

A woman wearing a blue t-shirt with gold embroidery and a red headscarf with yellow and black patterns is pouring yellow grains from a wooden bowl. She is standing in a dry, open landscape with sparse trees and a dirt path in the background. A white circle highlights her head and upper body.

The Farmer's Perspective: Bridging the Last Mile to Market



WAGENINGEN
UNIVERSITY & RESEARCH

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Prologue

Elders who were present during our visit to the Mathira Dairy Farmer's Cooperative in Karantina asked us to share the reason for our team's visit to their office and plant. On hearing that we were here to understand their challenges through their voices, in order to better design programmes to be more relevant and beneficial to them, their faces lit up as their agency was acknowledged and recognised. The sum total of our findings during this project to gather the farmer's perspective can be distilled by this experience. The shift from trade to aid cannot be successful without an accompanying shift in considering the farmer as a customer for PPP initiatives and not simply a beneficiary. And when the customer is made king, the organisation or company minimises the risks of the conventional hit or miss gamble of new product launches by ensuring that their new found understanding converts into immediately applicable and actionable insights that lower barriers to sustainable adoption of innovations.

Human-centred design targets the end users by seeking to understand their worldview, their dreams and aspirations, in the context of the challenges and opportunities of their daily environment. Based on this understanding, opportunities can be identified where innovative products, services and business models can create value.

Here onwards we aim to develop human centred design, from a proven approach to customer satisfaction and sales, to developmental applications such as in design of sustainable agricultural value webs, ICT tools for farmers built on the mobile platform or simply the adoption of a new way to apply fertilisers. The outcome would be a simplified and generalised human centred approach to solution finding - a problem solving process - rather than a list of prescribed recommendations or suggested answers to problems defined too narrowly.

If we are truly seeking to discover the barriers to adoption of technology and the sustainable development of agricultural value webs in economically challenged regions, then the way forward to building trust and long term mutually beneficial relationships should be through such visible demonstrations of respect and humility.

Assignment

The Dutch Ministry of Economic Affairs and the Ministry of Foreign Affairs contribute to PPPs with the intent of proliferating sustainable agricultural practices with farmers in developing countries, thus promoting sustainable and equitable growth. In search for opportunities to enhance the scale and spread of the adoption of sustainable agricultural practices, we were requested by both Ministries to conduct this current inquiry on adoption of information and technology services with farmers in their rural communities. We have looked at this subject through the lens of human-centred design (HCD), applying it both as a research method, as well as a prospective holistic innovation process, by which the values of technology and business could be integrated to best meet the needs and aspirations of the end user, the farmer.

The current research on the farmers' perspective is the second, and follow-up project to an earlier inquiry into the workings of PPP's and how they address, and meet the needs of the farmer, which was conducted in 2012.



Summary

The humble producer must be considered as the most important stakeholder when PPP programmes want to shift the emphasis in development from aid to trade. She, as a powerful business entrepreneur, is the critical link in any value chain of social and economic benefit if the shift from aid to trade is to result in outcomes with impact. However, currently the majority of the donor-led programmes aimed at improving the lives of those in developing countries tend to focus on them as passive consumers of innovation – whether its innovative services on the mobile platform, as in this case, or whether it's the plethora of designer products like smokeless cooking stoves, solar lanterns and water pumps. Few PPPs, if any, have targeted the indigenous innovators, creators and makers – especially those spread out in the hinterlands, away from the sprawling, opportunity-laden urban metro capitals. This is the main conclusion from the inquiry on adoption of information and technology services with farmers in their rural communities. LEI Wageningen UR has executed this inquiry on behalf of the Dutch Ministries of Foreign Affairs and Economic Affairs.

The agricultural value web

The Kenyan 'farmer' value chain was not just a neat box in the formal structure of a value chain, but a flexible, multipurpose node in the rural economy's complex web of human interaction and exchange of goods, services and knowledge. Therefore we have called it the agricultural value web.

In addition to this there is also no single persona that can represent 'the farmer' in the value web of the rural economy. Often implicit in discussions around farms and agricultural development is the assumption that 'producers' or 'farmers at the Base of the Pyramid (Bop)' are a homogeneous and undifferentiated mass of humanity.

The BoP farmer doesn't exist

As we began to take a closer look at how information flows within the agricultural value web along with attempting to identify barriers to adoption of new technology or innovation, we began to see a pattern of social and economic links within the context of rural society. This complexity of observed behaviours gave rise to profiles of different 'types' of farmers – admittedly rough and ready concepts, but which help us visualise the relationships between farmers in the same community and how they impact and influence each other.

The profiles can be based on three broad areas of focus. Her farm, her family and her dreams. Our existing and prior research into rural economies, household financial management, consumer mind set and buyer behaviour as well as aspirations and innovation adoption, lead us to believe that these three spheres of importance are not only interrelated but dynamically so in their ability to inform and impact each other.

A representative model

In context of the rural community's information ecosystem, populated by the differing farmer types, this modelling of the key determinants of the individual farmer's ecosystem attempts to represent the ultimate research goal of crafting such detailed personas for each of the segmented profiles. This model could predict changes in farm management based on the type, frequency, style or choice of influences on aspirations, future goals and information flowing through the ecosystem. Taken together, what we have crafted here is one conceptual model for understanding information adoption and exchange of value in the rural context of India and Kenya. By no means is this an exhaustive mapping or a complete method, and the profiling is simply representative.

Farmer Information Systems have to fit the ecosystem

In the last five years more than a hundred e-Agriculture/ mAgri solutions have been deployed in Africa, Asia and South America. Most of the initiatives, with a focus on market information and advisory, attempt to cut straight to their target market, taking little consideration of the existing trust, and information ecosystem. In the existing ecosystem the mobile phone is already serving a crucial role in connecting the value web as a basic communication tool. To those who seek to offer a new service, it may be prudent to understand the existing ecosystem, its players, how it works, and the values and assumptions that underpin it and then to act

with this knowledge in mind. The initiatives tend to work in a stand-alone manner, attempting at building their own information value chains to targeted users, rather than looking for possibilities to apply insights and systems from other initiatives that are making comparable attempts first. In summation, the services provide tend to be unidirectional, fragmented, lack interoperability, and tend to work in isolation from the information ecosystem. Consideration of the actual, mostly informal setting, and building on that, can increase the scope of possibilities for the adoption of solutions.

Visual proof by identification

Visual media appear to greatly enhance communication and understanding. They are able to capture a lot of complexity and present an explanation in simple form. Many technology solutions seem to neglect this value however. They tend to overburden SMS as a singular medium, exceeding the bounds of complexity with which it is capable of transferring information and understanding.

It is all about trust

Trust is a key determinant for adoption of any service or system. With all the factors we have been able to observe in this study, factors that generally form the pitfalls for projects attempting to convey information and technology services to farmers, trust keeps recurring. Trust can make or break realisation of the initial intent a project sets out with. The following are four recommendations for a better adoption.

- 1 Integrate and include, to consolidate fragmented service provision, to improve interoperability, and to link with the information ecosystem.

- 2 Emulate institutional arrangements prevalent in the informal market context.
- 3 Reduce complexity so as to enhance understanding by making information contextualised and actionable.
- 4 Provide interaction on human terms with personal and visual proof.

Programmes have to prove their value

Donor-funded initiatives from the outside seeking to promote a certain crop or agricultural innovation, not taking the cost benefit analysis to the farmer/entrepreneur into account nor providing clearly demonstrable returns such as the larger cob of maize from the more expensive seed, face a barrier to the sustainable adoption of their intervention. When current day PPPs or mobile solutions seem to lack contextual relevance or value, they are less likely to be adopted, again acting as their own barrier to local impact.

Local solutions for local problems

Ventures and programmes from foreign origin are receiving increased pushback from local technology ventures and start-ups more attuned to the needs of their rural brethren. Charity distorts natural market mechanisms of pricing and competition as customers naturally gravitate towards that which is free or subsidised versus the higher market-driven pricing from local businesses seeking to sustain themselves on revenue generated rather than funds donated. The democratisation of global information and communications technology has now given voice to the urban, educated youth, who, like their peers in Silicon Valley or Bangalore, seek fame and fortune as the next successful start-up to be purchased by Google or aim to become the respected founders of innovative ventures.





1 The farmer in the centre

The challenge of our growing global population is known and well described: We will need to feed 9.1 billion people by 2050, entailing a 70% increase in food production from current levels¹. Agriculture has to adequately respond to this challenge, balancing growth in production, with sustainable production practices that reduce, or possibly eliminate the pressure of its claims on some of our scarcest natural resources.

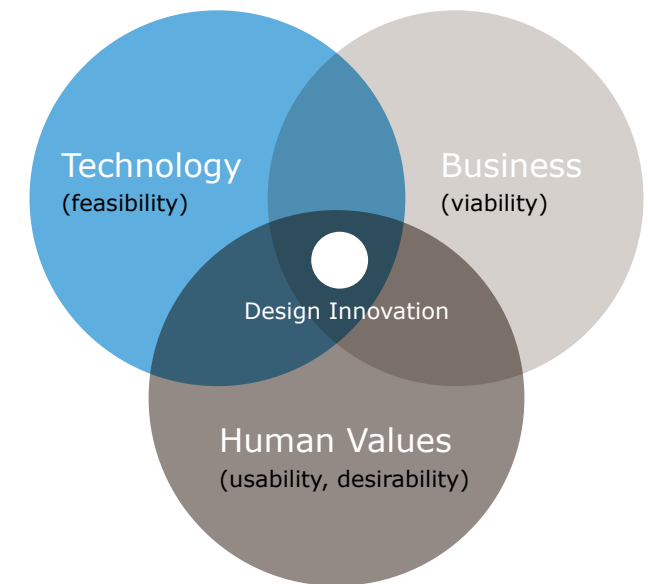
The challenge is broad and complex. Already there is a realisation amongst key public and private stakeholders that they can't address all the important issues on their own. Public-Private Partnerships (PPPs) are required, which can effectively ally against each of the challenge's facets. Within these partnerships, the farmer has a pivotal role. The farmer is at the origin of food production, and most of the sustainable growth impact the world is seeking for, will have to be delivered through her choices and operations in management of the farm. Therefore the effects of PPPs can best be seen from a farmer's perspective. This has led to the problem statement aimed to identify barriers to the adoption of innovation among farmers in developing countries, i.e. the end-users of the implemented solutions. We have chosen that the field of user-centred design (UCD) and human-centred innovation planning, as a proven process used in business, could help in reflection to discover underlying assumptions.

Consequently to the understanding that is achieved of the farmer's perspective, an opportunity space can be mapped. This helps to identify the actionable insights that organisations can translate into immediate and relevant value. This is done through defining user requirements, and design and testing of product-service-business model (the ecosystem) prior to full-scale launch. Applying the UCD can demonstrably increase the rate of their successful diffusion while attempting to minimise the barriers to adoption.

As John Heskett (retired Professor of Design, IIT-ID) says, 'An invention is not an innovation until it creates value for the company, which means it needs to be accepted by the user.' This translates quite naturally to the conditions of our current project, where PPP consortia aim to introduce innovation for sustainable agriculture practice which then need to be sustainably adopted by the farmer as the end user.

This research initiative was scoped into two broad areas, reflecting the concluding recommendations and solutions proposed at the end of the 'donor side' perspective (See Earlier insights, page 10). We had identified the need to conduct exploratory user research, using design ethnography methods, in order to refresh and bring up-to-date our perception of 'the farmer' at the bottom of the

pyramid who was the target beneficiary of the process and the PPPs; and recommended development of a platform for dialogue and exchange of knowledge that could close the feedback loop, using ubiquitous technology such as the mobile phone.



Source: <http://dschool.stanford.edu>

¹ FAO; http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf

Our approach: human-centred design

Human-centred design provides a rigorous methods-based approach for innovation and planning². In user-centred design innovation, the practice of exploratory user research (aka immersion) is the primary means by which to understand targeted populations, and arrive at a vision relating to the problem they face.

The basic user-centred process adapted for holistic solution development (UCSD) was the starting point for this particular project, offering both a systems level lens by which to evaluate the observed real world process of PPP development as well as framework by which to assess its efficacy.

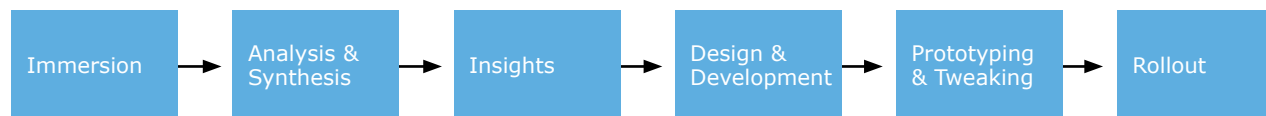
The figure below has broken down the steps, for the purpose of defining the sequential stages of the work process. However, the rational underlying the mode of working in the application of the process is what is often referred to as design thinking, which is a process 'of enlightened trial and error wherein one observes the world, identifies the patterns of behaviour, generates ideas, gets feedback, repeats the process, and keeps on refining.'³ Within the resource constraints, we felt that the best means to garner an authentic sense of the viability of our approach would be to narrow our focus accordingly:

- 1 Fieldwork: Talking directly to the people involved.
 - Surveying the farms, the farmers, their hyper-local network and markets, in order to identify the bounds of the last mile of the value chain, as framed in the context of sustainable agricultural value chain development by PPPs.
 - Visually mapping this 'last mile' segment of the value chain and identifying representative actors.
 - Seeking to discern the barriers to adoption of technology and/or innovation, from the end user's perspective, through direct dialogue and observations.
 - Engaging with subject matter experts in agriculture, NGOs, and other agriculture-related institutions for contextual inquiry to understand the local situation and operating environment.
- 2 Precursor analysis around technology introduction and adoption among farmers.
 - Deep dive into state of the art e-Agriculture and mAgri pilots, projects and programmes (precursors) in the space of information provision, farmer feedback and market creation at the last mile of the value chain.
 - Review of the mobile phone as an innovative platform for social and economic development at the base of the pyramid and emerging markets with an emphasis on rural regions.
 - In-depth analysis of the design and implementation of selected farmer information solutions with a view towards identifying barriers to adoption or obstacles to sustained use.

We also used this opportunity to better refine our initial problem statement, as well as identify and scope the future research plan for the recommended immersion into the rural environment. The insights gathered enable the identification of representative user profiles among the farming community, and design the research protocol and programme. The precursor analysis provides us with a roadmap for future product and service development, including user research needs informing interface, interaction and information design (UX, UI, UCD) aiming to minimise barriers to adoption.

We have gathered our insights by visiting farmers and experts in Kenya and Western India and a quantitative research on food security among 320 farmers in Western India. In addition to this we have made a deep analysis of information services and applications on the mobile platform targeted at lower income demographics, on local mAgri and e-Agriculture pilot programmes and start-ups and on high profile farmer information services like Nokia Life, Reuters Market Light and Fasal.

The following sections are based on our workshop exercises to identify patterns across the various data from multiple interviews, farm and shop visits and locations and synthesise narratives to assist with understanding the ecosystem of the rural value web from the perspective of the farmers. As there were no direct correlations to the textbook models of value chains, we hoped to use these as starting points for the process of mapping the web and attempting to trace the flows of information between the actors and nodes.



² As pioneered by the Institute of Design, Illinois Institute of Technology (IIT-ID) Chicago

³ Design Thinking Definition - Niti Bhan <http://www.lukew.com/ff/entry.asp?357> (2006)

Earlier insights

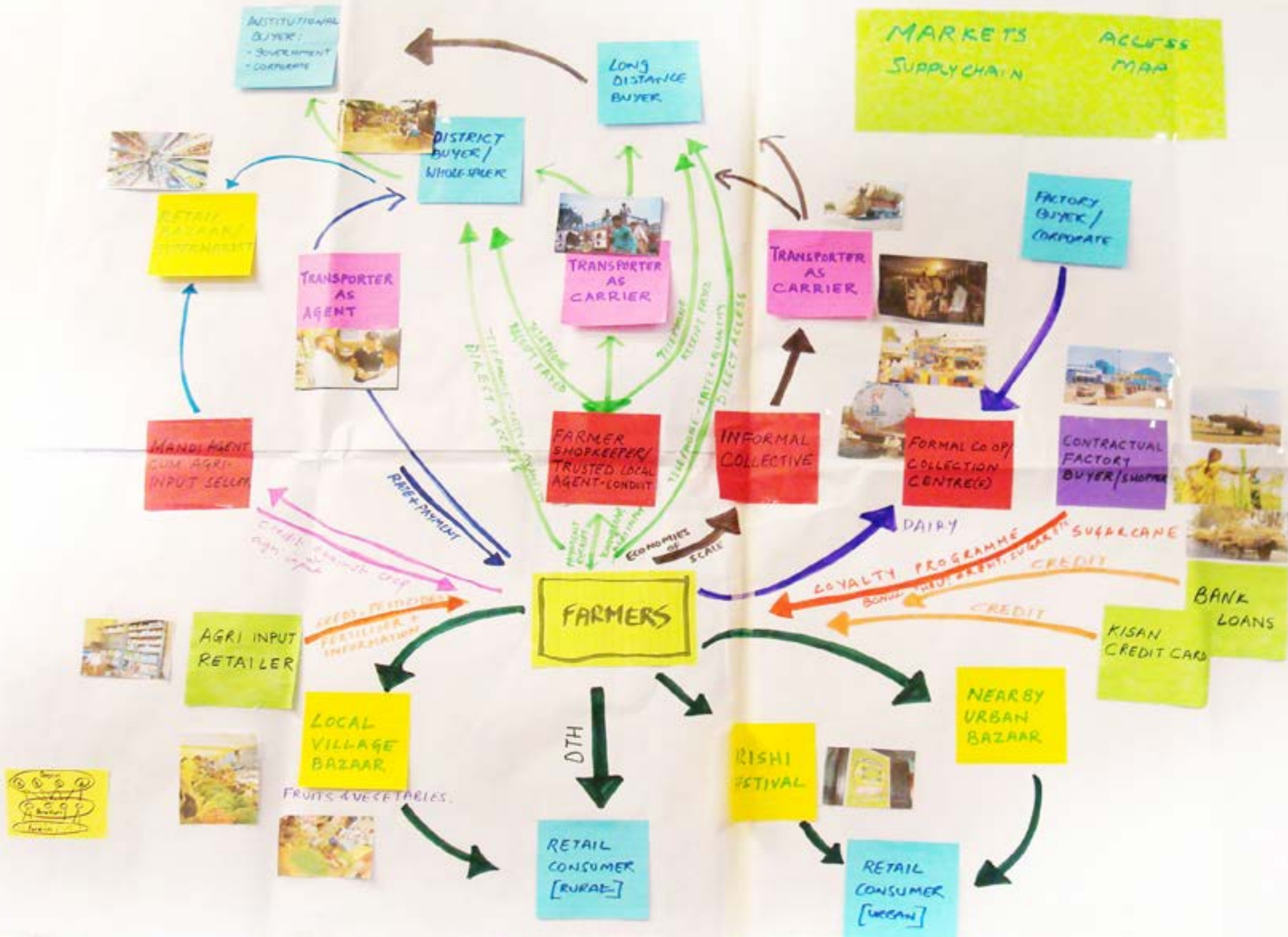
At the end of the first exploratory user research conducted among the multistakeholder groups involved in PPPs for sustainable agricultural value chain development in the autumn of 2012, we reached certain conclusions based on our observations on both the process as well as the content. These can be summarised as follows:

- We confirmed our initial hypothesis that the human-centred design (HCD) approach had a role within government, in policy planning and programme development. We said that the value of judicious and selective application of relevant and selected methods and frameworks from the human-centred design planning toolkit lies in their ability to align strategy and deliverables from the top to the identified needs and requirements of the end user, in the context of his or her operating environment. The role of human-centred design planning is to offer holistic road-maps for manifesting envisioned solutions in a tangible, self-sustaining manner.
- We identified and clustered actionable insights from the PPP process observed in the workshop setting which we deemed relevant to research question on 'barriers to adoption among lower income farmers' and framed them as recommended design criteria for programme design. These were:
 - 1 Real people's real lives, dreams, hopes, aspirations should drive decision making and design
 - 2 A coherent narrative for the project story for all stakeholders
 - 3 Remaining consistently responsive to new insights and learnings as projects progress
 - 4 Applying business modelling to focus on the 'Pay as you go' rural economy (see 96% of all mobile users in Africa are on prepaid plans)

- Based on our findings from the 'donor perspective' we concluded that there were gaps in the entire process of PPP conceptualisation, framing, action plan and implementation that led to unsatisfactory results when impact was finally evaluated and measured. Thus we ended our report with the following recommendation: Addressing the design of the PPP initiation process, supported by the customisation of a heuristic toolkit for policy makers and advisers to identify the correct problems where intervention is required and then to craft programmes that meet these needs, and provide feedback from the end users, would offer immediate actionable impact on returns.
- Our proposed solution of a heuristic toolkit to improve the outcomes of the PPPs in sustainable agricultural value chain development was based on the assumption arrived at through synthesis of the above-mentioned findings that: the commonly held perceptions of lower income (BoP) farmers in rural Africa were decades out of date, and that current day technologies and socioeconomic development had far outpaced the obsolete image of 'the farmer'. This worldview needed to be updated and revised by in-depth exploratory user research, segmentation of the rural population to better refine PPP targets and a platform for dialogue and relationship building could be established to close the feedback loop leading to more responsive adaptable programme implementation cycle.

At this point it was deemed important to gain the farmer's perspective by conducting 'quick and dirty' field visit supported by desk research and analysis in the form of this current 'feasibility study', before proceeding to develop these recommended solutions. This purpose was in line with the human-centered design philosophy at the heart of this project's process and methodology.





2 The agricultural value web: at first sight a complex set system

We uncovered what we believe to be our most important discovery in Kenya after we visited a number of rural towns attempting to identify the various actors in this last mile of the agricultural value chain between the farm and the farmer's sale of her harvest.

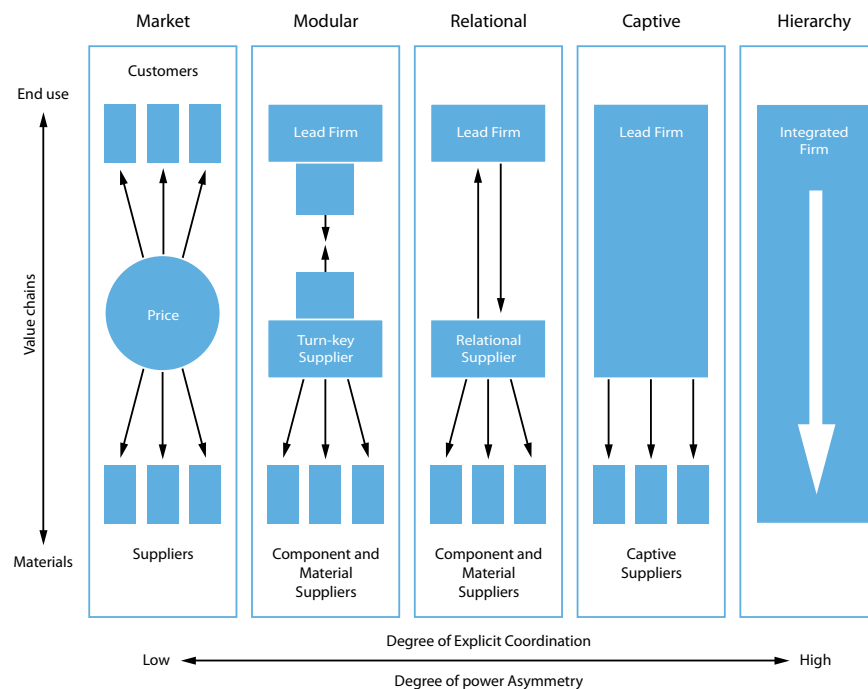
Textbooks present orderly abstracted value chain models, also referred to as governance configurations, diagrammed in a manner that implies linear progression and a high degree of specialisation. The Kenyan 'farmer market' was not just a neat box in the formal structure of a value chain, but a flexible, multipurpose node in the rural economy's complex web of human interaction and exchange of goods, services and knowledge. The classic, orderly pattern of exchange in value chain form, based on assumptions of a structured, formal hierarchy of power residing downstream, does not, in fact, appear to exist.

The Kenyan 'farmer market' was not just a neat box in the formal structure of a value chain, but a flexible, multipurpose node in the rural economy's complex web of human interaction and exchange of goods, services and knowledge.

Market structure

It appeared that the Kenyan distribution landscape was more decentralised yet interlinked. We were able to identify three types of trading zones - net demand; net supply and those that aggregated. The market, it seemed, was not simply a physical location where local sellers came to meet buyers. It was a bazaar, the weekly market day being the equivalent of a village fair, attracting people from miles around with its hustle and activity, and most importantly, its opportunity. Like in the forums of Imperial

Rome or the agorae of Greece, the choicest gossip was exchanged and information traded while hawkers plied their household wares or knickknacks from the city. Farmers, market women, brokers, aggregators, transporters all came together pursuing new deals, reaffirming the existing, all the while conducting their business of grading, packing, repackaging, distribution, forwarding, input purchase, grocery shopping, buying day-old chicks and seedlings, or simply catching up with remote connections face to face.



Source: Gereffi, G, Humphrey, J, Sturgeon, T (2005), 'the governance of global value chains' Review of International Political Economy 12:1 February 2005: 78-104

Market interaction

What seemed like a web of chaos turned out to be a sophisticated set of interactions. Produce exchange between farmer and 'other' happened at the farm gate, at the local market, at urban produce markets and even at the final retail outlet, with the retail consumer. We found farmers at every single interface, even selling directly to restaurants. On the one end, in Kagio, we met traders who were bulking produce they had just hauled in from farms. On the other end, at the City Park Market located in an upmarket suburb of Nairobi, one out of every two traders we spoke to claimed to be a farmer who had harvested the produce they were retailing from their own farm on the outskirts of Nairobi.

What seems to be often overlooked is the intervention of farmers, and the way farmers engage in an intricate dance with buyers, constantly weighing reasonable expectations of speedy conversion of goods into cash against expectations of a higher pay out a little further along the value chain continuously making decisions about when to offload their produce and to whom.

And, as we found, this was similar to what was observed in rural Maharashtra in Western India. This discovery signalled to us that instead of rushing to design new tools or solutions to enable farmers to bridge the last mile of the agricultural value chain, we needed to take a step back in order to better understand the existing situation linking the harvest in the field to the customer who purchases it. It underscores our recommendation for comprehensive exploratory⁵ user research in this last mile, and the need to first uncover and understand all the

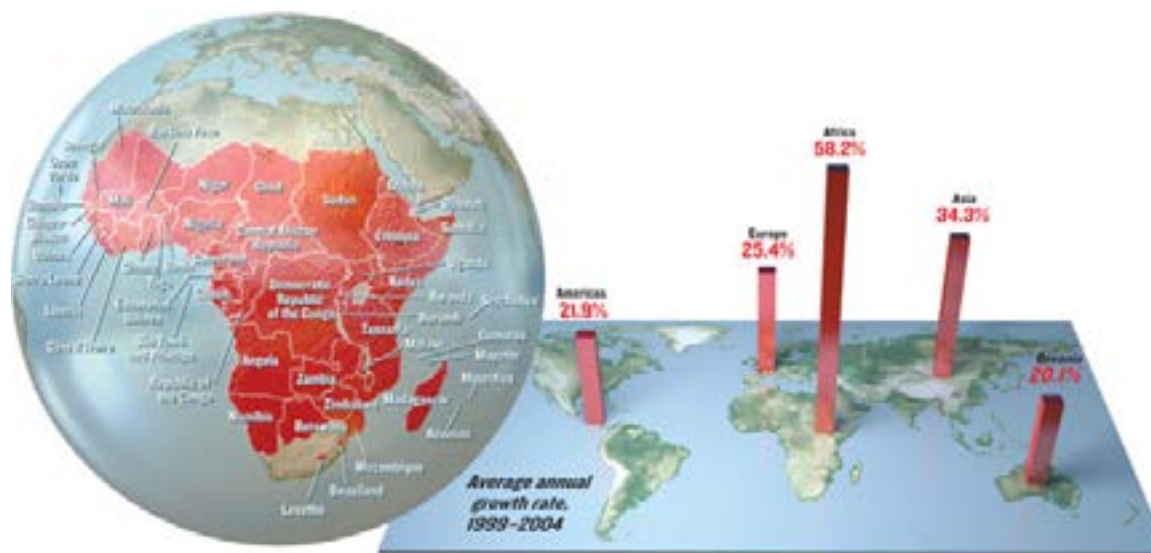
ways by which information flows through the ecosystem. Thus, it appears to be a natural pattern in rural life that the heart of local economic and social activity is the nearest regular community gathering i.e. the weekly market. And so the conventional wisdom of applying the textbook model of value chains would not only be irrelevant but inappropriate as a means to capture these real world contexts. We prefer therefore to use the term agricultural value web instead of agricultural value chain.

New interactions and better information

Adding a substantive layer of complexity has been the rapid proliferation of low cost mobile phones with ex-

tremely affordable pay as you go (prepaid) voice, text and data plans. In Kenya particularly, prices of both hardware and services have dropped significantly in just the last

The point is that the mobile phone is already serving a crucial role in connecting the value web as a basic communication tool.



Global Mobile subscriptions growth rate. Source: IEEE⁶

⁵ Chipchase J. and Jung H., Nokia Research Center (2007)

⁶ <http://spectrum.ieee.org/images/may06/images/afri1.jpg>

⁷ Hidden in Plain Sight by Jan Chipchase (2013)

three to five years, encouraging rapid adoption. This in turn is helping sustain relationships created face-to-face and expanding the possibilities of coordination. Small brokers and farmers now have tools available that can increase their reach to the market, bypassing incumbent trade channels if they prove to be inadequate or act as a barrier to commerce. No longer does the power to coordinate reside exclusively with the downstream players.

Our research established that the mobile phone is already being used to great effect by players in the agricultural value web. Transporters and middlemen use their mobile phones to identify or establish demand, then inform farmers which markets they intend to visit, and which produce they will be interested in buying. Farmers similarly receive information from their extended social networks via the mobile phone. For example, in Migwani, a market town in Kitui County, one enterprising dealer had discovered a way to set up a regular supply of watermelons from the coast, setting himself up as the sole provider and capturing local demand. The market abhors a vacuum, and enterprising Kenyans had found ways to sense out where demand exceeded supply and to respond appropriately. The market configurations that result may often not be tidy or perfect, but they are solutions that are filling a gap on the ground. The point is that the mobile phone is already serving a crucial role in connecting the value web as a basic communication tool⁷. To those who seek to offer a new service, it may be prudent to understand the existing ecosystem, its players, how it works, and the values and assumptions that underpin it and then to act with this knowledge in mind.

The BoP farmer doesn't exist

There is no single persona that can represent 'the farmer' in the value web of the rural economy. Often implicit in discussions around farms and agricultural development is the assumption that 'producers' or 'farmers at the Base of the Pyramid (BoP)' are a homogeneous and undifferentiated mass of humanity. While there are indeed geographic regions where local farmers may indeed be culturally, ethnically or linguistically homogeneous, they are human beings with diverse natures, abilities and personalities. As we began to take a closer look at how information flows within the agricultural value web along with attempting to identify barriers to adoption of new technology or innovation, we began to see a pattern of social and economic links within the context of rural society. This complexity of observed behaviours gave rise to profiles of different 'types' of farmers – admittedly rough and ready concepts, but which help us visualise the relationships between farmers in the same community and how they impact and influence each other. Here we illustrate these sample profiles as an example of the variance in mind set, decision making and enterprise among 'farmers' as a population segment.

The farmers are a heterogeneous lot and must be segmented in a manner similar to the kind of customer segmentation that consumer product companies do in order to refine the focus of their marketing budget and thus, generate better returns. Subsequent to this profiling, we looked at the interactions among the various types, to understand how the web of knowledge exchange and innovation adoption between them would work. We observed that interactions between these farmer types could be differentiated and layered according to who were



the influencers within the system, who the influenced were, and what aspirations people held that they sought to manifest within the system itself. We found that the exchange of value did not flow fully and freely within this ecosystem - some groups shared a similar worldview or aspirational mindset and information flowed more easily and directly between them; while others were not really part of this ecosystem in the same way (such as the 'innovator farmer'), in which case knowledge followed a different path.

Here, we can say that the non-connecting worldviews or differing levels of aspiration and ambition acted as an inherent barrier to knowledge exchange. After this attempt to contextualise the heterogeneity of the farming community's mindset and worldview and their inter-relationship in the information ecosystem, we took a closer look at key determinants that would distinguish any one such entrepreneurial profile. That is, we wished to understand the farmer's perspective of her own ecosystem, what sources she would use for knowledge and

information, and so extrapolate what she might consequently do with the information received and its influence on her ecosystem.

My ecosystem: my farm, my family and my dreams

In context of the rural community's information ecosystem, populated by the differing farmer types, this modeling of the key determinants of the individual farmer's ecosystem attempts to represent the ultimate research goal of crafting such detailed personas for each of the segmented profiles. Farmer Pedro here perceives his world - his hyper-local social and economic ecosystem - as consisting of these three broad areas of focus. His farm, his family and his dreams. Our existing and prior research into rural economies, household financial management⁸, consumer mind set and buyer behaviour⁹ as well as aspirations and innovation adoption¹⁰, lead us to believe that these three spheres of importance are not only inter-related but dynamically so in their ability to inform and impact each other. A simple example would be the unplanned sale of a cow in order to pay school fees for a child about to sit for national level examinations, which may temporarily impact contributions to the local dairy cooperative. Thus, changes in aspirations or social networks influence farm cash flow planning decisions, thus how the land is to be tilled and what investments must be made. This model could predict changes in farm management based on the type, frequency, style or choice of influences on aspirations, future goals and information flowing through the ecosystem.

Next steps in research

Taken together, what we have crafted here is one conceptual model for understanding information adoption and exchange of value in the rural context of India and Kenya. By no means is this an exhaustive mapping or a complete method, and the profiling is simply representative. But they are enough to inform us that further and deeper research is not only needed but such kind of segmentation of the mythical 'producer' would offer greater returns on interventions better focused and targeted towards differing needs and populations. A final attribute to add a layer of nuance would be to also map these profiles against varying levels of income and food security. While we were constrained in the scope of this project, the dipstick quantitative study conducted offers some touch-points by which to prepare the research protocol and identify relevant and appropriate profiles for future study.

⁸ The Prepaid Economy project by Niti Bhan funded by iBoP Asia & IDRC (2009)

⁹ Design for the Next Billion by Niti Bhan & Dave Tait, published Core77 (2008)

¹⁰ Household Energy Consumption Behaviour, Niti Bhan for ToughStuff Solar, East Africa (2012)

SAMSUNG
1055G
-INTERNET
-RADIO
-MP3
-TRACKER
2199k

SAMSUNG
ORIGINAL
2699k

SAMSUNG
1205 NEW
-RADIO
-MP3
-TORCH
-TRACKER
1999k

SAMSUNG
1205 NEW
-RADIO
-MP3
-TORCH
-TRACKER
1999k

ITEL
3600
2599k

ITEL
T210
CAMERA
-TWIN SIM
-B-TOTTH
-M-SLOT
-RADIO
-MP3
-TORCH
2299k

ITEL
2020
1999k

TECNO
T209
-RADIO
-B-TOTTH
-TWIN SIM
-M-SLOT

TECNO
T340
-CAMERA
-B-TOTTH
-RADIO

TECNO
T451
-RADIO
-WALKER
-CAMERA
-B-TOTTH
-INTERNET

TECNO
T605

TECNO
T471
-TWIN SIM
-B-TOTTH
-INTERNET
-CAMERA
-RADIO
-M-SLOT

TECNO
T380
-TWIN
-RADIO
-B-TOTTH
-CAMERA
-M-SLOT
-MP3

TECNO
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-TWIN SIM
-B-TOTTH
-CAMERA
-RADIO
-M-SLOT

3 Farmer Information Systems

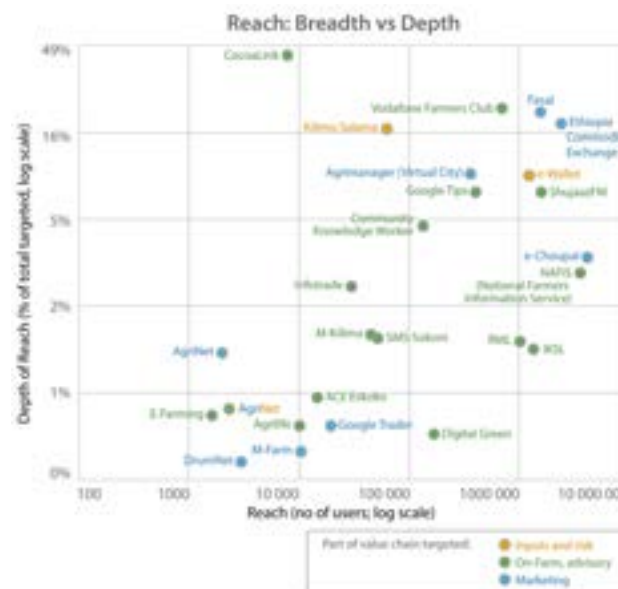
Big differences in adoption

In the last five years more than a hundred e-Agriculture/ mAgri solutions have been deployed in Africa, Asia and South America. At first sight the space looks dynamic and crowded: 118 solutions across 25 countries using all available platforms – SMS, Voice/IVRS, Web, USSD¹¹, even smart-phone apps. (Report by Futurescape available on request.) However, when we take this development in a broad perspective, there are huge differences in availability and adoption of agricultural tech-driven services. There are a few countries in Africa (like South Sudan) where we weren't able to trace any agriculture ICT solutions. Some countries, like Kenya, have a high number of initiatives, yet adoption numbers were relatively low compared to the farmer population. Lastly there were countries that have only a few initiatives, but hold impressive adoption rates, like Nigeria and Ethiopia.

The solutions cover a spectrum of 59 problem areas. Yet there appear to be some gaps between the developers and the users whom the solutions are intended for. First, most of the applications have yet to come to a user base of 10,000 farmers. Weather forecast applications show low adoption numbers (or no numbers at all), despite the participation of very capable telco partners in most cases. This raises questions as to whether such services are perceived as relevant to farmers. There are other areas where trial has been haphazard, and thus the numbers

are low but the market gap might be there. This could be true for data collection, soil nutrient analysis, record-keeping, (fruit) tracking applications, as examples. In the graph below we attempted to show some adoption patterns by visualising the reach (number of users) of the initiative versus the depth of reach (percentage of target market) across the focus areas. Most applications focus on providing market information or advisory with varying degrees of market reach. The many price

information and marketplace solutions out there are either very successful (in some exceptional cases) or they do very poorly. Advisory services are more evenly distributed along the curve. Kilimo Salama, the mobile insurance seller, and e-Wallet that provides fertiliser vouchers to the mobile, are among the few that focus on the upstream part of the value chain. They are also ones that openly provide numbers on active and paying customers, information that other initiatives often lack¹².



Most of the initiatives attempt to cut straight to their target market, taking little consideration of the existing trust, and information ecosystem.

Understanding the value web

Most of the initiatives attempt to cut straight to their target market, taking little consideration of the existing trust, and information ecosystem. Also initiatives tend to work in a stand-alone manner, attempting at building their own information value chains to targeted users, rather than looking for possibilities to apply insights and systems from other initiatives that are making compara-

¹¹ IVRS stands for Interactive Voice Response System, a kind of an automated call center. USSD is used to communicate with the GSM provider's computers via messaging, allowing a two-way exchange of a sequence of data (*101# would be a familiar example).

¹² It was very difficult to determine reliable active user counts. Most applications don't provide public user numbers, let alone publicise the number of active users and paid subscribers. Press releases talk of users that the service hopes to reach by the end of the year. For instance, Nokia Life boasts reaching farmers in the tens of millions, but nowhere do they publicise actual usage or subscription numbers. Some more successful initiatives set a good benchmark for making data publicly available. For instance, Intuit's Fasal has a live ticker on their website. Others, backed by NGOs, are compelled to display extensive public real-time data, like is the case with Gates- Foundation-backed Digital Green.

ble attempts first. This pattern is based on the following observations:

First, the farmer is effectively considered as a recipient, a consumer of information and knowledge. It is true that some call centres do allow farmers themselves to pose the questions relevant to them, providing some control to the user. However, most initiatives constrain human interactions through emphasising technology and the technology interface, thereby limiting multidirectional communication.

Second, we observe information providers trying to 'inject' their information through the various layers of the ecosystem, to the layer of the farmer, forgetting the existing flow of information through the value web. A farmer hotline like M-Kilimo in Kenya, attempting to offer the farmer direct advice, competes with existing and trusted solutions for advice like the local extension officer. Such an approach is hampered from the onset by the fact that there is little affiliation as to how a farmer herself actually collects and shares information, thus creating a barrier for the farmer to understand what added value the service could provide.

Third, most applications seem to stand alone and thus limit their potential. Partnerships run with donors, NGOs and government offices, but there is very little room for an open exchange between (various) applications (e.g. through APIs).

In summation, the services provided tend to be unidirectional, fragmented, lack interoperability, and tend to work in isolation from the information ecosystem. Many of the tech solutions tend to operate on assump-

Fred Ogana, Country Director of Technoserve Kenya:

'There are a dozen costly steps between the farmer and the market, and knowing the end-market price alone does not help the farmer sell her produce.'

tions of an ideal type institutional setting in which their solutions would work. An application or information itself is not enough to empower the farmer unless the existing, often informal, enablers and barriers to market are accounted for. An example of solutions that have taken the actual institutional backdrop into consideration comes from the private company ITC in India. ITC's e-Choupal system is now in place all over the country – a network of agricultural-produce-buying and information-providing kiosks run by a local operator with an internet-enabled computer. e-Choupal's progress can be attributed to the fact that it has found a way to emulate the existing institutional setting based on three attention points.

- They use local operators who are from the community.
- They changed the status of the middlemen from buyers with power over the farmer to agents that cooperate with the farmer and earn commission from ITC for providing logistic support.
- They gave the farmer free information and quotes, thereby granting free will to sell elsewhere, leaving the farmer with the power of choice and control.

Similarly in India, Fasal seems to be using the buyer network directly available to the farmer. In effect, Fasal puts the buyers from all nearby local markets to com-

pete against each other on price – putting the farmer in the driving seat. Consideration of the actual, mostly informal setting, and building on that, can increase the scope of possibilities for the adoption of solutions. Working with an ideal type institutional setting severely limits the conditions for success.

Finding the value of information

It might seem self-evident that the farmer should be able to apply the information she receives to her farm management. Yet, as an agricultural extension officer in Kenya noted, he has seen too many foreign aid projects fail in getting through to the farmer. What the farmer

What the farmer needs is 'relevant information that empowers him to make rational choices'.

needs is 'relevant information that empowers her to make rational choices'.

According to our interview with Vijay Pratap, the CEO of Ekgaon Technologies, farmers were initially open to receiving information, but refused to pay once asked. It turned out that farmers of course shared and compared information sent to them and when they found it to be the same for everybody, decided they will wait for others to pay. This drove Ekgaon to develop a service that provided more personalised and actionable instructions; based on soil data the farmer receives alerts on how much fertiliser to apply and when. It is often that such kinds of working assumptions are made early on in project phases, but rarely validated. They mostly come

to light when the end of trial project impact evaluation is done. An evaluation of Reuters Market Light (RML), amongst others¹³, revealed that 'generic information triggers dissatisfaction and reduces the frequency with which farmers access the service'. Even though farmers do subscribe to the service, 'on average they would have taken similar decisions eventually, with or without RML'¹⁴. Many projects still seem to struggle with defining information that is actionable to the farmer and her context, and thus raise a barrier to understanding the intent and value that the service can provide.

Many projects still seem to struggle with defining information that is actionable to the farmer and her context

Understanding the value web

One can imagine that the way in which the demographic we have interacted with makes its choices, is influenced by the burden of consequences of making a wrong choice. Choices are made either safe or not at all. Just taking someone's word for it that something will turn out well is likely not to be a good bet. This is because the uncertainty of something not turning out as expected comes fully at your own expense. The burden won't be shared. Hence trust is hard to come by. Lack of trust has huge implications for delivering value. Companies seeking to target these customers need to put a lot of effort in to mitigate uncertainty to the consequences of

Successful mobile services

- The Ethiopia Commodity Exchange managed a quarter of a million SMS subscribers and a million calls coming in to their IVR system in a month¹⁵. This comes on top of the extensive network of kiosks and a supply system built up by the Exchange.
- Digital Green running farmer advisory services via video using small video players and projectors run on car batteries;
- E-Choupal has demonstrated how the Internet could be a successful delivery mechanism, through village-level kiosks reaching even marginal farmers;
- Grameen Foundation's Community Knowledge Workers, who are equipped with and trained to work on a smart-phone.

The importance of face-to-face interpersonal relationships is also relevant to buy-sell relationships, sharing risk and knowledge, for solving problems, and adopting anything new. From the farmer's point of view, the mobile phone is thus generally used to maintain rather than to form a relationship. We can conclude that coordination through mobiles is (mostly only) happening because the same coordination is possible face-to-face.

the customer's choice, way more than in predictable developed countries, where trust is more prevalent. We will touch upon two important factors that we've seen in the field which foster the creation of trust, but which are not well addressed in development of technology solutions, namely word-of-mouth from a trusted person and visual proof, such as hanging display of results in the agro vet store or a neighbour's plot.

Mobile services have to fit the ecosystem

Among the many tech services for farmers, SMS looks like the preferred platform for technologists - SMS was the choice for 43 out of 118 of the initiatives we mapped out. There are many benefits to SMS. It is still the cheapest option to push information. An SMS is also information that can be stored to some extent. There are strong signals, however, that SMS is not the preferred platform from the farmer's perspective. None of the farmers we interviewed in Kenya mentioned text messaging when prompted on how they use their mobile phone. Farmers we interviewed in India preferred making phone calls instead. Naturally, there is a lack of awareness of SMS services; In India, only 3% out of 332 farmers we surveyed get their agricultural information through SMS. Qualitative interviews revealed that there is low trust towards information received via text message, exemplified by even leaving the inbox untouched when it is full, out of suspicion of being charged for access in some way. This is not to say that SMS isn't suitable as a medium. SMS can work when it fits the existing information structure. There are examples of solutions that apply interpersonal contact as part of the delivery mechanism for tech solutions on other platforms.

Visual proof by identification

Farming is essentially a visual profession. Animals, and plants don't talk, so a farmer needs to rely on observation to ascertain what actions to take. In the same way understanding problems and solutions are most effectively expressed in a visual way. To adopt something new, farmers thus need to 'see' the relevance. Rikin

¹³ Socio-Economic Impact of Mobile Phones on Indian Agriculture by Mittal, S., Gandhi, S. and Tripathi, G. (2010) <http://www.colombiadigital.net/newcd/dmdocuments/89.%20Socioimpact%20agriculture.pdf>

¹⁴ Impact of SMS-Based Agricultural Information on Indian Farmers by Fafchamps, M. and Minten, B. (2012) <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/04/rml.pdf>

¹⁵ A Market for Abdu: Creating a Commodity Exchange in Ethiopia by Eleni Gabre-Madhin (2011) <http://www.ifpri.org/sites/default/files/publications/oc70.pdf>

An Indian farmer prefers face-to-face contact when getting information about new crops and techniques:

'If I try to have a chat with him on the phone [...] he may be distracted and give me vague or rushed responses. When I meet him, he is forced to focus his attention on me.'

Gandhi, CEO of Digital Green pointed out that even during the showing of audio-visual material, farmers looked for visual cues that would identify the farmers on screen. Only after being satisfied with the caste, community and wealth class ('Is he one of us?') of the farmer, did they start paying attention to what was being shown. They were more likely to adopt the learning when they identified with the person in the video.

An example of a successful business that applies visual cues to convey trust to customers is Baricho Farmers Store in Karatina, Kenya. The lady running the store told us that when she gets new varieties of seed, she will test them on her own farm first herself. The resulting maize cobs were hung out, and a picture of the maize plant in full growth was laminated, all for her customers to see. The abstract slogan 'this new seed variety improves crop yield' had been made concrete in the form of a cob and plant, one bigger than the other. In the worst case even your customers will be able to discuss defective products with neighbours as a check. Such visual sources of verification will thus ensure that lemons are sorted from the market as swiftly as possible, and thus foster trust. Visual media appear to greatly enhance communication

and understanding. They are able to capture a lot of complexity and present an explanation in simple form. Many technology solutions seem to neglect this value however. They tend to overburden SMS as a singular medium, exceeding the bounds of complexity with which it is capable of transferring information and understanding. The examples above indicate to the contrary that there is a multi-channel requirement on solutions that aim to reach the farmer, with the interpersonal contact and visual support amongst the essentials.

It is all about trust

Trust is a key determinant for adoption of any service or



Impression of Baricho Farmers Store in Karatina, Kenya

system. With all the factors we have been able to observe in this study, factors that generally form the pitfalls for projects attempting to convey information and technology services to farmers, trust keeps recurring. It comes into play in interpersonal relations, in interactions with a text messaging service, with visual demonstrations, and through an insider's understanding and expectations of how an (informal) social system works. Trust can make or break realisation of the initial intent a project sets out with. Overall, the society around the developing country farmer is predominantly system sceptic. Everything is questioned, and needs to be verified from multiple sources before serious consideration is even given. But that doesn't take away the fact that mechanisms for trust enforcement do exist, and thus implies that there are opportunities for trust creation and enhancement. The points we have mentioned in this part are observations on what stands in the way of adoption. Essentially, these points must not be seen as hindrances, to be avoided. Rather they are potential levers for raising a structure of trust that can surround and enhance a project's intent. These levers just need to be grasped and pulled in the right direction. In summary we would thus deliver recommendations for projects to:

- 1 Integrate and include to treat fragmented service provision, to improve interoperability, and link with the information ecosystem.
- 2 Emulate institutional arrangements prevalent in the informal market context.
- 3 Reduce complexity so as to enhance understanding by making information contextualised and actionable.
- 4 Provide interaction on human terms with personal and visual proof.



4 Farmer involvement for real impact

The impetus behind this research series has been the theme of shifting emphasis in development from aid to trade. This shift in orientation, particularly in the context of sustainable agricultural value web development in the developing world, implies that the humble producer, once considered just the beneficiary of the various PPP programmes should be considered as the most important stakeholder. The farmer is the critical link in any value chain of social and economic benefit if the shift from aid to trade is to result in outcomes with impact. Our research findings lead us to conclude that the farmer's existing knowledge and expertise, or their experience in the context of the agricultural value web is rarely taken into account when programmes or solutions are designed. Simply the discovery that there is already in existence a complex web of trust and transaction with a flow of information and resources relied upon by producers, when external actors have based their programme design on theoretical models of the value chain is one such glaring disparity. It can only lead to a cascading series of fundamentally inaccurate assumptions on the

The farmer is the critical link in any value chain of social and economic benefit if the shift from aid to trade is to result in outcomes with impact.

requirements or needs in the local context. Not involving the farmer will probably lead to no adoption of recommendations after the attractive rewards provided by donor funding are withdrawn.

The farmer as an entrepreneurial businesswoman

Every actively engaged farmer we met, whether big or small, growing cash crops or mixed use, already upwardly mobile or just taking the first steps out of subsistence, first and foremost thought of herself as an entrepreneur. The farm is her livelihood, a business activity whose returns must be weighed against the investments made in time and money. And as businesspeople, farmers will grow what sells, hence the prevalence of maize and beans seen in the majority of the lower income farms in Kenya. Demand is guaranteed for these staples in the local market. Innovators who took the risk of planting a different crop based their decisions on the information gleaned from their extended social networks on patterns of demand as an indicator for decision making. Even the humblest farmer, such as Mama Mercy, invested in a breed milk cow in the hopes that daily milk sales would provide an improved cash flow for household needs. Donor-funded initiatives from the outside seeking to promote a certain crop or agricultural innovation, not taking the cost benefit analysis to the farmer/entrepreneur into account nor providing clearly demonstrable returns such as the larger cob of maize from the more expensive seed, face a barrier to the sustainable adoption of their intervention.

Programmes have to prove their value

Interviews in rural Kenya, particularly with a private agricultural extension consultant, Geoffrey, in the coffee-growing region of Karantina (Nyeri) revealed that an increasing number of private brands such as Dolman's Coffee were engaged in competition with each other in order to capture the best harvests for their supply chain. These firms were engaged in market promotion and communication behaviour similar to consumer product brands, such as brand roadshows, attractive giveaways, brochures and leaflets, to convince farmers to sign up as a supplier with them instead of the others. Increasing private sector competition had shifted the onus of demonstrating value onto the buyers rather than the producers.

As the emerging economies of Sub-Saharan Africa become ever more attractive to investors and domestic brands claim their stake, the natural impact on the local market will be increased competition for the favourable opinion and harvest of local producers. Donor-funded programmes and NGOs, which enjoyed a virtual monopoly of the farmer's time and attention in the absence of viable alternatives, will face increasing competition requiring them to make a case for why their programmes offer greater returns than others. When current day PPPs or mobile solutions seem to lack contextual relevance or value, they are less likely to be adopted, again acting as their own barrier to local impact.

The possibilities of the new information landscape

Analysis of the information technology solutions and tools lead us to identify the assumptions underlying their conception and design that could be said to be the key barriers to their successful implementation and adoption among the target audience. These can be clustered into two key areas.

The rise of the African ICT industry due to extremely affordable mobile devices and decreasing prices of voice and data services is changing the information and communication landscape of rural regions in the developing world. Particularly in Kenya, these market forces are transforming rural societies in ways we are just now beginning to discern. Innovations like Safaricom's MPesa mobile money transfer system and the rise of popular social networks are connecting beachboys and subsistence farmers alike, not only to each other but also to the rest of the world. Increasingly, the youth in Kenya, whether urban or rural, is going online with the handheld computer in their pocket.

Similarly, the Kenyan solar energy and renewables market is being changed by the advent of ever cheaper technology, increasing penetration by the Chinese and numerous new products across all price points and market segments. In the Nyeri region with its emerging prosperity and food security, the home energy market has already progressed to second-hand sales as increasing electrification puts grid power within reach of the emerging middle classes who can afford the connections.

A decade ago, the connective value of television with its power to connect people to the rest of the world, was the demand driver for solar home system installations by the

emerging middle classes of rural Kenya. However, the unforeseen and exponential growth in the mobile phone industry is rapidly dislodging television's primary position, as ever increasing bandwidth and lower data costs offered by mobile service operators tempt people to connect online with the world wide web of humanity. Low service costs and cheap Chinese phones allow the humblest homesteads to proudly possess more than one such device, which need far lower power and less frequent charging than televisions.

Downward price shifts of consumer electronics and concurrent rural upward mobility mean that the original early adopters of modern communication technology (innovation) - the rural elite consisting of schoolteachers, civil servants, health professionals and other salaried middle managers - have progressed to the acquisition of flat-screen Sony Bravias and home stereo systems displayed lavishly even in small dealerships in the more economically developed region visited.

And if they happen to be too remote to connect to the electric grid, they tend to purchase solar home systems of 60W and above. That is, access to electricity infrastructure is no indicator of the rural homestead's upward mobility or purchasing power. All of this has given birth to a plethora of additional non-farm economic activity by rural residents, as affordable solar systems power barber shops and hair salons (kinyozis), general stores and rural hotels/bar & restaurants that use lights, music and color television to attract customers after nightfall.

Thus, it can be said that just as mobile phones are rapidly overtaking radio and television's role as the 'connectors' to the outside world when prices dropped for

both phones and solar energy, the biggest shift in the market has been the 'democratisation' of modern technology among the mass majority of the rural population. Modern energy, in the form of a solar home system, is now an accessible aspiration for many, if not already within financial reach for far more people than before. This 'democratisation', in turn, raises the bar of aspirations among the rural Kenyan population, whether it's sending a young daughter to university or investing in a solar powered water pump for irrigation.

In this dynamically changing environment, the mistaken assumptions underlying the design of e-Agriculture and mAgri services are glaringly obvious when they seem to reflect an obsolete and static perception of the poor African farmer, remote and isolated from the modern world.

Local solutions for local problems

The majority of the donor-led programmes aimed at improving the lives of those in developing countries tend to focus on them as passive consumers of innovation - whether its innovative services on the mobile platform, as in this case, or whether it's the plethora of designer products like smokeless cooking stoves, solar lanterns and water pumps. Few PPPs, if any, have targeted the indigenous innovators, creators and makers - especially those spread out in the hinterlands, away from the sprawling, opportunity-laden urban metro capitals. For a variety of reasons, including education and/or orientation, any mention of existing or locally developed solutions is left off the table when discussions about wealth creation and poverty reduction take place, and are even not considered as first prototypes for what works in the local context. This leads to products and

services developed remotely and in isolation from the local context and market being introduced as 'world-changing' or 'paradigm-shifting', particularly by donor-funded social enterprises thus insulated from the natural feedback provided by the local market in the form of sales figures or consumer response.

Taken together with the dynamic, globally connected environment described above and the influence of the 'Rising Africa' narrative prevalent in the media; this is leading to increasing pushback from local technology ventures and start-ups more attuned to the needs of their rural brethren. Charity distorts natural market mechanisms of pricing and competition as customers naturally gravitate towards that which is free or subsidised versus the higher market-driven pricing from local businesses seeking to sustain themselves on revenue generated rather than funds donated. The democratisation of global information and communications technology has now given voice to the urban, educated youth, who, like their peers in Silicon Valley or Bangalore, seek fame and fortune as the next successful startup to be purchased by a Google or aim to become the respected founders of innovative ventures.

On any global communication platform, Africans will be the first to point out the fallacy of the underlying assumption being made in this situation that only the first world is capable of providing modern innovative solutions for their problems.

Programme goals, outcomes and design should be driven by real people's real lives, dreams and aspirations not our assumptions alone.

Mama Mercy aspires to send her son to university, and so she puts away every spare shilling towards this future goal. That is why she was more easily convinced to invest her savings in a dairy cow, which could provide her with an increase in steady flow of cash, rather than purchase more land to expand her holdings as some might advise

or invest in a certification process. While every farmer may have their own dreams, one can identify and segment clusters by similarities in needs or goals. For example, those seeking to increase their cash flow; those seeking to save for future plans like a house or higher education; or those seeking to expand.

Do the programmes have a viable business model that will sustain them after donor support ends?

An early-on programme incubation period, before programmes are formalised, could provide basic validation of models and tools to co-create a shared narrative, understood and owned by all stakeholders. Such a discovery driven process also offers the means to capture feedback

and weak signals embedded in programme implementation design that would ensure earlier, faster, more flexible and cheaper adjustments. In the end, this would ensure a programme's best fit to the needs and wishes of the target segment as a lasting outcome.

*A coherent narrative for the project rationale for all stakeholders, with the farmer being the most important stakeholder.
Do the aims offer long-term value for time or effort invested by her?*

The producer in a value chain is often viewed through a narrow lens - as a coffee farmer, a dairy farmer or as a banana farmer. But in reality, she is all of this and more: she's an agro-entrepreneur managing a broad portfolio of crops, working within a complex ecosystem, seeking to make it work for her. Her continued participation in a programme or adoption of innovation is based on her

cost/benefit analysis of where her time and energy can be spent. Narratives that support a holistic perspective, connecting issues like food security, sustainability, income stability, as well as aspirations, for all the stakeholders involved, will have the best chance for sustainable success.

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