Talking pictures: new tools to boost smallholders' milk production

RIU

Validated RNRRS Output.

New tools have been developed and tested in Bolivia, Tanzania, Kenya and India to help smallholder dairy farmers manage their animals better and greatly boost the amount of milk they produce. The improved breeds of cattle now available can produce up to 25 litres of milk per day, but many are producing similar amounts to local breeds simply because of poor management. To overcome this, researchers have produced software like the dairy rationing system for the tropics (DRASTIC), which trained users can use to predict what effect a particular mix of feeds will have on milk production. Another tool is Talking Pictures–Dairy (TP-D) which can be used to generate pictorial guides that local producers can easily understand and relate to.

Project Ref: **LPP02:**
Topic: **7. Spreading the Word: Knowledge Management & Dissemination**
Lead Organisation: **Stirling Thorne Associates, UK**
Source: **Livestock Production Programme**

Document Contents:

Description

LPP02

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Bolivia, India, Kenya, Tanzania,

Target Audiences for this content:

Livestock farmers,

A. Description of the research output(s)

1. Working title of output or cluster of outputs.
In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Optimising Knowledge and Information transfer. Novel Approaches for Stimulating Innovation as a Poverty Reduction Entry-point.

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

Livestock Production Programme

3. Provide relevant R numbers (and/or programme development / dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

R6282: Development of a practical dairy feed rationing system appropriate for use in developing countries (DRASTIC – A Dairy Rationing System for the Tropics).

a. FEDEPLE (Federacion de Productores Lecheros), Santa Cruz, Bolivia. Mr F. Cadario.
b. TLRC (Tanga Livestock Research Centre) Tanga, Tanzania. Dr B.S.J Msangi.
c. TDDP (Tanga Dairy Development Project), Tanga, Tanzania. Mr I. Rutamu.
d. BAIF Development Research Foundation, Pune, India. Dr D.V. Rangnekar.

R7431 / **R7855**: Development and testing of the Talking Pictures – Dairy decision support tool in Tanzania, Kenya and India

a. TLRC (Tanga Livestock Research Centre) Tanga, Tanzania. Dr B.S.J Msangi.
b. TDDP (Tanga Dairy Development Project), Tanga, Tanzania. Mr J. Shoo, Mr Mbessere, Mr I. Rutamu.
c. ILRI (International Livestock Research Institute), Nairobi, Kenya. Dr D. Romney. Ms M. Wambugu.
d. SDP Smallholder Dairy Project, Nairobi, Kenya. Mr J. Kariuki
e. ANTHRA, Hyderabad & Pune, India. Ms S. Ramdas. Ms N. Ghotge.
f. Valsad and District Dairy Cooperative Union, Valsad, Gujerat, India. Dr E.K. Chaudhari.
g. RRIDMA (Rajasthan Rural Institute of Development Management), Udaipur, India. Dr D.N. Shindey.
h. Independent Consultants. Dr S.D. Rangnekar. Ms E. Alderson. Dr D.V. Rangnekar. Dr P. Venkatramaiah. Ms M. Dhamankar.

*4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? **(max. 400 words)**. This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database.*

Small-scale dairying with a commercial or semi-commercial focus has been widely promoted in **Asia**, **Africa** and **Latin America**. These systems offer a number of benefits to producers (increased, regular income; reduced vulnerability) and associated communities (increased labour engagement for the poor; improved nutritional status, particularly for children).

Relatively good animal genotypes are now available to the dairy farmer with the potential to produce around 25 litres of milk per day during peak lactation. However, these yields are rarely achieved indicating the extent to which the development of effective managerial capacity amongst dairy producers has lagged behind the provision of good stock, veterinary services and marketing channels. Indeed, it is common to see improved animals producing no more milk than is achievable from indigenous animals – but at a much higher cost.

R6282 developed, tested and produced a **software**-based implementation of a novel **feed rationing system** for **dairy cattle** (**DRASTIC**). This system was designed specifically to generate information that would be relevant and accessible to **extension services** and farmers trying to improve the nutritional status of dairy cattle managed by poorer households in developing countries. It achieved this by:

- packaging the complex calculations required to describe accurately the relationships between nutrient intake and production levels;
- functioning effectively with the patchy and unreliable information on feed quality that is available in a field situation;
- using simple, **qualitative indicators**, readily assessable in the field to cope with the variability seen in tropical **feed quality**;
- being user-friendly and accessible to those with only limited experience of computers and compatible with a basic IT infrastructure.

Implementation and testing of DRASTIC in Bolivia and Tanzania indicated that that it could be used effectively – by trained technical staff – to formulate dairy rations that were more appropriate for the needs of resource-poor dairy producers.

Work undertaken by projects **R7431** and **R7855** built upon the successes achieved with DRASTIC by improving accessibility to end-user and thus its potential for widespread application. This was achieved by adding the capacity to produce locally-**customisable pictorial guides** for dairy cow management that could be used directly by farmers (or front-line, field extension staff) in relation to their own animals. The resulting tool, **Talking Pictures – Dairy** (TP-D), has now been widely tested at a number of locations in East Africa and India. It has proved very robust in supporting appropriate management decisions for both problem-solving and implementing routine improvement to the levels and efficiency of production.

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	***Technology***	***Service***	***Process or Methodology***	***Policy***	***Other Please specify***
X		*X*	*X*		

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

Milk and milk-products in developing countries.

However, the Talking Pictures methodology (i.e. using locally-available data to run a core-model that can generate customised pictorial guides to support management decision-making) is generic. As a result it could be easily adapted to support innovation

in the production and post-harvest handling of a wide range of agricultural and other commodities. In the past, we have had informal discussions with a range of potential collaborators about the suitability of the approach for such issues as forest nursery management, animal health management, crop disease assessment and management and backyard poultry production.

7. What production system(s) does/could the output(s) focus upon?
Please tick one or more of the following options.
Leave blank if not applicable

Semi-Arid	***High potential***	***Hillsides***	***Forest-Agriculture***	***Peri-urban***	***Land water***	***Tropical moist forest***	***Cross-cutting***
							X

8. What farming system(s) does the output(s) focus upon?
Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

Smallholder rainfed humid	***Irrigated***	***Wetland rice based***	***Smallholder rainfed highland***	***Smallholder rainfed dry/cold***	***Dualistic***	***Coastal artisanal fishing***
X	*X*	*X*	*X*	*X*	*X*	

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).*

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

Promotion of Exogenous Innovation. TP-D has proven itself as an effective tool for strengthening the capacity of farmers to manage and innovate (see Q12) in a way that intrinsically meets their own needs and objectives. We have been wary of promoting its use to support the implementation of specific technologies as:

a. inappropriate use of the tool could potentially distort farmers' perceptions of technologies being promoted, encouraging adoption at the expense of more effective indigenous innovation.
b. the great power of TP-D lies in its adaptability to a wide range of management situations and options. Piggy-backing specific technologies onto its use could divert farmers from accessing the full versatility of the tool.

Notwithstanding these *caveats*, there probably is a rôle for TP-D in allowing farmers and extension officers to conduct their own *ex ante* impact assessments on exogenous technologies that they may be considering. A number of LPP outputs might fall into this category e.g. **R5188**, **R5732**, **R6153**, **R6610**, **R7010**.

Integration with other Innovative Approaches to Information Delivery. A number of other LPP projects have developed evaluated and implemented innovative approaches to knowledge management and information delivery that could complement these outputs. These include **ZC0261** (Development of a Dairy Toolbox) and **R7637** (Integration of indigenous and biological knowledge for improved dry season feeding strategies in hill farms in Nepal) which produced a tool capable of integrating

indigenous and biological knowledge of fodder quality into customisable extension delivery documents. An integrated approach to the more widespread implementation of these tools might yield a number of synergistic benefits.

Application of the Talking Pictures Methodology to Other Management Issues. See Q6 and the dossier prepared for projects **R7376** / **ZC0257** outlining the potential for a Talking Pictures enhanced version of the Oxfeed decision support tool for draft animal management.

Validation

B. Validation of the research output(s)

*10. **How** were the output(s) validated and **who** validated them?*

*Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the "who" component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation **(max. 500 words)**.*

Technical Validity. The technical validation of DRASTIC and TP-D was undertaken by project partners with support from the project team in Bolivia, Tanzania, Kenya and India. These activities used a range of longitudinal monitoring approaches conducted on-farm with end-user participation to demonstrate the basic predictive accuracy of the tools.

a. Dijkman, J. and Thorne, P.J. (in review) Facilitating farmers to make science-based decisions through the use of a dynamic, pictorial decision support tool. part 1: development and testing. Agricultural Systems.

Acceptability of Tool Formats to End-users. The format of the TP-D guides was developed, form scratch, with the participation of end-users from Tanzania. It was then tested by formal and informal questionnaires with other end-users in Tanzania, Kenya and India.

a. Thorne, P.J. and Dijkman, J. (in review) Facilitating farmers to make science-based decisions through the use of a dynamic, pictorial decision support tool. part 2: field use and farmers' innovation. Agricultural Systems.

Capacity to Support Innovation. Detailed case studies conducted by project team and partner organisations (NARS, Dairy Development Project) in Tanzania and partner organisations (NGO, Dairy Cooperative Union) in India. These provided strong evidence of the capacity of TP-D to support farmers and / or extension staff to respond to changing circumstances and to innovate effectively in managing their dairy animals:

a. Anon. (2005) The Scale and Scope of Impacts of Talking Pictures - Dairy amongst Smallholder Dairy Producers in Coastal Tanzania Project Case Study No. 1. Llangefni, UK, Stirling Thorne Associates. 2pp. http://www.stirlingthorne.com/documents/case_study_01.pdf.

b. Anon. (2005) Using Talking Pictures - Dairy to Reduce Supplement Wastage in Late Lactation Project Case Study No. 2. Llangefni, UK, Stirling Thorne Associates. 2pp. http://www.stirlingthorne.com/documents/case_study_02.pdf.

c. Anon. (2005) Applying Talking Pictures - Dairy in Mastitis Screening: A Novel User Innovation. Project Case Study No. 3. Llangefni, UK, Stirling Thorne Associates. 2pp. http://www.stirlingthorne.com/documents/case_study_03.pdf.

*11. **Where and when** have the output(s) been validated?*

*Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above **(max 300 words)**.*

Location	Social groups*	Production system	Farming system
Tanzania			
Tanga Region	Landless urban and peri-urban; crop – livestock farmers; paid labour.	High potential / Peri-urban / Urban	Smallholder rainfed humid / Dualistic
Kenya			
Kiambu District	Landless urban and peri-urban; crop – livestock farmers.	High potential / Peri-urban	Smallholder rainfed humid
India			
Andhra Pradesh			
a. Medak district	Crop-livestock farmers.	Semi-arid	Smallholder rainfed dry.
b. Three mandals of Chitoor district (Madanapally, V. Kota, Punganur)	Crop-livestock farmers.	Semi-arid	Smallholder rainfed dry.
Gujerat			
a. Three mandals of Valsad District ()	Women-led households; Tribal communities.	High potential	Smallholder rainfed humid
Maharashtra			
a. Pune District (9 villages)	Crop-livestock farmers.	Semi-arid	Irrigated; Smallholder rainfed dry.
b. Kohlapur District (3 villages)	Crop-livestock farmers.	Semi-arid	Irrigated.
c. Karad District (1 village)	Crop-livestock farmers.	Semi-arid	Irrigated; Smallholder rainfed dry.
Rajasthan			
a. Two mandals of Udaipur district.	Crop-livestock farmers.	Semi-arid	Irrigated

b. Bilwara District	Crop-livestock farmers. Peri-urban.	Semi-arid	Irrigated

* None of the validation work targeted specific social groups but, as a result of the mandates of partner organisations, some groups were disproportionately represented at some locations.

Current Situation

C. Current situation

12. ***How and by whom*** *are the outputs currently being used? Please give a brief description* ***(max. 250 words****).*

Extension workers and farmers associated with the partner organisations are using TP-D both alone and in concert to:

a. characterise potential problems related to dairy cow feeding and management.
b. identify possible changes in management practises that would help to overcome these problems or could contribute to improved efficiency and benefits from the small-scale dairy enterprise generally.
c. implement and test the outcomes of the management practises identified.

During the development of TP-D a number of obvious management problems were identified that the tool might assist farmers with; e.g. identification of the most efficient levels of supplement feeding, management of the quality of forage resources. In practise end-users have identified rather more wide ranging uses than we had envisaged including:

a. local validation of external recommendations on feeding levels at different stages of lactation.
b. routine identification of under-performing animals that may require veterinary investigation (e.g. for sub-clinical mastitis).

We have observed high levels of acceptability (See Q13). Current evidence suggests that adopters are continuing to use the tool in this manner. In addition, project partners are continuing to train staff to implement TP-D more widely in their client communities where resources and local priorities allow.

13. ***Where*** *are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used* ***(max. 250 words).***

TP-D and its components have undergone widespread application and detailed testing and monitoring in Bolivia, Tanzania, Kenya and India. Initial acceptability rates have been high with at least 70 *per cent* of end-users, trained in the use of the tool being able to apply it to useful purpose. Formal follow-ups on some of the project's earlier activities in Kenya and Tanzania has indicated that more than 60 *per cent* of farmers continued to make use of the tool after 18 months.

We have not had the resources to promote the use of TP-D more widely. However a number of "*ad hoc*" adopters have been able to download the software and training materials from our website and are currently incorporating its use into a range of

dairy development activities. These include:

a. Argentina – Government of Argentina funded dairy development project implemented by INTA (Instituto Nacional de Tecnología Agropecuaria).
b. China and Indonesia – ACIAR-funded dairy development projects implemented through the Victoria Department of Primary Industries.
c. Ethiopia – Initiative to improve the management of urban dairy cattle (Government of Ethiopia).

These initiatives appear to be reasonably self-supporting based on the easy accessibility of the software and supporting manuals and training materials.

14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading ***(max 250 words).***

With the exception of India, where funding was available to follow-up on some of the training and dissemination activities undertaken during the project's later stages it is difficult to accurately judge current usage. The following represent our best guesses:

India: Approximately 1500 users trained during the projects lifespan. Based on our conservative estimate of adoption and persistence of at least 50 per cent, this would mean that at least 750 producers would still be using the tool, although others are likely to continue to benefit from innovations implemented as a result of its earlier use. In Rajasthan, in particularly, training of trainers in other districts has been undertaken and these are currently promoting wider use amongst end-users.

Tanzania and Kenya: Approximately 250 trained users at least 50 per cent still routinely using the tool after 18 months (in 2003). Current adoption and use continues in NGO supported youth projects in Tanga Region.

***Ad Hoc* Adoption**: These are relatively new initiatives and we do not currently have any figures on usage.

As far as we are aware, there has been no external evaluation of these activities by the donor that could provide further information on current usage.

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/ or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

The project has benefited from strong linkages with some highly competent partner organisations (government agencies, NGOs and cooperatives) that have facilitated an examination of the key issues influencing the adoption of TP-D by end-users. As a result, we have been able to establish a number of significant facilitators for successful adoption:

a. Implementing bodies need to have a genuine and effective two-way chain of contact with end-users and awareness, at middle and senior levels, of the development issues that really affect their ultimate clients. In our experience, these features are far from ubiquitous in practise (despite what some of these organisations may write in their annual reports).
b. For the Talking Pictures methodology, in its dairy guise at least, a degree of market-orientation in the producers that use it provides a strong focus for evaluating the outcomes of the management alternatives that it can help to identify.

Promoting market-orientation in dairy production is a policy that is widespread particularly in urban and peri-urban areas. Where it is not implicitly or effectively supported by government initiatives, the market, in urbanising parts of south Asia for example, may be equally effective.

c. There is a need to generate critical mass. This applies to both implementers in partner organisations and end-users. Given the nature of the projects described here (i.e. innovative research) and the resources available to them, success in this area has been variable. Where it has occurred – in parts of Rajasthan and in Tanga for example – the use of TP-D would appear to be quite sustainable.

TP-D was basically designed to strengthen the capacity of farmers and extension workers to make effective management decisions based on the underlying biology and economic factors that govern the system. There are two principal reasons for its success in achieving this:

a. The participatory development of the system means that it presents the information that is needed to achieve this objective to the end-user in a format that they can easily understand. In this respect, it is highly significant that training of these end-users has almost invariably been a much simpler process than familiarising the technically trained staff involved in supporting the programmes.

b. The system, as used by the farmer, is extremely flexible. Not only can it be easily customised for local conditions, but it does not attempt to deliver a message that may be inappropriate for an individuals objectives. This latter feature means that users approach the process with their own questions and difficulties in mind and are able to use TP-D to address these. Thus, farmers actual (rather than their perceived) objectives will always be addressed directly as part of the process.

Current Promotion

D. Current promotion/uptake pathways

*16. **Where** is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion **(max 200 words).***

Currently, there are no directly funded promotional activities being undertaken. The integrated version of the DRASTIC and Talking Pictures – Dairy software along with instructions for its use and various training materials designed to support the implementation of programmes using the approach may be downloaded from www.stirlingthorne.com. Currently downloads of the software run at approximately six per month based on relatively minimal promotion (search engines / word-of-mouth). We have little information on the extent to which each download stimulates further percolation within organisations.

We aim to support, where possible, the activities of any *ad hoc* adopters (see Q13 for details) although funding is also a constraint here as our aim has been to ensure that the outputs of these projects remain freely available.

*17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. **(max 200 words)**.*

Lack of awareness: Although available free-of-charge, TP-D is a product that requires wider marketing to members of the development community. We do not currently have the resources to do this.

Resources to support training of trainers and implementation: Effective implementation of a tool like TP-D requires properly costed investment in activities that are directed at establishing a critical mass of trained trainers and pilot-level implementation with end users. We have been able to achieve this on a limited scale in India but funds to complete a similar task in East Africa have not been forthcoming. We now have a strong network of potential partner organisations (see Q22) but funding will be required to operationalise the tool within these organisations to a level that will be sustainable in the long-term.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues ***(max 200 words).***

We do not see any major problem with the capacity that is generally available to implement TP-D or similar tools. TP-D has designed to be implemented within existing information delivery frameworks and has many features that are directed at compensating for the well-documented difficulties that may be experienced by these organisations. That the tool is effective in this respect has been clearly demonstrated (Q10, 11, 20).

The major need is for a properly costed programme of wider implementation this would need to cover:

a. Widespread promotion of the tool and its capacity to organisation with the potential and need to implement it
b. Identification of further, suitable partner organisations in developing countries where small-scale dairy production is, or could potentially, make an effective contribution to poverty alleviation.
c. Maintenance of a network of partner organisations to provide support and exchange of experiences
d. Institutionalisation of TP-D on the ground through training of trainers and pilot-level implementation with farmers and extension staff to establish a critical mass of disseminators and users.

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

A number of key issues arise from our own experiences and the observations of the team that conducted the final impact assessment:

a. The need for TP-D to be implemented through a respected organisation is critical in order to establish it credibility with farmers. However, the tool was regarded as beneficial by these organisations as it strengthened their advisory capacity in areas that were either weak or not previously addressed. In doing so, it gave field workers increased confidence in their abilities and increased credibility with their clients.
b. Whilst the tool proved effective in the hands of field advisors (paravets / extension agents), it was generally found to more effective when applied by farmers themselves. There was a degree of institutional resistance from some of the partner organisation in India to this kind of handover although, in east Africa this was found to be an acceptable means of application.
c. The most effective use of TP-D was as an open-ended decision support tool. This allowed farmers to characterise and address their most pressing problems, using their own knowledge to provide context for the appropriateness of any management changes identified. In our view, constraining the use of the tool by attempting merely to promote exogenous innovation would prevent end-users from realising its full potential.

Impacts On Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

In view of the nature of the output (i.e. a process aimed at strengthening the management capacity of farmers themselves or those in the extension services who support them directly), impact assessment has, to an extent, become entangled with the validation studies. As a result, there is some duplication here of studies listed in response to Q10.

Quantitative Studies of the Outcomes of Applying TP-D to Management Decision Making.

a. Anon. (2005) The Scale and Scope of Impacts of Talking Pictures - Dairy amongst Smallholder Dairy Producers in Coastal Tanzania Project Case Study No. 1. Llangefni, UK, Stirling Thorne Associates. 2pp. http://www.stirlingthorne.com/documents/case_study_01.pdf.

b. Anon. (2005) Using Talking Pictures - Dairy to Reduce Supplement Wastage in Late Lactation Project Case Study No. 2. Llangefni, UK, Stirling Thorne Associates. 2pp. http://www.stirlingthorne.com/documents/case_study_02.pdf.

c. Anon. (2005) Applying Talking Pictures - Dairy in Mastitis Screening: A Novel User Innovation. Project Case Study No. 3. Llangefni, UK, Stirling Thorne Associates. 2pp. http://www.stirlingthorne.com/documents/case_study_03.pdf.

Independent* Impact Assessment

a. Venkatramaiah, P. and Dhamankar, M. (2006) Talking Pictures – Dairy (TP-D) Analysis of the experience of applying TP-D in selected field sites in Gujarat, Rajasthan and Maharashtra states in India. Unpublished consultants report. 10pp.

* - In this case independent refers to the fact that, in the absence of an externally commissioned, independent impact assessment, the study was carried out by consultants who had no previous contact with the work and who were given free rein to interact with partner organisations and end-users at the four project locations in India.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/ or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*

- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

We have observed a wide range of benefits to both end-users and implementing agencies. Based on a synthesis of the results of the various validation and impact assessment activities conducted by the project, some of the most significant benefits to end-users observed included the following:

Human Capital

- Better understanding of factors that need to be considered when managing dairy cattle and the way in which these interact, even by illiterate farmers.
- Farmers motivated to monitor management variables (e.g. quantities of feed offered, changes in body condition) for more informed decision making
- General empowerment and reduced vulnerability of resource-poor farmers through reducing dependency on external sources of information.

Social Capital

- Farmers trained in the use of TP-D discussed the benefits with neighbours and encouraged them to adopt either the methodology itself or innovations derived through its use.
- Stronger extension - farmer linkages were generated by increasing farmers' confidence levels.
- TP-D is inclusive. We have observed successful application across genders, literacy levels, age and social groups including historically disadvantaged groups in India (Dalits and tribal communities).

Natural Capital

- More efficient resource use. Less wastage as more informed feeding allows more effective forage / supplement combinations.
- Healthier livestock through improved feeding and the capacity to make early identifications of diseased animals.

Financial Capital

As TP-D has been applied in a number of market-oriented smallholder dairy systems we can present some reasonably reliable quantitative assessments of the observed financial benefits of using it (Annexe Table 1). The sums quoted for the four example innovations amount to increases in profit over a full lactation of between five and 25 *per cent*. It should be noted that the effects of some of these innovations may be additive. These figures should as be regarded as indicative as the innovations that TP-D supports are generated by individuals or groups of end-users and are not generally pre-determined before end-users are exposed to the tool.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? ***(max 300 words)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

TP-D is essentially a tool that enhances the awareness of users to a wide range of factors that relate to their production system. As a result, the most significant environmental benefits of using TP-D more widely are likely to accrue from more effective resource management and, through a better appreciation of the value of feed resources, an incentive to manage these with greater care and more sustainably. For example, in Tanzania, farmers were able to use TP-D to attach a financial value to the grasses that they collected from waste ground and roadsides. This prompted them to consider not only the most appropriate grasses to collect but also the best approaches for ensuring that these would continue to be available to support their dairy enterprises.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? ***(max 100 words)***

Not directly. TP-D is a tool that assists farmers to make informed resource management decisions in relation to their own household and production objectives. Any changes in patterns of resource use may, potentially impact on the environmental resource base and this will be one of the factors that will determine the acceptability of the change. TP-D aims to make the management practices of the farmers who use it more efficient and more able to meet their objectives. As a result, the changes required to achieve this should be based on better information generally and should be more likely to avoid negative environmental impacts.

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

Any output that consolidates the livelihoods of the poor will increase their capacity to deal with the risks and threats that they face. As discussed in response to questions 20 and 21, the financial and other, broader benefits that may accrue to users of TP-D, or other similar tools that might be developed, are likely to enhance the capacity of poor to make informed scince-based decisions in the face of change.

Annex

Annexe Table 1: Some examples of management innovations implemented by farmers using Talking Pictures – Dairy and their individual financial benefits.

Location	*Management Issue Identified*	*Innovation*	*Observed Financial Benefit*	*Implications for Outscaling*
Tanzania	Underfeeding of concentrate to improved animals resulting in yields that were little above those of the indigenous animal.	Scaled increases in concentrate feeding followed by financial assessment and re-evaluation with tool.	Highly variable amongst animals and over time but probably at least US$30 per lactation.	This is a global issue. TP-D allows farmers to calculate concentrate rations for the needs of a specific animal rather than basing them on recommendations for a global “standard” cow. There likely to be very few lactations in this production system that would not benefit from the more matched approach to concentrate feeding that can be achieved with TP-D
Tanzania	Adverse impacts of poor quality basal forages on milk production.	Incentives introduced for employed forage collectors to select better quality materials.	Approximately US$ 15 – 20 per lactation, derived from a combination of better yields and / or savings on purchased concentrates.	This was a fairly specific problem for urban and peri-urban dairy producers in Tanga region. However, many TP-D users in Africa and Asia have cited an improved understanding of the importance of the basal ration as one of the benefits that they have derived from using TP-D.
India	Possibility of pre-screening individual animals for mastitis testing based on TP-D performance criteria.	TP-D used to identify animals with anomalous production characteristics and submit these for early mastitis testing.	Approximately US$7 – 8 per detected infection.	Although individual benefits are relatively small, sub-clinical mastitis is very common and disruptive. In some, wetter parts of India, it has been estimated that 70% of lactations may be affected. This application of TP-D is, therefore, likely to be of very widespread practical benefit.
India	Reliance on static recommendations leading to over-feeding of dairy animals during late lactation. This results in financial inefficiency and possible re-breeding problems.	Reduce concentrate feeding for affected animals during the last three months of lactation and monitor outcomes.	Based on average milk prices, approximately US$15 over the last three months of lactation	Anecdotal evidence from other states in India (and also from Pakistan) suggests that, due to a reliance on the same recommendations everywhere, this problem is ubiquitous.

Annexe Table 2: Proposed locations and institutional arrangements for wider outscaling of novel approaches for stimulating innovation in smallholder dairying.

Country	*Proposed partners*	*Mode of implementation*	*Impacts realised via …*
South Asia			
Bangladesh	University of Mymensingh	Establish linkages to wider promotion of innovations in dairy feeding systems (R6610)	More effective identification of target beneficiaries and improved design of innovation strategies.
India	BAIF Development Research Foundation (Rajasthan, Uttar Pradesh); DfID Rural Livelihoods Project (Madhya Pradesh)	Integration with existing (RJ, UP) and new (MP) programmes of support to small-scale dairy producers.	Identification of management constraints and solutions at individual farm level.
Nepal	CEMORD; Department of Livestock Services; Community Livestock Development Project.	Integration with NGO's front-line support to farmers.	Promotion of increased reliance on local feed resources for more cost-effective dairy production in Kathmandu valley.
East Africa			
Ethiopia	Department of Urban Agriculture / Land o' Lakes (USAID) Dairy Development Project	Integration with project activities under new dairy development project.	Augmentation of capacity of project extension services.
Kenya	Ministry of Agriculture; Heifer Project International; Land o' Lakes.	Enhancement of current service delivery through MoA and associated projects.	Stabilisation of year-round production capacity; more efficient matching of supply and demand.
Tanzania	Ministry of Agriculture and Food Security; TAMPRODA (Tanzania Milk Producers Organisation). Heifer Project International. Regional Dairy Projects (e.g. Tanga, Iringa, Mwanza)	Cooperation with local cooperatives, farmer groups, and private dairy enterprises.	Better exploitation of improved genetic capacity of animals provided by HIT schemes. Protect profit margins of market-oriented producers.
Uganda	Dairy Development Authority.	Cooperation with regional dairy development initiatives, local private producers and traders.	Improved marketing opportunities and integration with school milk feeding programmes.

Annexe Table 3: Indicative financial impacts of improvements in production and production efficiency generated by farmer innovation using Talking Pictures – Dairy.

Country	% of marketable milk derived from smallholder sector	Number of milking animals in smallholder sector (x 10^6)	Mean milk production (l / milking animal / year)	Milk price (USD / litre)	Potential benefits of farmer-generated innovations (litre equivalents / milking animal / year)				Combined impacts of farmer generated innovations (USD / milking animal / year)
					1	2	3	4	
Bangladesh	90	3.5	209.4	0.27	200	400	42	72	193
India	80	59.2	1186.5	0.19	120	30	45	180	71
Nepal	55	1.1	617.2	0.46	160	32.5	42	72	141

Ethiopia	45	3.4	193.3	0.45	170	30	36	90*	147
Kenya	75	4.1	510.9	0.26	80	22.5	30	90*	58
Tanzania	80	3.9	170.4	0.18	130	40	36	90*	53
Uganda	65	1.3	350.0	0.36	150	35	42	90*	114

Farmer-generated innovations: 1 - Remedy concentrate underfeeding; 2 - Improve basal forage quality; 3 - Early identification of sub-clinical mastitis; 4 - Reduce late lactation concentrate wastage (see Annexe Table 1 for further details).
* - Data were not available to assess the extent to which late lactation overfeeding of concentrate might be prevalent in these countries. An arbitrary value of 50% has been assumed