

Can the TV makeover format of edutainment lead to widespread changes in farmer behaviour and influence innovation systems? Shamba Shape Up in Kenya



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ABSTRACT

Edutainment, the combination of education with entertainment through various media such as television, radio, mobile phone applications and games, is increasingly being used as an approach to stimulate innovation and increase agricultural productivity amongst smallholder farmers in sub-Saharan Africa. Shamba Shape Up, a widely publicised makeover reality TV programme, is an example of edutainment that has received considerable attention, and airs in three countries in East Africa where it is estimated to be watched by millions of viewers.

There is no published academic research on the influence of makeover television formats on innovation systems and processes in smallholder agriculture. Using an Agricultural Innovation Systems approach, this paper explores how makeover edutainment is influencing smallholder farmer innovation systems together with the effect this is having on smallholder farms. In the absence of previous research, it articulates a Theory of Change which draws on research traditions from mass communication, agricultural extension and innovation systems.

Data came from two large scale quantitative (n = 9885 and n = 1572) surveys and in-depth participatory qualitative research comprising focus group discussions, participatory budgets, agricultural timelines, case studies and key information interviews in Kenya. An estimated 430,000 farmers in the study area were benefiting from their interaction with the programme through increased income and / or a range of related social benefits including food security, improving household health, diversification of livelihood choices, paying school fees for children and increasing their community standing / social capital.

Participatory research showed SSU enhanced an already rich communication environment and strengthened existing processes of innovation. It helped set the agenda for discussions within farming communities about opportunities for improving smallholder farms, while also giving specific ideas, information and knowledge, all in the context of featured farm families carefully selected so that a wide range of viewers would identify with them and their challenges.

Broadcasts motivated and inspired farmers to improve their own farms through a range of influences including entertainment, strong empathy with the featured host farm families, the way ideas emerged through interaction with credible experts, and importantly through stimulating widespread discussion and interaction amongst and between farmers and communities of experts on agricultural problems, solutions and opportunities. The fact that local extension workers also watched the programmes further enhanced the influence on local innovation systems.

The findings indicate that well designed makeover edutainment can strongly influence agricultural innovation processes and systems resulting in impact on the agricultural production and behaviours of large numbers of smallholder farmers.

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1. Introduction

Smallholder farming has been given renewed focus on a global scale (APP, 2010; FAO, 2014; WFP, 2011), with donors, NGOs and private foundations moving their focus to small scale farming as a way to combat poverty and food security and to meet the development goal of eradicating poverty and hunger. Initiatives such as the Alliance for a Green Revolution in Africa (AGRA), the Africa Progress Panel, the Bill and Melinda Gates Foundation and African Smallholder Farmers Group (ASFG) see small scale farms as central to agricultural growth and poverty reduction. Despite the acknowledged importance of smallholder farming questions remain regarding the future viability and productivity of small farms (Collier and Dercon, 2014) and in sub-Saharan Africa agricultural production still lags behind population growth.

Policy makers, NGOs, government ministries and research institutions are using a range of different approaches to stimulate increased productivity and incomes. One of these is edutainment, an approach that mixes education with entertainment through various media (e.g. television, radio, mobile phone applications and games) in an attempt to influence the knowledge, perceptions and behaviour of specific audiences. While edutainment has been shown to be successful in a wide range of public health, health promotion (from HIV/AIDS education to promotion of breast feeding and vaccination) and other public policy settings (Dway et al., 2016; Flora et al., 2014; Forster et al., 2016; Jana et al., 2015; Jenkins et al., 2012) there is little published research on its use and impact in agriculture.

Alongside the increased focus on small scale farming from a policy level there has been a concerted effort to better understand how change occurs in smallholder farming systems and what stimulates change. These efforts can be broadly understood within the framework of agricultural innovation systems thinking. This paper seeks to explore how a novel form of edutainment is influencing smallholder farmer innovation systems and the effect this is having on the farm.

The educational-reality television programme Shamba Shape Up (SSU) aims to encourage change by imparting critical agricultural technical knowledge, awareness and skills to viewers on a large scale and to diverse audiences. SSU is a new departure in edutainment agricultural programming, bringing a 'makeover' format of reality television into the context of smallholder farmers and farming. It is very different from conventional farm broadcasting but also to more commonly used forms of edutainment such as soaps, and is estimated to have millions of viewers across three countries in East Africa. Each weekly instalment involves a visit to a farm (Shamba) by well-known presenters where current problems facing a host smallholder household are discussed and then addressed practically with the help of experts. Direct linkages between watching SSU and behaviour change that enables a farmer to improve productivity have not yet been proven. Within this context, this paper sets out to answer two main questions; what is the effect of SSU in Kenya specifically as an example of the makeover form of edutainment? And how is it influencing smallholder innovation systems?

2. Developing a theory of change for Shamba Shape Up

Theory of Change (ToC) represents a long evolution of the evaluation process that is meant not only to understand or predict outcomes, but also to understand the deeper meanings and reasons as to the 'whys' and 'hows' of specific actors, actions or interventions. With its theoretical roots based in the 'logical' model approach, ToC differs from the 'classic' model by the way in which it deals with assumptions (Batchelor and Goodman, 2012). Increasing understanding of assumptions results in a more reflective process of understanding individual, communal and cultural values, norms, processes and ideological perspectives or philosophies (Vogel, 2012; Guijt and Retolaza, 2011).

To develop a ToC for SSU as a basis for researching its effect, we

drew upon three main bodies of literature: mass media and society, extension and advisory services and innovation systems in smallholder agriculture. The fundamental question which the ToC sought to address is whether a link can reasonably be expected between the broadcasting and viewing of SSU, and changes in farmer behaviour, smallholder productivity and farm family incomes.

2.1. Mass media and society

Most research on the influence of broadcast mass media on farmers and the agriculture sector has been based on the assumption that the role of mass media is to make useful information available to a mass audience. Further, it has assumed that programme makers, or those experts advising them, know what information farmers (and other viewers) need and what changes are desirable, whether for individual farmers (e.g. more efficient use of expensive inputs) or for society at large (e.g. reduced pesticide residues on food products sold in local markets). While information dissemination is an important capability and function of mass media, their role in society goes far beyond that (McQuail, 2010) including agenda setting, stimulating discussion and challenging audience perceptions. The full range of roles can be expected to be at work in effective broadcasting to support agricultural innovation.

Farmers rely heavily on information gathering through often complex social networks (fellow farmers, family, extension agents, input suppliers and markets) (Manfre and Nordehn, 2013; Muhammad and Garforth, 1999). However additional media for information communication are ever increasing and expanding (radio, print, mobile phones, television and the Internet) (Manfre and Nordehn, 2013). Manfre and Nordehn found that information dissemination via different types of ICT was most popular and information was most likely to be used when a combination of human and technology-based communication is featured (Manfre and Nordehn, 2013, p. 7). It is possible that specific socio-economic factors may have considerable weight or influence on the actual use of information to make changes at farm level, such as education levels, skills training, physical infrastructure and communication organisation (Lio and Liu, 2006).

Manfre and Nordehn (2013) also found that farmers believe information to be useful and credible when: it is presented by perceived experts, it is provided by individuals within their own social network, they have actually witnessed the impact, and they are able to test the quality of the information themselves (p. 5). Anderson and Feder (2004) found that while appropriate information may be being transferred, uptake and adoption also relies upon and is determined not only by local availability of inputs, technology and services but by a farmer's perception of risk and potential profitability (cf. Lio and Liu, 2006).

Television's use as edutainment has a long history in the telenovela dramas originating in Mexico in the 1970s, a format that has spread to many other countries (Tufté, 2005), in which social issues are portrayed and explored in dramatic but realistic 'everyday' settings. A strong body of theory has developed, based on robust evaluation, on how such dramas can influence audiences at emotional, cognitive and behavioural levels (Bandura 1977; Cody et al., 2004). More recent reality television formats involve the audience directly, with audience members telling their stories to a national audience and interacting with experts or celebrities in activities which entertain the audience while enabling them to explore possible implications for their own situation (Burger, 2012). Obregon and Tufté's (2014) review of research on Edutainment acknowledges that it is 'a highly successful communication strategy that has achieved global recognition as a useful and effective approach to tackling contemporary development challenges' which had its origins in agricultural extension services. However the studies covered in their review focus on soap opera formats, and makeovers are not mentioned. A literature search on the impact of makeover television programmes more broadly yielded no results which highlights the importance of this study.

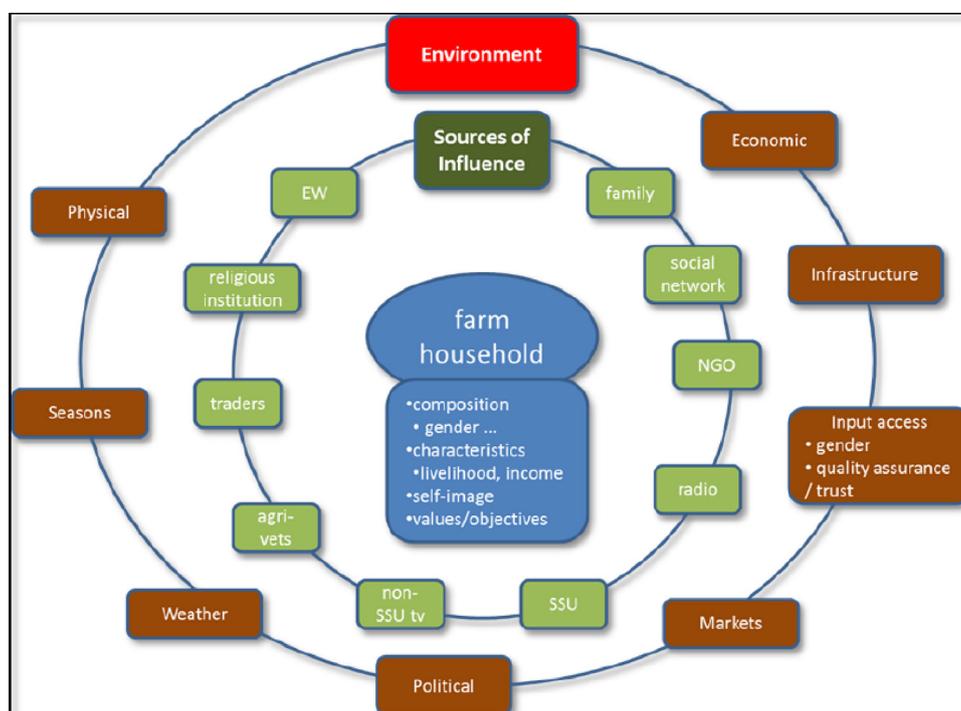


Fig. 1. Sources of information, influence and constraints on farm household decisions.

2.2. Extension and advisory services

Much has changed since advisory services were premised on the simple notion that all that farmers needed was to have the latest science-based advice and information passed on to them through an efficient, well-drilled cadre of extension workers. Current thinking, based on considerable research and evaluation over the past 15 years or so, is that advisory services are most effective when they are demand driven, based on dialogue between farmers and information providers, acknowledge the importance of social learning (Birner and Anderson, 2007; Garforth, 2004; Swanson, 2008), focus on addressing farm-level and systemic problems rather than pushing pre-planned technical ‘messages’, and operate within an economic and institutional environment that supports innovation and enterprise among farmers (Chipeta, 2006).

This idea acknowledges that farmers are active seekers of information, not just passive recipients; and that advice works best when it addresses a problem or an opportunity that farmers have identified – a feature that is built into the production process for SSU and is portrayed on screen. In this way, SSU is fulfilling an important role of advisory services, to stimulate demand for advice and information. As Chowa et al. (2013) explain, the idea that extension should be demand-driven comes from two main strands of thinking. First, top-down, supply-driven extension, as in the former Training and Visit system (Anderson and Feder, 2004) and its various modifications, was shown to be effective only in contexts very different from the diversity and pluri-activity (Brookfield, 2008) that characterise smallholder farming systems in most sub-Saharan African countries. Second, significant market failures in both the demand for and the supply of agricultural advice and information are common, partly because information is intrinsically a public good but also because providing and accessing it involves high transaction costs and information asymmetry; farmers may also discount the potential value of information and advice from some service providers (Beynon et al., 1996).

2.3. Innovation systems in smallholder agriculture

Stephen Biggs proposed his ‘multiple sources of innovation model’

for understanding technological change in smallholder agriculture nearly 30 years ago (Biggs, 1990). Since then, interest has grown in using innovation systems frameworks to explore smallholder farmers’ response to new ideas as they seek to respond to challenge and opportunity (Spielman et al., 2011). Innovation system concepts have been reflected in recent extension policy reforms, including in Kenya (GoK, 2012). Above all, innovation systems perspectives put the contribution of information and advice from service providers into context, by acknowledging the many other factors that influence not only farmers’ ability and willingness to try out new ideas and make changes in their farm enterprises, but also the extent of any consequent improvements in productivity, income or livelihoods. Four key innovation systems ideas relevant to SSU are that there are multiple actors within an innovation system, that farmers are active seekers of information, that innovation is a process not a once-for-all event, and that innovation at farm level always involves an element of adaptation (Chowa et al. 2013).

Fig. 1 shows the range of factors that might influence the decisions of a farm household, seen as operating within an innovation system. The household’s own characteristics and composition will affect the availability of labour and other resources as well as its goals. It is well known from literature that there are gender differences within innovation systems (Hambly Odame et al., 2002; World Bank, 2009), for example in the way men and women access, evaluate and use information as well as in their access to productive resources (land, capital, credit). Then the household interacts with many different sources of information and influence, from within their network of family and friends, from mass media, from public, NGO and commercial providers of information: SSU is both an additional source of information and influence, and at the same time a potential source of influence on other innovation system actors. Finally, there is a set of factors which might constrain farmers in their decisions and their ability to put their decisions into practice, ranging from seasonal and weather factors, to physical infrastructure, regulations, and market conditions.

2.4. Theory of change for Shamba Shape Up

SSU is a new departure in agricultural programming. It brings a

particular format of reality television – the ‘makeover’ – to a novel context, that of smallholder farms and farming in Kenya. It is very different from conventional farm broadcasting, which seeks simply to transfer information to large numbers of farmers, beaming information into millions of homes at a fraction of the cost of an extension worker meeting with an individual farmer, or a group of a few dozen farmers. SSU incorporates key ideas from mass media theory, good practice in extension and advisory services and innovation systems frameworks.

SSU goes far beyond the broadcasting of information, from a pre-scripted lecture or documentary or discussion; beyond even the interactive ‘phone in’ format that is now widely used in farm radio programming. It brings multiple experts to a farm household. SSU represents social learning, which is an essential element in more interactive, participatory approaches to agricultural extension and innovation. The audience eavesdrops on the conversations between household members and experts, understanding and empathising with the former and wanting to see how the interaction will find a positive way forward for the farm. A key feature of good reality television is that the audience’s emotions are engaged, not just their cognitive faculties. If the farm has been selected well, then many in the audience will identify with the situation, challenges, doubts and aspirations of the host family.

There are four parts to the ToC for SSU.

(i) Production

The producers of SSU bring together three different parties, each with an interest in ensuring smallholder farmers are supported in improving their farms and livelihoods: funders of the programme, research scientists and farmers. This way SSU manages to address both the supply (funders and research scientists) and demand (farmers and other users) sides of the provision of agricultural information.

• Broadcast

An episode of SSU contains useful information, but it is much more than a simple vehicle for that information. Information and advice are presented in a context in which they are useful and are likely to receive a positive response. The audience is able, vicariously, to share in the process by which the farm household comes to a decision on the changes to try out on their farm. The broadcast also gives information on where farmers can source inputs they might need and on the government, NGO and commercial support that is available. The process of design and production, and the broadcasts themselves build in current ideas on good practice in extension and incorporate an understanding of the role of media in society and social and economic change.

• Audience

The SSU audience identifies with the household on screen, not necessarily because they live in identical circumstances but because they share the same aspirations of wanting the best for their families and their farms. This leads to empathy for the household and engagement with the process of identifying opportunities for change, enhancing the likelihood they will learn, remember and try out ideas that are relevant to their own farm. Farmers are also likely to discuss the broadcast within their family and with other farmers, which may lead them to seek further information either from SSU or from more local sources, enhancing the learning process and potential to try out new ideas.

Not all of the audience will be farmers. Many will be living in urban areas with relatives in their home village who may contact them to discuss what they have seen on SSU. In many cases, these urban viewers may be key decision makers on the family farm and may be the ones who can provide investment to put new ideas into practice. Other viewers may include extension workers or other actors within the farmers’ innovation system; they may find that the programme helps

them to learn how they can be more effective in their support for farmers. The flow of information is not only from the broadcast to the farmer, but via multiple channels. Furthermore, it stimulates actors to seek/revisit information already available within the innovation system. This way, SSU can be seen to be supporting the whole innovation system.

• Outcome

The impact of SSU on incomes and livelihoods and the wider agricultural economy will be felt through the outcomes of changes that farmers make in their farm enterprises. Ideas featured on SSU aim to lead to increases in one or more of the following: output of a featured commodity; yield per unit area or animal; use of purchased inputs; prices received for produce sold (through improved quality or more effective marketing); net returns from an enterprise; nutrition and food security for the farm household.

These four parts should not be seen only as a linear sequence of events. There are important feedback and cyclical elements within the ToC. Outcomes feed into the ongoing interactions among the audience. Requests from the audience to the production team for further information reinforces and extends learning and outcomes.

3. Objectives

The objectives of this paper are to measure the outreach and effect of SSU on smallholder farmers and to investigate the processes by which the programme is influencing smallholder innovation systems. To address these objectives two key questions are asked:

- 1 What is the outreach and effect of SSU on smallholder farmers?
- 2 How many farmers are being reached by SSU and who are these farmers?
- 3 What are the economic and social benefits gained by farmers as a result of viewing SSU?
- 4 What is the process by which SSU influences change?
- 5 How is SSU influencing farmers’ decision making and activities?
- 6 What role does SSU play in farmers’ innovation systems?

4. Methodology

4.1. Approach

A mixed methods approach, combining quantitative and qualitative methods, was used to assess the outreach and effect of SSU and to understand the process by which it influenced farmer decision making. The study began with a listing survey of male or female household decision makers ($n = 9885$) which covered 119 randomly selected Kenya National Bureau of Statistics Enumeration Areas¹ and was used to quantify TV ownership and SSU viewership. The listing survey was followed by the main quantitative survey ($n = 1572$)² which investigated in more detail the practices, attitudes and effect of the programme on various enterprises.³ Running concurrently, Participatory Qualitative Research (PQR) specifically focused on establishing the processes through which smallholder farmers interact with SSU, the extent to which they are making changes to their farm enterprises influenced by SSU and the social and economic effect of those changes on the farm and household. The PQR relied on both the listing survey and the main survey data for the identification of the sites and participants.

¹ The study population is defined by the population of households in the counties targeted by SSU during their broadcast seasons of 2012 and 2013.

² 893 SSU viewers and 679 non-viewers.

³ In order to avoid potential bias in responses questions that mentioned SSU were placed at the end of the survey and therefore after all details of farmer practices and changes had been explored.

Table 1
Participatory Qualitative Research tools.

Tools	Clusters	Muranga	Nakuru	Total
Key Informant Interviews (KIIs)	Farmer KIIs (case studies)	12	11	23
	Other Actors	10	7	17
	Total KIIs	22	18	40
Focus Group Discussion (FGDs)	Male FGDs	1	1	2
	Female FGDs	1	1	2
	Male & Female FGDs	3	3	6
	Total FGDs	4	4	10
Participatory Budgets and Effects Diagrams (PB & EDs)	Maize PB & EDs	18	19	37
	Dairy PB & EDs	15	6	21
	Total PB & EDs	33	25	58

Specific PQR tools used included 1) Participatory Budgets (PBs), 2) Effects Diagrams, 3) Focus Group Discussions (FGDs) and 4) Key Informant Interviews (KII). Participants from two districts were selected from those interviewed in the listing and main surveys (Table 1) and in some cases (30 of 72 PBs) snowball sampling was used to identify additional participants.

KIIs were conducted with three categories of interviewees; service providers (extension agents, county government officials, input distributors, traders and seed distributors), farmer case studies (identified in the focus groups) and urban-based viewers (identified in PBs and FGDs before follow up by the PQR team). FGDs used tools including agricultural timelines to develop a picture of the overall agricultural system in the study sites, enterprise histories to understand how specific changes in enterprises had taken place, and communication maps to build up a visual picture of the agricultural innovation system in an area. PBs are participatory farm management tools (Galpin et al., 2000) that were used here to understand how farmers allocate resources on their farm and to isolate changes in farming practice that may have a positive or negative effect. The PBs recorded all of the activities, inputs and outputs of an enterprise, together with their timing, and enabled calculation with each farmer of gross margins. In this study, PBs were used to isolate the effect of a change (i.e. a practice or practices now used as a result of SSU or, in non-viewers, those influenced by other sources) so a second PB was drawn to provide a counterfactual (i.e. what would have happened under the same overriding conditions if the change hadn't been made). The two PBs were then compared and the difference made by the change isolated. Effects diagrams were used to identify and quantify financial and other, non-financial, differences that resulted from the changes that farmers had implemented on their farms.

4.2. Study area

The quantitative surveys covered the main target areas for the SSU programme, i.e. south west Kenya as is shown in Fig. 2:

The PQR was carried out in purposively selected sites based on preliminary analysis of the listing survey data. The analysis was used to classify areas with sufficient numbers of SSU viewers who identified themselves as maize and/or dairy farmers (see 4.3 below). As a result two counties in Central and Rift Valley Provinces of Kenya, Muranga and Nakuru were selected.

The exclusion of urban areas from the sampling frame may lead to the charge that the sampling frame excluded important segments of the population that watch SSU. We took the view that any effect on farms from urban viewing of SSU would be picked up from farm households that are influenced by information, advice, encouragement and finance from urban viewers.

4.3. Choice of enterprises

SSU broadcasts have covered a broad range of agricultural

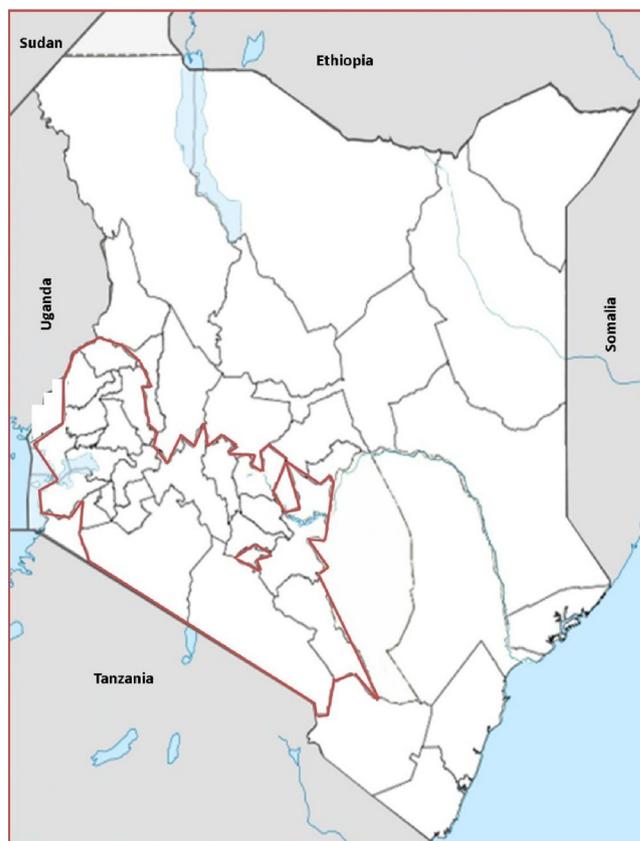


Fig. 2. Map of Kenya highlighting study area which covered large parts of the south west of the country, i.e. large parts of the South West of Kenya (amended from: http://en.wikipedia.org/wiki/Busia_County#mediaviewer/File:Busia_location_map.png).

enterprises and specific agricultural practices. Within the time and resource limitations of this study, only a specific selection of practices could be investigated. Two enterprises, maize and dairy, were chosen as they were considered to be enterprises on which SSU had focussed and within which the effect of the programme could be measured. Selection of the specific practices was achieved through a systematic process using criteria based on frequency of transmissions on practices and previous survey results. The final choice of enterprises was agreed with members of the SSU production team who had intimate knowledge of the programmes. The process also benefited from consideration and discussion at a Study Design Workshop which obtained input from a range of actors with experience of the agricultural innovation system in Kenya.

4.4. Categorisation of viewers

One of the key steps in investigating the effect of SSU was to understand how different farmers may have been influenced by the programme. Box 1 outlines a four-fold classification of farmers that was used for the purposes of this research. The categories were developed retrospectively through initial analysis of the survey results.

Social and economic characteristics across the four groups were compared as it was important to ensure that the categories were only different in their relationship to SSU. With regards to age and gender of respondents there were no significant differences between the categories outlined in Box 1. Other household characteristics, including gender of household head and size of household also showed negligible and non-significant differences. Farm and herd sizes are similar across the defined categories. There were differences in the level of education of respondents across the categories. Respondents who recorded higher

levels of education were significantly more likely to be viewers of SSU than non-viewers but there was no significant difference between viewers, influenced by SSU and viewers, not influenced by SSU. Viewers of SSU, whether they were influenced or not, also on average scored higher on the Progress out of Poverty Index (PPI⁴). SSU viewers were less likely to be below the \$2.50 per day Purchasing Power Parity poverty line. It is important to note that PPI score may be a cause or an effect of the respondent's relationship with SSU.

5. Results

This section first outlines some key results from the listing survey which estimate the viewership of SSU in the study area and provide an indication of how those viewers are interacting with the programme. The results from the in-depth investigation of maize and dairy practices promoted by SSU are then presented before an estimation of the effect of these practices on a large scale is reported. Following the section on large scale effects, the paper uses results from the PQR study to explore how the changes farmers make effect outcomes at the farm and household level, and how SSU has influenced farmers' innovation processes and the innovation system.

5.1. Are respondents watching TV and Shamba Shape Up?

The listing survey gathered data about the main decision maker and their farming households, including their age, gender, the farming enterprises that they practice, TV ownership and viewership and whether or not they watch SSU. The estimated number of households in the study area that had watched TV in the four weeks prior to the survey was 948,388 (32.5%⁵) and the number of households with working TVs in the target area is estimated at 637,851. This represents approximately 21.9% of households.

The listing survey estimates that 368,407 (12.6%) respondents⁶ in the study area watched SSU within the four weeks leading up to the survey. This means that, as a percentage of those who actually watched television in the previous four weeks, more than a third were SSU viewers (38.9%). While the majority of viewers watch SSU in their own home, a combined 43% of all viewers reported that they watch the programme at an external venue such as a neighbour's house or another public place, suggesting that communal viewing of SSU is popular. Those respondents who did report to be SSU viewers were regular watchers, with almost half (43%) reporting that they watch every two-three weeks and more than a quarter (26%) stating that they watch the programme every week.

5.2. Practices promoted by SSU

The practices recommended and demonstrated by SSU differ by enterprise and only the most commonly promoted practices were analysed using data from the main survey. For the purpose of this research twelve practices were analysed for maize and thirteen for dairy. The practices suggested by SSU are some of the most common practices promoted and demonstrated in Kenya by a variety of agricultural service providers, which makes attribution to a specific source of information or advice more difficult.

5.2.1. Maize

The twelve maize practices that have been promoted by SSU are shown in Table 2 together with the percentage of respondents from

⁴ PPI is a poverty measurement tool. For more information see <http://www.progressoutofpoverty.org/>

⁵ This figure is very similar to the estimate (33%) from IPSOS, collected on behalf of Kenya Advertisers' Research Foundation (KARF).

⁶ The level of viewership was estimated on a household basis so the actual number of viewers is likely to be higher than this.

each category who reported using them. Some individuals may have started these specific practices before SSU programming and some may have adopted part or all of the practice from the influence of SSU.

As shown in Table 2, the most popular practices for viewers who are also influenced by SSU are: purchasing maize seed from an agro-dealer/shop (84%); weeding maize two times (or more) (84%); applying fertiliser at planting (71%); intercropping (59%); applying top dressing fertiliser (54%); and using spacing suggested in best practice advice (51%).

SSU influenced households are significantly more likely ($p < 0.01$) to carry out ten of the twelve practices (the six listed in the previous paragraph plus purchasing seed for intercropping, applying fertiliser with manure at planting, testing the soil in your farm and using actellic in stored maize) than the other two categories.

Fig. 3 shows that, of those viewer influenced households carrying out each of the maize practices, a large proportion specifically stated that they were influenced by SSU to employ that practice. The graph shows that this is especially the case concerning application of fertiliser, top-dressing, mixing fertiliser with manure and purchasing seed from an agro-dealer.

The results displayed in Table 2 and Fig. 3 suggest that SSU is influencing a considerable number of farmers to undertake promoted practices in their maize enterprise.

5.2.2. Dairy

The thirteen dairy practices demonstrated in SSU programming were investigated. Table 3 shows the specific practices and the percentage of respondents in each category who reported that they utilise them.

The most popular practices adopted by viewers, influenced by SSU are: purchasing supplement feeds or salt licks (81%); deworming cows (79%); spraying cows for ticks or lice (77%); and feeding cows chopped Napier grass (63%).

All of the dairy practices investigated show a statistically significant difference ($p < 0.01$) between viewer influenced and non-viewer non-influenced households, meaning that viewer influenced households are significantly more likely to carry out the techniques promoted by SSU. For ten of the promoted practices (increasing number of adult cows, planting Napier grass for the first time, increasing amount of Napier grass, feeding cows chopped Napier grass, treating mastitis, making and feeding hay, making and feeding silage, constructing a new cow shed and making improvements to cow shed) viewer SSU influenced households were significantly ($p < 0.01$) more likely to carry out the practices than viewer non-influenced households.

Fig. 4 shows that, of those viewer influenced households carrying out each of the dairy practices, a large percentage specifically stated that they were influenced by SSU to employ that practice. The graph shows that this is especially the case concerning construction of a new cow shed, increasing the amount of Napier grass, chopping the Napier grass before feeding and spraying cows for ticks and lice. This, similarly to maize enterprises, suggests that SSU is encouraging farmers to take up techniques for improving dairy enterprises.

5.3. Outreach and effect of SSU

5.3.1. Beneficiaries

Through the quantitative survey it was possible to estimate the number of beneficiary households from SSU. The overall number of beneficiaries, i.e. those households specifically reporting that they had made changes to their maize or dairy practices as a result of SSU or who reported that they had benefited from SSU through increased profit or improved household food situation⁷, is estimated to be 428,566

⁷ i.e. those who may of benefited from information / influence on any of the enterprises promoted by SSU.

Table 2
Maize practices promoted by SSU and the percentage of each category practicing.

Maize Practices	Viewer - SSU influenced	Viewer - not SSU influenced	Non viewer - not SSU influenced
N =	232	486	518
Apply fertilizer at planting	165 (71%)	253 (52%)	259 (50%)
Apply fertilizer mixed with manure at planting	37 (16%)	34 (7%)	31 (6%)
Apply manure at planting	44 (19%)	87 (18%)	98 (19%)
Purchase maize seed from a agro-dealer/shop	195 (84%)	282 (58%)	269 (52%)
Plant a crop in your maize plot as an intercrop	137 (59%)	219 (45%)	228 (44%)
Purchased packed seeds for intercropping from a shop/agro dealer	30 (13%)	39 (8%)	41 (8%)
Planted your maize at this distance 2.5 feet/75 cm between rows and one foot/30 cm between plants	118 (51%)	97 (20%)	140 (27%)
Apply top dressing fertilizer	125 (54%)	170 (35%)	145 (28%)
Weed your maize two times (or more)	195 (84%)	248 (51%)	280 (54%)
Planted Desmodium in the maize field	2 (1%)	5 (1%)	0 (0%)
Use Actellic in your stored maize	77 (33%)	83 (17%)	57 (11%)
Test the soil in your farm	2 (1%)	0 (0%)	0 (0%)

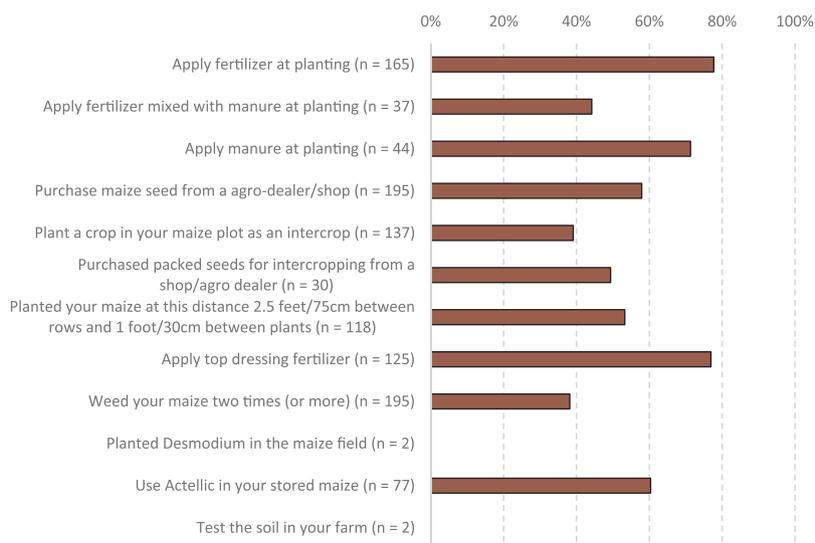


Fig. 3. Percentage of SSU influenced maize farmers carrying out each practice directly stating SSU as an influence that led to that specific change¹¹.

Table 3
Dairy practices promoted by SSU and the percentage of each category practicing.

Dairy Practices	Viewer - SSU influenced	Viewer - not SSU influenced	Non viewer - not SSU influenced
N =	112	323	280
Increased number of adult dairy cows since 2012	30 (27%)	55 (17%)	39 (14%)
Plant Napier Grass for the first time	17 (15%)	32 (10%)	17 (6%)
Increase the amount of Napier Grass	30 (27%)	32 (10%)	25 (9%)
Feed cows chopped Napier Grass	71 (63%)	145 (45%)	92 (33%)
Spraying cows for ticks and lice	86 (77%)	265 (82%)	196 (70%)
Deworm cows	88 (79%)	278 (86%)	216 (77%)
Treating Mastitis	32 (29%)	55 (17%)	31 (11%)
Making and feeding hay	6 (5%)	6 (2%)	3 (1%)
Making and feeding silage	3 (3%)	3 (1%)	3 (1%)
Purchase supplement feeds or salt licks	91 (81%)	226 (70%)	151 (54%)
Ensure cows have enough water all day	52 (46%)	184 (57%)	126 (45%)
Constructed a new cow shed	11 (10%)	13 (4%)	8 (3%)
Made improvements to cow shed	16 (14%)	13 (4%)	8 (3%)

households (14.7% of households in the study area). The study also estimated that 218,562 households were making specific changes to their maize practices as a result of SSU and 65,063 households were making changes in their dairy practices as a direct result of the influence of SSU. Of the beneficiaries of SSU it is estimated that 44%

(188,569 households) are living on less than \$2.50 per day on the basis of the PPI index for Kenya.⁸ It is also possible that the PPI score of households in the survey may have increased due to SSU.

⁸ <http://www.progressoutofpoverty.org/country/kenya>

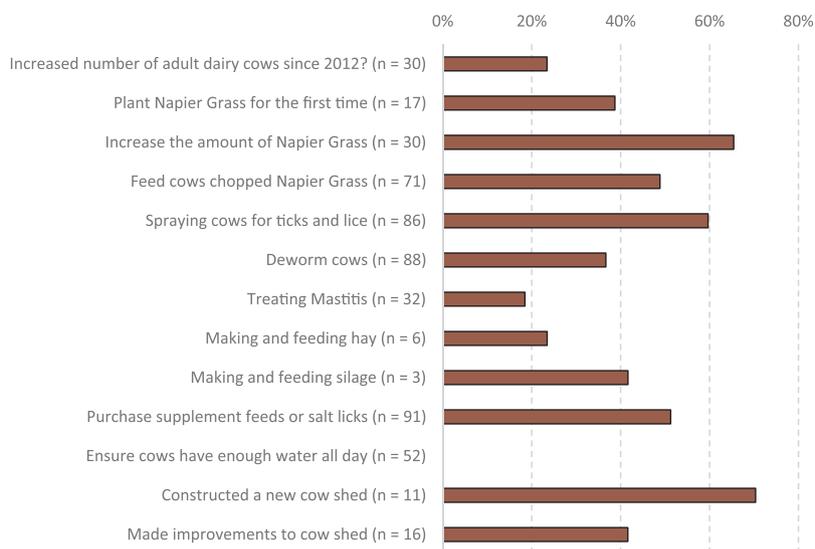


Fig. 4. Percentage of SSU influenced dairy farmers carrying out each practice directly stating SSU as an influence that led to that specific change.

5.3.2. Effect on production

It is clear from the evidence presented in the previous section that SSU is influencing farmers to make changes and to implement some improved practices on their farms. The next section investigates whether these changes are having an effect on farmers' production.

(i) Maize

Respondents were asked whether or not they felt that their maize yields (for at least one plot) had improved because of the practices that they had implemented on their farm. Viewers who were SSU influenced were significantly ($p < 0.01$) more likely to report an improved maize yield due to the changes that they had made when compared to viewer non-influenced or non-viewer non-influenced; with almost double the percentage of respondents recording an improvement in yield (Fig. 5).

The overall picture from the maize enterprise in the study area suggests that SSU is influencing maize farmers to make positive changes in their maize enterprises and that these changes are increasing their available yield.

• Dairy

Dairy farming households were asked whether or not the practices that they were using in their dairy enterprise had improved their yields and the length of time that their dairy cows lactate. A significantly

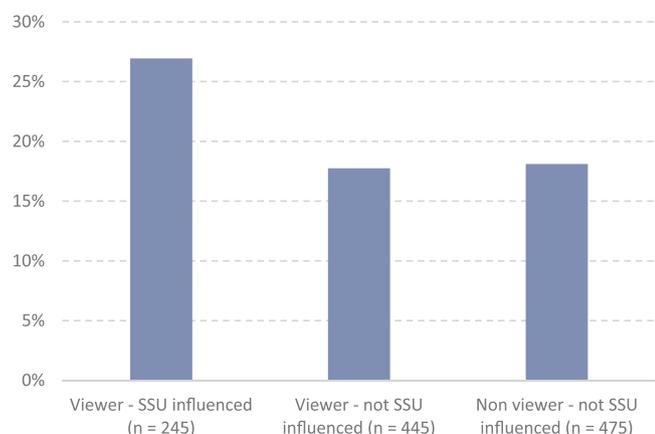


Fig. 5. Percentages of maize farmers who recorded an improvement in their yields due to the practices that they have implemented.

larger percentage of viewer SSU influenced respondents recorded that milk yields ($p < 0.01$) and the length of time their dairy cows lactate ($p < 0.01$) had increased since implementing the practices encouraged by SSU when compared to those households not influenced by SSU (Fig. 6). Three times the percentage of viewer SSU influenced households had seen an improvement in their milk yields and the length of the lactating period compared to non-influenced households (18% compared to 6% non-influenced for yield and 14% compared to 3% for viewer non-influenced and 4% for non-viewer non-influenced for lactating period).

The results for dairy farmers also show a better picture for viewer SSU influenced respondents than their peers. Their perceptions and improved yields point towards improvements in the dairy enterprise in the study area being due to practices and techniques promoted by SSU.

5.4. Understanding the effects of SSU at a household level

The quantitative survey enabled us to understand that SSU is having an effect at the community and national level in Kenya. Participatory tools were used to understand how this effect relates at the household level. The households that took part in participatory budgets activities were practising a mixture of the two selected enterprises: maize and dairy. The sampling strategy for the PB activities was designed to allow two comparisons, the first of these is a before and after comparison in SSU influenced households and the second comparison is the differences made by on-farm changes influenced by SSU and those not influenced by SSU. When making before and after comparisons respondents first constructed a PB for the enterprise for a period after implementation of SSU practices and then were asked to estimate how their enterprise would have fared given the same over-riding conditions (e.g. weather, market prices etc.) but without the changes in practice.

5.4.1. Differences in SSU influenced maize farming households before and after change

Before respondents made the SSU influenced change more than half (11 out of 20) households were recording a positive gross margin per acre and the average gross margin per acre was \$45 (range: -\$1054 to \$822). There were a range of practices influenced by SSU, including mixing manure and fertiliser, purchasing inputs from a reputable dealer, purchasing certified seed, intercropping, top-dressing, using recommended spacing and using foliar feed. Following the SSU influenced changes 19 out of the 20 households recorded a positive gross margin per acre (average \$334, range -\$352 to \$1012; see Table 4).

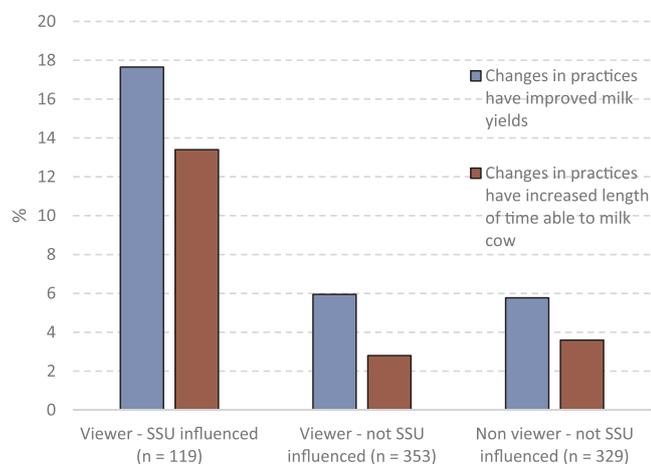


Fig. 6. Percentages of dairy farming households recording improved yields and improved length of lactation.

The average gross margin per acre for SSU influenced households had increased seven-fold following the change/s they had made. Spend on inputs increased by 20% while the average output almost doubled (96%). The majority of the extra produce that resulted from the change was sold (60%). The results presented here suggest that SSU influenced changes are encouraging investment in inputs and also labour as well as increasing output and gross margins of farmers in both sites.

5.4.2. Comparison of the differences made by SSU influenced changes and non SSU influenced changes in maize farming households

As established above, 19 of the 20 SSU influenced households recorded an increase in gross margin per acre. Of the fourteen households that made changes not influenced by SSU, ten recorded improved gross margins, two recorded no change in gross margins and two recorded a negative effect on gross margins following the change.

SSU influenced households increased investments into their maize enterprise as a result of the changes that they made whilst non-SSU influenced households reduced their outgoings post-change. On average, SSU influenced households spent an extra \$38 (53%) on cash inputs and an extra 6% on hired labour per acre as well as increasing family labour by 18%. Non SSU influenced households spent an extra \$12 (15%) on cash inputs but reduced spending on hired labour per acre by 6% and also reduced the amount of family labour they used by 9%.

With regards to outputs, the SSU influenced changes increased production to a greater degree when compared with non-SSU influenced changes. In terms of consumed output, SSU influenced changes increased the amount by 67% (\$354 per acre following the change and \$211 per acre prior to the change) compared to 35% for non-SSU influenced changes (\$311 per acre following the change and \$231 per acre prior to the change). The comparison was even more stark when sales are considered, SSU influenced changes increasing the income from sales by 133% (\$373 per acre following the change and \$211 per acre prior to the change) compared to a 35% increase for non-SSU influenced changes (Table 5).

Overall the SSU influenced changes increased the gross margin by 639% (\$334 per acre following the change and \$45 per acre prior to the change) and the non-SSU influenced change increased average gross margins by 127% (\$297 per acre following the change and \$131 per acre prior to the change). These results suggest that, allowing for the small sample, the changes that are being influenced by SSU are proving to be more successful in improving production and gross margins per acre than those not influenced by SSU.

5.4.3. What do these differences mean for maize farmers?

The above results indicate that SSU is encouraging positive change

on the farm, increasing both investment and production. The effects diagrams enabled farmers to describe what these differences mean in real terms. For example, a male farmer from Muranga (PB/MUR/M/08⁹) reported implementing three of the practices promoted by SSU, including top dressing and using certified seed. He does not sell the produce; however, the increased production has resulted in the household becoming food secure and saving money that used to be spent on food. This money is now used for school fees, clothing and fuel. A female farmer in Nakuru (PB/NKR/M/11) was inspired to make several changes in her maize enterprise after watching SSU, which included applying manure after land preparation, top dressing using CAN, using actellic and inter-cropping maize and beans in different rows. Following these changes she has increased her yield by four 90 kg bags to 18 bags on her 0.75 acre farm; this has brought in an extra \$67 in sales and two extra bags for home consumption which gives her confidence that the family has food for the whole year. She has also doubled her yield of beans now that they have been separated from the maize. Also in Nakuru, farmer PB/NKR/M/05 reported increasing his maize yield by almost half (from 25 to 35 90 kg bags from his two acre farm) which means that he will be able to sell almost ten bags at \$28 per bag (\$280). He perceived this increase to be due to his use of top-dressing after seeing the idea on SSU. The money he makes from sales will be invested in his business, e.g. increasing his stock and buying inputs for the next season. For maize farmers more generally, effects reported fell into four main categories: improved household food security, ability to pay school fees, buying household items and re-investment in the farm.

5.4.4. Differences in SSU influenced dairy farming households before and after change

PB activities were conducted with 12 SSU influenced dairy farmers, eight in Muranga and four in Nakuru. Prior to any changes eight of the twelve were recording a negative gross margin per cow per year with an average of -\$9 (range: -\$1351 to \$504; see Table 6). There were a range of practices influenced by SSU, including improving feed, mixing own silage, chopping Napier grass, zero-grazing, feeding dairy meal, using supplements, increasing frequency of tick control, and building a cow shed. Following the changes, nine of the twelve SSU influenced dairy farmers' recorded positive gross margins and three negative gross margins (average = \$252; range = -\$681 to \$1080).

SSU influenced dairy farmers have, on average, increased their gross margins considerably, moving from recording a small negative gross margin to a gross margin of \$252 per cow per year (Table 6). Most of this increase has been due to large increase in produce for sale (36%) as well as a considerable reduction in family labour used (25%).

5.4.5. Comparison of the differences made by SSU influenced changes and non SSU influenced changes in dairy farming households

As with the maize farmers, we are able to investigate whether the changes that are influenced by SSU have more of an effect than those influenced by other sources. Four of the seven households in which changes were not influenced by SSU recorded positive gross margins (average = \$9; range = -\$658 to \$754).

The results in Table 7 suggest that the SSU influenced changes had more of an effect on households than changes influenced by other sources. SSU influenced households increased their investment in cash inputs by more than a quarter (27%) as well as hired labour (12%) due to their changes but reduced the amount of family labour used by 25%, whilst non-SSU influenced households increased cash inputs by less than a fifth (17%), maintained their level of investment in hired labour and increased family labour by 6%. Alongside the increased investment that is encouraged, the SSU influenced households are, on average,

⁹ Coding: PB = Participatory budget, MUR = Muranga, M = Maize, 08 = Number of exercise

Table 4
Pre and post-change gross margins for SSU influenced maize farmers (mean US\$ per acre).

	Cash inputs	Hired labour	Family labour ^a	Total costs	Consumed output	Sold output	Outputs	Gross margin
Pre SSU influenced change (n = 20)	72	146	108	325	211	160	372	45
Post SSU influenced change (n = 20)	109	156	127	392	354	373	726	334

^a Hours of family labour used for each task were recorded. A rate per hour (40KSH or 0.45USD) was calculated across all households using average hired labour costs.

Table 5
Comparison of mean differences in maize gross margins following SSU and non-SSU influenced change (\$US).

	Cash inputs	Hired labour	Family labour	Total costs	Consumed output	Sold output	Outputs	Gross margin
SSU influenced households (n = 20)	38	9	19	67	142	213	355	288
Non-SSU influenced households (n = 14)	12	-6	-13	-7	80	79	159	166

Table 6
Mean pre- and post-change gross margins for SSU influenced dairy farmers (US\$ per cow per year).

	Cash inputs	Hired labour	Professional costs	Family labour	Total costs	Consumed output	Sold output	Outputs	Gross margin
Pre SSU influenced change (n = 12)	292	68	19	410	789	255	525	781	-9
Post SSU influenced change (n = 12)	371	76	16	306	770	306	715	1021	252

Table 7
Mean difference made by changes in dairy practice (US\$ per cow per year).

	Cash inputs	Hired labour	Professional costs	Family labour	Total costs	Consumed output	Sold output	Outputs	Gross margin
SSU influenced households (n = 12)	80	8	-3	-104	-20	51	190	241	260
Non-SSU influenced households (n = 7)	35	0	1	32	68	11	95	106	38

increased their overall output by almost a third (31%) compared to an increase of 15% in those that made changes not influenced by SSU. Consumed output increased by a fifth and output for sale by more than a third (36%) as compared to a five per cent increase in consumed output and an increase of a fifth (19%) in produce for sale in those households not influenced by SSU. This means that in SSU influenced households gross margins have increased from making a small loss to a profit of \$252 (a difference of \$260) as compared to an increase of \$39 in non-SSU influenced households.

5.4.6. What do these differences mean for dairy farmers?

Similarly to maize farming households, results from dairy farming households suggest that SSU is encouraging positive change. Typical results from the effects diagrams are highlighted here to help explain what these changes mean to individual households. In Nakuru, farmer PB/NKR/D/02 has built an improved cattle shed for his two Friesian cows, sourced better AI services and started to use dairy meal for his cows. These changes have been encouraged by SSU and have increased his overall milk yield by 50% (from 12 to 18 litres per day from his two cows). The extra milk yield adds to that consumed in the home and the sale of milk supplements school fees for three of his children. The management changes have also improved the health of his livestock and treatment costs have reduced. The farmer described SSU as “phenomenal”. An example of a female farmer in Muranga was PB/MUR/D/14 who spoke of sharing the information that she receives from SSU with her women’s group. SSU encouraged her to increase the frequency of spraying for ticks and de-worming as well as feeding her cow dairy meal during the drying off period. These changes have resulted in a four-fold increase in milk yield (from three litres to 14 litres per day). The increased yield of milk has, firstly, boosted family health and the proceeds of sales have enabled her to boost her business. Another

female farmer in Muranga (PB/MUR/D/23) reported making an extra \$210 from her two dairy cows due to changes she made encouraged by SSU. She is making her own silage based upon the recommendation of the programme. She reported that the increased income has meant that she is able to comfortably buy feeds for the cows, pay the workmen and purchase household items. More generally, the effects reported by farmers focus on improved household food security from increased consumption of milk and cash to buy food, ability to re-invest income in the dairy enterprise, and reduction in animal disease and consequent veterinary bills.

5.4.7. Summary of effects at household level

Results from the PB analysis suggest that SSU is having an effect on gross margins, measured through two different comparisons. Firstly, considering SSU influenced households and comparing PBs before and after changes they made, the results clearly show that households have increased their gross margins in both maize (by 639%) and dairy (by 3010%). These increases in gross margins have benefited farmers and their households by improving their food security situation, improving the health of family members, providing the money for school fees, enabling investment in farming (i.e. inputs and / or labour) or other businesses (e.g. shops and groceries), saving money on veterinary fees *inter alia*.

Secondly, when the difference made by changes influenced by SSU and those not influenced by SSU are compared, those influenced by SSU result, proportionally, in a greater improvement in gross margins for maize (639% compared to 127%) and dairy (3010% compared to 130%). This suggests that the edutainment approach used by SSU was, within this sample, more effective than other methods of extension support.

5.5. Innovation processes

The results above indicate that SSU has led to considerable changes in farmers' activities and productivity in Kenya. In addition to investigating effect, an aim of the paper is to explore the processes by which SSU influences change, including what role SSU plays in farmers' innovation systems. PQR methods (timelines and communication maps together with key informant interviews and observations) across a range of actors allowed us to investigate the innovation processes that occurred and why SSU had led to such substantial change.

5.5.1. Innovation context

The five timelines conducted with groups of farmers show clearly that farming systems in the study are dynamic. Farmers are continually responding to changes in the physical, market and institutional environment in which they operate, changes which vary from place to place. Common themes in the timelines were the use of different crop varieties in response to changes in weather patterns – more drought resistant and shorter time to maturity maize and potato, for example; investment in new enterprises as new regional and international markets open up; and the decline of some enterprises, including beans due to farmer perceptions of less reliable rainfall. Some of these changes have been facilitated by support from government, including local government, and private sector agencies. Institutional factors are not always positive, however. Farmer groups reported adulteration of inputs in both dairy and maize sectors by unscrupulous suppliers, a decline in quality of AI services and the entry of local brokers into the milk buying and marketing chain as big dairy companies have withdrawn from local purchasing which has reduced the proportion of the retail milk price going to farmers. The overall impression from the timelines is that farmers are ready to respond to opportunities when they have credible information and the institutional and market environment is favourable. Indeed, they are actively looking for ways of improving the economic performance of their farms through new enterprises, varieties and technology.

5.5.2. Communication context

In the communication mapping part of the PQR, farmers described a rich communication environment in which they access and interact with many sources and channels in their efforts to gain useful information and knowledge to inform their farming decisions. At local level, these range from conversations with fellow farmers who are doing something differently to public meetings called by community leaders often as a forum for interaction with government or NGO advisers. The former are valued because farmers can see what is being done and its local relevance, and can assess the credibility of their informant.

The immediacy, visibility, relevance and credibility of the information are features that are deliberately recreated in the SSU format through the careful scoping and selection of content and featured farm households. Ideas from a wide range of public, commercial and NGO sector information providers are canvassed for current, proven improvements that farming households can make that will bring increased productivity and incomes, while primary and secondary research among rural households identifies their priorities and challenges. Woven into this iterative process is the search for funding for the production, in which information providers who wish to reach a large audience of potential users of their information are of primary interest. Bringing together and reconciling the commercial and public service interests of information providers, and an understanding of what rural households will find interesting and useful, is part of the creative challenge facing the SSU production team. Getting this right makes it more likely that a large audience will continue to watch the broadcasts and that a proportion of viewers will be motivated and enabled to make changes. Another part of the creative process is selecting a set of farm households with whom different segments of the potential SSU

audience will identify, and which will 'perform' well on television. The more successful this selection, the more likely it is that viewers will see the information content of SSU episodes as relevant and of interest.

Beyond the village, many farmers use mobile phones to extend their range of one-to-one contacts with other farmers and with specialist sources of advice. Farmers also mentioned government officials at county level, local and regional radio stations, television and, though less frequently, newspapers as sources of information and advice on farming. All PQR groups specifically mentioned SSU as having an important place in this web of communication. It is not the only source of information on improved farming but it is practical, visual and uses experts who they see as credible; while the SSU SMS service is valued for the ability to seek clarification and ask further questions. All groups also said that after viewing an episode of SSU they discussed what they had seen with others within their family and community. This discussion extends to family members who live elsewhere, who are potential sources of funds to invest in new enterprises or improved practices.

These findings suggest that SSU is fulfilling one of the roles anticipated in the ToC, that of contributing to and stimulating conversations within farming communities about specific opportunities for farm improvement. This can be seen in part as 'agenda setting' (McQuail 2010), but also as providing concrete, realistic steps that farmers can consider taking.

5.5.3. Farmers' viewing experience

In focus group discussions, farmers were asked why and where they watched SSU and what happened when they watched it. Discussion on 'why' showed that farmers have a wide range of reasons for deciding to spend time watching a farm makeover broadcast. These reasons reflect the different stages farmers might be in the process of making changes to the way they farm as well as the different reasons any audience chooses to watch a television broadcast.

Reasons include: to get new agricultural information, for entertainment, to refresh their memories, for motivation to carry out similar ventures, because they were fans of the personalities presenting the programme, because they generally liked farming or a specific enterprise aired and also to pass time. The most frequently cited reason by farmers in both Muranga and Nakuru was to learn new ideas or innovations that they could use to improve their farming. As one female participant in a Nakuru FGD said "*This programme is quite informative and educative; since I started watching it in 2012, I have acquired new farming methods on how to rear cows and now my cows are doing better*". Some farmers watched the programme to compare their own farming practices with those of featured farmers as a way of finding out if they were doing well.

Service providers also watched SSU including input suppliers and private and public sector extension staff. In FGDs and KIIs, these people said they watch to acquire knowledge, for entertainment and to pass time. They reported continuing to watch SSU even when the content or promoted technologies were known to them, which highlights the role of media in reinforcing learning and knowledge and the role of SSU in stimulating the broader set of actors within the local innovation system.

The FGD discussions showed a gender difference in where viewers watched SSU. Most of the women watched the programme at home on Sundays after attending church services, often while preparing the family meal alone or in the company of their children. Men reported watching the programme in public places such as hotels and village bars where they would watch as a group and the programme content would feed into their discussions about farming and business concerns. Some farmers noted they would watch the programme at a neighbours' place.

Watching and discussing the broadcasts encouraged viewers to seek further information. FGD and communication map data show how viewers went on to interact with SSU through the SMS service, through reading brochures (requested by SMS) and also accessing information online. Most went on to share this information with friends, neighbours and formal and semi-formal groups in which they were involved.

Box 1

Categorisation of households.

Viewers – influenced by SSU – These respondents stated that they were SSU viewers and that they received information from or were influenced by SSU to carry out a specific practice related to a specific enterprise.

Viewers – not influenced by SSU – These respondents stated that they were SSU viewers but indicated they had not received information from or been influenced by SSU to carry out a specific practice related to a specific enterprise.

Non Viewers – not influenced by SSU - These respondents stated that they were not SSU viewers and indicated they had not received information from or been influenced by SSU to carry out a specific practice related to a specific enterprise.

Non Viewers –influenced by SSU¹² - These respondents stated that they were not SSU viewers but that they had received information from or been influenced by SSU to carry out a specific practice related to a specific enterprise¹³.

5.5.4. Influence of SSU on innovation

SSU was in itself an innovation – a new player in the already rich and varied communication environment in which farming households make decisions about enterprises, farming practices and the future of their farms. The qualitative research gives an insight into how SSU has been integrated, by farmers, into their local and personal innovation system. Data from the FGDs and KIIs were supplemented by detailed case studies of individual viewers' experience.

Farmers watching SSU are using the ideas shared through the programme in several different ways: replicating technological changes, adapting technologies to suit their individual circumstances, becoming inspired to make other changes on their farm, forming plans for changes they can make in the future and creating new institutional arrangements to access technologies promoted in SSU. Taking a specific focus group in Muranga as an example: of the seven farmers who had watched the programme, two had been encouraged to begin feeding their cows supplementary feeds, routinely spraying for ticks and de-worming their cows more regularly. The same farmers were using a combination of artificial fertiliser and farmyard manure to fertilise their maize farm. Other farmers were planning to start poultry units or strawberry farming based on ideas they had seen on SSU. In Njoro, Nakuru, farmers had organised themselves to source a new potato variety in bulk from another county after the variety was promoted in an episode of SSU with each farmer contributing money to purchase the seed. In dairy, SSU had mostly influenced production related changes such as improved herd health, feeds and feeding as well as structures for housing farm animals. KIIs reinforced the finding that an increase in the use of feed supplements and silage in both Muranga and Nakuru was associated with watching SSU (e.g. KII/MUR/10¹⁰).

The different ways in which individual viewers have responded to SSU are illustrated in the detailed case studies. Two contrasting cases are summarised here, highlighting the point that the impact of SSU on innovation goes far beyond the simple 'transfer' of information into farming practice.

L is a 47 year old small scale farmer who keeps dairy cows and poultry for commercial purposes and grows tea and coffee as cash crops and maize, beans, bananas and vegetables for family consumption. She has been farming for over 30 years. She began watching SSU when her daughter told her that the television 'is showing what you do on the farm'. She finds all the topics and enterprises of interest and while most have not directly affected the way she farms she is excited by seeing other farmers trying out, adapting and succeeding with new ideas. The one topic that has had a big impact on her is silage making: the idea of creating a palatable feed source for the dry season directly addressed

her own experience of a drop off in milk production and having to spend many hours looking for feed. She tried it 'as an experiment; I didn't know if it would work or not'. She was pleased with the increase in milk production and was able to use time saved in other income earning activities. She has also developed a new income stream by making silage for other dairy farmers who have surplus Napier grass and is also paid for giving technical advice on silage making by farmers in the area. She has used some of the new income to start a poultry enterprise, then used the income from this to buy a couple of pigs. She has now bought some land in her village – becoming a land owner in her own right for the first time (SSU/CS/NKR/01).

M is studying agriculture at university in Nairobi. He is enthusiastic about SSU because 'as well as bringing new ideas to farmers it educates them on how to make the most out of a small piece land through proper planning'. He has used ideas learned from SSU to support innovation on his parents' farm through providing technical advice and also some of the resources needed. He mentioned specifically compost pit making, agribusiness in vegetables, management of *striga* in their maize field and building an improved cattle shed. Improved quality and quantity of manure used at planting has reduced expenditure on inorganic fertiliser and improved crop health and production, including a 50% increase in maize yields (SSU/CS/NKR/02).

The results presented in this and previous sections give rise to an important question. Why has SSU had such positive and widespread effects, and particularly when most of the agricultural practices focussed on in SSU programmes have already been promoted by extension services and NGOs in rural Kenya for some time? The findings indicate that the use of reality television, and in particular the carefully designed makeover format, caught the imagination of and led to high levels of engagement among viewers. For example, what was on the latest SSU episode has become a common topic of conversation amongst people in the areas of Kenya in which it is broadcast. It was evident from focus groups, key informant interviews and case studies that viewers a) felt strong empathy with and connected to the carefully selected families in the programmes; b) were very interested in the problems they faced and in the potential solutions promoted; c) wanted to see how the solutions would work out and whether they would benefit the families; and d) as a result considered and reflected on the solutions and opportunities promoted, together with their relevance to their own and or others' farms. This then led to further engagement and discussion and to actions including obtaining further information and inputs, innovating and adapting and implementing practices. The enthusiasm and interest was not confined to farmers alone but engaged other players and participants in the immediate and wider innovation system.

There were numerous examples of non-farming viewers of SSU being involved in innovation processes. These viewers were sharing information with farming family members or friends on the phone and were also, in some cases, financially supporting their families to implement some of the ideas (SSU/CS/NRB/1; SSU/CS/NRB/2). Outside immediate family and friends SSU stimulated engagement and action by other players in the innovation system. For example, extension staff

¹⁰ Coding: KII = Key Informant Interview, MUR = Muranga, 10 = interview number

¹¹ The respondents reporting to be directly influenced by SSU to adopt a specific practice is a percentage of viewer SSU influenced farmers that were carrying out each practice.

¹² The number of respondents (n = 33 or 2%) that made up the category Non-viewers – influenced by SSU was so small that results were not considered to be generalisable.

¹³ For example, a family member or neighbour may have watched SU and passed on information that influenced the respondent.

reported how SSU programmes both provided them with useful information and stimulated discussion on and consideration of farming issues and solutions amongst staff. The programme also provided information on where to access inputs such as seeds of improved varieties and worked with suppliers to facilitate inputs being available. Perhaps surprisingly there was evidence that local stockists were not aware of SSU and were therefore not seeking to obtain and supply inputs featured on the programme. This issue warrants further investigation.

The findings reflect much of the ToC (Section 2.4 above) including how applying makeover reality TV to smallholder agriculture can facilitate social learning, simultaneously reaching a mass audience and stimulating the interactive, participatory processes that support innovation. Key elements of the ToC are borne out by the findings: the multiple roles of mass media including agenda setting, stimulating discussion within social networks and challenging perceptions about the viability of smallholder farming (McQuail 2010); the importance of perceived expertise and credibility in sources of information (Manfre & Nordehn, 2013; Muhammad & Garforth, 1999); and the idea within innovation systems theory that multiple actors interact, communicate, and innovate in order to enable and support farmers to take on innovations and to innovate themselves.

One question that did not come up in discussions with farmers is whether their own voice and experience is sufficiently heard in the broadcasts. This is perhaps an area where the methodology in future studies could be strengthened. There are two potential issues here. First, that of feedback from farmers' own innovation behaviour stimulated by the programme. Broadcasting the adaptations that farmers have made and different ways in which they have used the ideas would further strengthen processes within the innovation system and acknowledge the important role of farmers' own initiative and innovation, both as individuals and collectively, in the continual improvement of smallholder farming. The second issue is an ethical one. SSU relies on funding from commercial and public sector organisations who have an interest or mandate to influence farming practice. Decisions on content, including what technologies, practices and inputs to include in response to featured farm families' challenges, were made through dialogue between the various interested parties, while the production team included those with a specific brief to ensure that all content was relevant to smallholders in the areas covered by the broadcasts. The trade-offs between commercial, public interest and farmer relevance were not explored in this study and is something that could usefully be taken up in research on future makeover programmes.

6. Conclusion

The aim of this study was to understand and measure the effect of a novel form of edutainment that uses this makeover format of reality TV, and to investigate the processes by which it influences farmers. In order to do this, the study took a mixed methods approach that included two large quantitative surveys and a detailed set of participatory qualitative and quantitative tools. Effect was investigated in terms of the number of farmers watching and influenced by the programme, and the economic and social consequences of changes made to their farms as a result of the broadcasts.

At the time of the study Shamba Shape Up was being watched by a large number of smallholder farmers across Kenya and it is influencing the farming decisions of an even wider range of farmers through word of mouth and peer-to-peer learning. An estimated 428,566 households (14.7% of households in the survey area) reported that they had benefited from SSU. Economically, maize farmers who had been influenced by SSU had benefited by an average gross margin increase of \$288 per acre (based on results of the participatory budgets) and dairy farmers had improved their gross margins by \$260 per cow.

This study has identified a range of social benefits gained by farmers viewing SSU. Effects diagrams were used to understand the 'real-life' impacts of the changes encouraged by SSU. Farmers, for example,

reported that they were able to ensure that their family had food for the entire year, improve the health and nutritional intake of their families, diversify their livelihood choices (invest in businesses outside of farming), pay school fees for their children, increase their social capital and community standing through sharing successful ideas with family members and fellow farmers, and develop new ideas for the future, providing motivation to succeed.

Evidence on the process by which SSU has achieved positive effects comes mainly from the PQR and shows that SSU is influencing farmers' decision making and activities in a positive way. This goes beyond simply implementing suggestions promoted in the broadcasts to a variety of influences on smallholders' innovation system overall. Results from both the questionnaire and the PQR show that the design of the programme enables the audience to share, vicariously, in the process by which the featured farm household comes to a decision about changes to try out on their farm, as proposed in the Theory of Change. Farmers identify with the host farmers and the problems that they face on their farms and are encouraged that they are also able to make positive changes on their farms as highlighted in the programme.

In other words, the broadcasts not only gave farmers information and ideas that might be appropriate on their farms; they also motivated and inspired them to improve their own farms through their empathy with the featured host farm families and by the way the ideas emerged through interaction with credible experts. Viewers were in effect taking part in a vicarious social learning process. Beyond this, however, SSU contributed to social learning within the networks of the viewers themselves as viewers discussed what they saw and heard among themselves, with family members and others who had not seen the broadcast. This led in some cases to local innovation beyond that featured in the broadcasts such as setting up a group to purchase inputs and establishing a new income stream through providing expertise learned from the broadcast and refined through personal experimentation to other farmers.

SSU explicitly encouraged farmers to actively seek information via SMS, brochures and through extension workers and, further to these interactions, farmers went on to share the information they received with neighbours and with formal and semi-formal groups in which they were involved. Extension workers and input suppliers, in key informant interviews, also reported watching SSU and using the programme as a source of new agricultural information to share with farmers or to refresh their agricultural knowledge and training. The programme has also influenced non-farming actors in the value chain. Family members or friends shared information on farming over the phone and, in some cases, provided financial support for putting the ideas into practice. All of this evidence leads us to conclude that the influence of SSU on the innovation system goes well beyond the straight forward provision of appropriate advice and information to the farmers who watch the programme. Ideas about the viability and potential of smallholder agriculture have had a broader influence on attitudes and perceptions as well as cognition and knowledge.

The overall conclusion is that well designed edutainment using a makeover format can strongly influence both the agricultural production and practices of very large numbers of smallholders and the agricultural innovation systems within which they operate. We have shown that specific features of the makeover format embodied in SSU have a positive effect on farmers and innovation systems. The careful selection of featured families helps viewers identify with them and engage with the programme; the opportunities for further engagement through SMS models the social communication that is at the heart of innovation systems; the whole farm and whole enterprise focus of each programme ensures that different viewers see and hear things that accord with their own situation and place in the innovation cycle; the use of well-known and liked presenters alongside credible experts in various fields relevant to smallholders helps build trust in the programme and its content; while the overall atmosphere of each programme celebrates smallholder farmers, their resilience and the opportunities for overcoming

challenges, thereby normalising innovation and change in the discourse of viewers and encouraging viewers to tune in to future broadcasts. There is scope for further development and improvement of the format, including building in additional cycles of feedback on farmers' innovative responses to the broadcasts, and for refining research designs and methods to include broader ethical questions about voice and control in programme design and production.

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