector in Assam is poorly perceived by the public sector, media and society at large. Following on from information/knowledge failures and incentive failures we also hypothesised coordination failures that contribute to the poor safety and quality of milk from the informal sector. Our underlying assumption here was that improving coordination would increase value chain performance. This was supported by work in Kenya which revealed a large dividend when informal milk traders became legitimised through a process of training and certification.

Outcome mapping is the central strategy for understanding the relations between actors and identifying strategies for more effective patterns of coordination. Outcome mapping is a method developed by the International Development Research Centre (www.idrc.ca/evaluation) which realises much of the impact of a project depends on actors who are outside the ‘boundary’ of the project and focuses on how the project can influence these boundary partners to shift behaviour, actions or relationships in a way that will further pro-poor development. The first step of outcome mapping, an intentional design workshop, was held in March. In this workshop, outcome challenges were identified for the main boundary partners and strategies developed. Table 1 shows strategies suggested by stakeholders for improving linkages with formal sector policy makers, an important boundary partner.

Table 1: Strategies for improving linkages with policy makers identified at outcome mapping workshop

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<th>Strategy</th>
<th>Causal</th>
<th>Persuasive</th>
<th>Supportive</th>
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<tr>
<td>Strategies &amp; Activities aimed at a specific individual or group</td>
<td>What will be done to produce our immediate output?</td>
<td>What will be done to build capacity?</td>
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<td>- Regular one-to-one meetings aimed at seeking guidance and sharing of knowledge products.</td>
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<td>- Exposure trips to similar interventions abroad</td>
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<td>- Workshop on traditional dairy system/milk quality/certification</td>
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<td></td>
<td>How will sustained support guidance or supportive monitoring be provided?</td>
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<tr>
<td>Strategies &amp; Activities aimed at the individual or group environment</td>
<td>What will be done to change the physical or policy environment?</td>
<td>How will you use the media or publications?</td>
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<td></td>
<td>- Encourage knowledge sharing by providing back office support to</td>
<td>- Develop attractive content (including photograph) for print media that highlight life &amp; work of milk trader / sweet maker</td>
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<td>What networks/relationship will be established or utilized?</td>
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<td>- Encourage formation of an intra department officers club with key individuals in the line departments as members.</td>
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<td></td>
<td></td>
<td>- Consumer forums</td>
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<td>- Press Club</td>
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<td>- Minority cell of political parties.</td>
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voluntary organizational, inter/intra department interactions on key issues.

- Design short social marketing commercial for television showing changed practices at trader level.

most of the traders in Assam belong to minority Nepali community
- Mobilize opinion and share expertise to develop and disseminate citizen charter for departments.

Conclusion

We found that placing the problem of poor milk safety and quality in the traditional dairy sector in the context of a sectoral innovation system helped us identify critical components of an intervention based on training and certification. We used three windows or approaches for identifying entry-points and opportunities for facilitating the innovation of training and certification for informal sector actors, namely: information/knowledge, incentives and co-ordination. We hypothesised failures in these were contributing to the observed safety failures and poor performance of the traditional milk sector. We developed methodologies that could help understand these including Knowledge, attitude and practice (KAP) study, training needs analysis (TNA), Participatory Risk Assessment (PRA), Value Chain Analysis and Outcome Mapping. Initial results suggest that these are feasible, appropriate and capable of generating the information and engagement needed for implementation of the project. The next step will be synthesising information from these studies in order to adapt training materials on milk-hygiene and business management to the informal dairy sector in Assam. These materials will then be panel-tested with prospective users to ensure suitability. The information and engagement will also be used to design an incentive-based mechanism for sustainable continuation of the training and certification as well as strategies to ensure an enabling environment.

References

