ePact
Strengthening evaluation effectiveness and impact

UKaid
from the British people

External evaluation of mobile phone technology-based nutrition and agriculture advisory services in Africa and South Asia

Mobile phones, agriculture, and nutrition in Ghana: Qualitative midline study report

Barnett, I., Faith, B., Gordon, J., and Sefa-Nyarko, C.

Published: 01.02.2019

Oxford Policy Management | itad | IDS Institute of Development Studies | Gamos | International Food Policy Research Institute IFPRI

e-Pact is a consortium led by Oxford Policy Management and co-managed with Itad

Acknowledgements

The authors would like to thank all individual community members who agreed to take part in this research, as well as national programme staff who agreed to be interviewed.

We are particularly grateful to the Participatory Development Associates (PDA) field team in Ghana overseen by PDA Director Edem Agbe and led by Clement Sefa-Nyarko, who conducted the midline qualitative data collection and production of transcripts and field reports, which are drawn on extensively in this report.

The Institute of Development Studies (IDS) team is extremely grateful for their ongoing collaborative partnership with the International Food Policy Research Institute (IFPRI), which is overseeing the evaluation's quantitative component, led by Dan Gilligan, and the Gamos team overseeing the business model component, led by Simon Batchelor. Both teams have provided invaluable feedback and support for the qualitative design and tools, as well as comments on drafts of this report.

We are equally grateful to Professor Laura Camfield from the University of East Anglia, who reviewed and commented on an earlier draft of this report and reviewed the qualitative design and the tools.

The team would like to thank the Department for International Development (DFID) and Oxford Policy Management (OPM) teams for their continued support and contributions to this project, and also the OPM team for their helpful feedback on an earlier draft.

The IDS qualitative evaluation team responsible for leading on this midline phase of qualitative work (including the design and development of qualitative tools, data analysis, and report writing) was led by Dr Inka Barnett, supported by Dr Becky Faith and Jessica Gordon.

The PDA team responsible for researcher team training, pre-testing tools, data collection, transcript and field report production was overseen by PDA Director Edem Agbe and led by Clement Sefa-Nyarko. PDA research team members included: Kobby Optson; Victoria Ampiah; Bright Dua-Ansah; Belinda Bamfo; Cosmas Bekyiereyira and Justine Guguneni Tuolong. PDA technical support was provided by Edem Agbe and Helen Nti.

This project is being led by the Institute of Development Studies (IDS) together with Gamos and the International Food Policy Research Institute (IFPRI) as part of the e-Pact consortium led by Oxford Policy Management (OPM) co-managed with Itad. The IDS project manager is Jessica Gordon [j.gordon@ids.ac.uk]. The report authors are Inka Barnett, Becky Faith Jessica Gordon (IDS) and Clement Sefa-Nyarko (PDA). For further information please contact j.gordon@ids.ac.uk.

The contact point for the client is Dan Haglund [D-Haglund@dfid.gov.uk]. The client reference number for the project is PO6420.

e-Pact
Level 3, Clarendon House
52 Cornmarket Street
Oxford OX1 3HJ
United Kingdom
Tel +44 (0) 1865207300
Fax +44 (0) 1865207301
Email admin@opml.co.uk
Website www.opml.co.uk

Disclaimer

This report has been prepared by the e-Pact consortium for the named client, for services specified in the Terms of Reference and contract of engagement. The information contained in this report shall not be disclosed to any other party, nor used or disclosed in whole or in part without agreement from the e-Pact consortium. For reports that are formally put into the public domain, any use of the information contained in the report should include a citation that acknowledges the e-Pact consortium as the author of the report. This confidentiality clause applies to all pages and information included in the report. This material has been funded by UK aid from the UK government; however, the views expressed do not necessarily reflect the UK government's official policies.

This project is being led by the Institute of Development Studies (IDS) together with Gamos and the International Food Policy Research Institute (IFPRI) as part of the e-Pact consortium led by Oxford Policy Management (OPM) co-managed with Itad. The IDS project manager is Jessica Gordon [j.gordon@ids.ac.uk]. The report authors are Inka Barnett, Becky Faith Jessica Gordon (IDS) and Clement Sefa-Nyarko (PDA). For further information please contact j.gordon@ids.ac.uk.

The contact point for the client is Dan Haglund [D-Haglund@dfid.gov.uk]. The client reference number for the project is PO6420.

e-Pact	Level 3, Clarendon House 52 Cornmarket Street Oxford OX1 3HJ United Kingdom	Tel Fax Email Website	+44 (0) 1865207300 +44 (0) 1865207301 admin@opml.co.uk www.opml.co.uk

Executive summary

This report constitutes the qualitative midline report of the evaluation of the mNutrition intervention in Ghana.

The mNutrition intervention in Ghana: the Vodafone Farmers' Club (VFC)

mNutrition is a five-year global initiative supported by the Department for International Development (DFID) since 2013, organised by GSM Association (GSMA) and implemented by in-country mobile network operators (MNOs) to use mobile technology to improve the health and nutritional status of children and adults in low-income countries around the world. The nutrition content of the programmes aims to promote behaviour change around key dietary and child feeding practices that are likely to result in improved nutritional health within a household.

The mNutrition intervention that is the focus of the evaluation in Ghana is the VFC. The service is a 'bundled solution', offering agricultural and nutrition information in addition to short message service (SMS, or text messages) and voice services. The content for all agricultural messages is provided by Esoko Ghana, a mobile phone-based rural information service, with support from the Global Alliance for Improved Nutrition, which has helped Esoko to develop production, processing, and consumption information for 13 nutritious crops.

The VFC product is available only through a dedicated VFC subscriber identity module (SIM) card and is activated upon subscribing to the service. VFC is available to farmers and people in the farming ecosystem in 71 districts of Ghana, although promotion and active subscription of farmers via VFC agents varies between regions.

Evaluation design

The aim of the impact evaluation is to assess the impact, cost-effectiveness and commercial viability of VFC. The evaluation is being conducted by a consortium of researchers from Gamos, the Institute of Development Studies (IDS) and the International Food Policy Research Institute (IFPRI).

The impact evaluation is being conducted in two regions of Ghana: the Central Region (CR) and the Upper West Region (UWR). The team draws on several methods and interlinked components to gather evidence about the impact of the mNutrition intervention in Ghana, including:

- a **quantitative impact evaluation**, employing a randomised encouragement design to determine the causal effect of the programme on dietary diversity, agricultural income, and production. A household survey will be conducted at the start of the programme and two years later in treatment communities (which receive encouragement in the form of additional marketing and promotion) and control communities (which do not receive the encouragement but still have access to VFC);
- a **qualitative impact evaluation**, which consists of three qualitative data collection rounds (i.e. an initial exploratory qualitative study, in-depth case studies at midline, and rapid explanatory qualitative work after the quantitative endline survey data collection), and aims to provide understanding of the context, underlying mechanisms of change, and the implementation process of VFC; and

- a **business model and cost-effectiveness evaluation** employing stakeholder interviews, commercial and end user data, document analysis, and evidence from the quantitative and qualitative evaluations to generate a business model framework and estimate the wider imputed benefits from the value-added service for the range of stakeholders involved.

This report

This midline report presents the findings of the second round of qualitative data collection conducted in March 2018. Data collection was carried out by Participatory Development Associates (PDA) in close coordination with the IDS qualitative team led by Dr Inka Barnett.

The qualitative midline uses a qualitative case study design to explain how and why (or not) farmers take up and engage with VFC and how VFC may trigger behaviour change related to agriculture and nutrition practices.

To achieve this, the midline has the following objectives:

- to document the implementation of VFC at community level and its effects on the uptake of VFC;
- to explore acceptance of VFC at household level and its effects on uptake and engagement with VFC; and
- to explore key barriers to the adoption of VFC advice and pathways of change.

Findings from the qualitative midline study will be combined and triangulated with the quantitative endline and business model/cost-effectiveness endline in 2019.

Midline findings

Key findings from the assessment of implementation processes

In contexts with no/irregular access to agriculture extension, remote delivery of agriculture and nutrition content (through mobile phone technology) seems both feasible and relevant. More specifically, the qualitative data suggest that:

- obtaining agricultural information remains a central and ongoing challenge for farmers in both CR and UWR, and may constrain the improvement of farmer livelihoods. VFC, if well designed, targeted, and delivered, may help to address this gap; and
- farmers prioritise information on agriculture and only a few (female) farmers showed active interest in nutrition content as part of agricultural services. VFC needs to package and advertise nutrition content well to ensure effective uptake.

VFC is only effective in changing farmers' agriculture and nutrition practices when farmers actively engage with the service. Current user statistics of VFC and self-reported service use among the farmers in the qualitative sample suggest that engagement with the different components of the service is very low and may decline further (e.g. if service charges are reintroduced). There was also a clear regional pattern with VFC (and the different services within VFC) being taken up more in UWR than in CR. The analysis of implementation processes of VFC at community level suggests several issues that may help explain the low engagement and regional difference in uptake.

- Poor Vodafone network signal was a major barrier to the activation of VFC SIM cards and to the use of VFC (especially in CR). This is an important shortcoming for the implementation of VFC in CR, but does not indicate an issue with the programme design *per se*.
- Recorded voice messages seem to be the best delivery channel in areas with high levels of illiteracy. However, farmers missed a large proportion of the recorded voice messages as they were preoccupied with daily activities and had no voicemail set up/were unaware of how to access their voicemail to capture missed voice calls. This implementation challenge at the end user level is easy to address and is likely to have a significant impact of the effective uptake of recorded voice messages. For example, subscribers could receive a small tutorial on the use of voice messages either in person (e.g. if sign-up happens through an agent) or during the initial profiling call conducted by ESOKO.
- Illiteracy and the inability to understand English were major barriers to the uptake of VFC SMS on price and weather. As there was a clear demand for weather and price information (especially from farmers in UWR), we recommend offering the content of SMS as recorded voice messages (in local languages). However, as the weather and price information are highly time-sensitive and context-specific, providing this information in recorded voice messages may increase the implementation costs of VFC considerably.
- There is clearly interest in and potential for the VFC call centre; however, only a few VFC members were aware of the centre, and even fewer knew they could consult the centre free of charge. Most of the small number of farmers that contacted the centre were not impressed by the performance as they had not received an answer to their question or had not been called back (as had been promised to them). To fully realise the potential of the centre, farmers' awareness of this service must be increased and capacity issues at the centre level need to be addressed.

The findings also suggest how farmers' initial uptake of and engagement[1] with VFC could be improved.

- Agents that promote VFC to farmers should explain the different services to farmers. To ensure that all services are covered, the promotion script should be revised (e.g. to better explain the call centre and what voice messages are).
- Interpersonal contact with VFC promoters was perceived as important for building trust and convincing farmers to sign up. Interpersonal support is also important to facilitate the correct activation of the VFC SIM cards and to ensure that farmers take up recorded voice messages effectively (e.g. by setting up voicemail to capture missed calls). This suggests that an interpersonal component during the promotion, and as ongoing support, may increase both uptake and sustained use.
- VFC was perceived as an alternative to traditional farmer-based organisations (FBOs) by some farmers. While this may strengthen uptake and engagement with the service, it can also result in disappointment once members realise that VFC cannot deliver many of the benefits of an FBO (e.g. material support, interpersonal contact).

[1] Up-take describes the processes of receiving and comprehending the message content.
Engagement is the next desirable step after up take and describes the process of actively processing, thinking and potentially discussing the content of the messages.

Key findings from the acceptance assessment of VFC

High levels of acceptance of both content and delivery mode are critical for initial uptake and sustained engagement with the service and are a precondition for the adoption of new behaviours and practices in response to it. The qualitative data found:

- VFC is valued as a service with an expansive reach that is not limited by space, resources, or time (as agriculture extension services often are). In the absence of well-functioning agriculture extension services (due to staff shortage or lack of funding), VFC can provide reliable agriculture information to farmers (as do other channels such as radio and TV). In contrast to radio and TV, VFC can be more tailored and targeted towards farmers' specific needs;
- VFC can help empower female farmers (who are often excluded from traditional information sources, such as FBOs and agriculture meetings, due to time constraints) by providing much-needed tailored agriculture information. However, female access to mobile phones may impede access to VFC. The quantitative evaluation baseline data found that only 46% of women own a mobile phone in rural Ghana but 81% of men;
- farmers value practical, easy-to-understand information that is tailored towards their agricultural activities. Insufficient tailoring or information that merely repeats established agricultural knowledge can result in disengagement with the service. Careful profiling of farmers to ensure highly tailored content is essential for uptake and sustained engagement;
- market price and weather information is highly valued and acted upon if resources to act are available (e.g. farm equipment, safe storage for grains, financial resources to travel to different markets). High levels of illiteracy and the inability to comprehend English prevent most farmers from using the price and weather information;
- nutrition information is perceived as useful and acted upon mainly by female farmers (who are usually responsible for all domestic chores, including food preparation and childcare). Nutrition information as part of VFC enhanced female farmers' attitude towards the service, as it was perceived to be an indication that VFC cares for the health and well-being of its members;
- radio is preferred over mobile phones for the delivery of information by many farmers. The reasons for this are that radios are perceived as more inclusive (not everybody can afford a mobile phone) and less distracting during farm work and daily chores than voice calls. Blending of mobile phone-based information and radio might make use of the advantage of both technologies;
- currently, VFC is predominately a one-way mobile phone-based intervention. The lack of interpersonal contact is perceived as a major limitation of VFC. Farmers miss personal rapport, dialogue, and support from human beings. Over time the lack of interpersonal contact can also negatively affect farmers' trust in the credibility of the information. Introducing occasional interpersonal interactions (e.g. community-based VFC meetings) and strengthening the call centre capacity may help to address this shortcoming and ensure sustained engagement; and
- a potentially major challenge to VFC may be financial sustainability. Farmers interviewed for the qualitative midline were unwilling to pay for the service or said they would only be willing to pay a very small amount of money. Alternative funding sources may be necessary to support the service.

Key findings on contextual barriers to adoption of VFC advice

Successful uptake and high levels of acceptance of VFC are critical for farmers' engagement with the service. However, contextual barriers may impede the translation of the advice into practice. The following key barriers emerged:

- financial constraints and the belief that costs for purchasing agriculture inputs and/or more nutritious food may outweigh their benefits (especially as benefits are often uncertain); and
- the risk-averse attitude of farmers and their unwillingness to invest time and resources in new practices with uncertain benefits.

Recommendations for policy and practice

Mobile phone-based advisory services such as VFC are unlikely to be effective as a stand-alone channel for behaviour change; however, they may perform best when integrated with traditional media and channels as part of a multi-level strategy. Mobile phone-based information could thereby be one part of a broad many-pronged policy, and not the only component aiming to change behaviours and practices.

Mobile phone-based interventions may generate new inequalities, as not everybody can afford or has access to a mobile phone. In particular very poor and already marginalised farmers who may benefit most from the information may be excluded. A blended approach combining different technologies and approaches to disseminate information may increase inclusiveness and address some of these newly-generated inequalities (e.g. mobile phone and radio; mobile phone and community meetings that are open to non-subscribers).

The transmission of information to passive audiences without an element of interactive engagement has limited effectiveness in changing behaviour and practices. Very limited uptake and various implementation issues of the interactive VFC call centre meant that farmers did not experience any peer, social, or emotional support when attempting to adopt the advice VFC provided.

VFC includes two interactive components that could (if advertised and implemented well) provide the desired interactive and supportive components: the call centre and the free farmer-to-farmer calls.

With regards to content, farmers are interested in and receptive to agricultural content. Content needs to be tailored, context-specific, relevant to farmers' changing needs, and cognisant of farmers' characteristics (limited literacy skills, low school education). Farmers frequently look for specific information that can help them to address acute individual farming problems (e.g. pest infestations, access to seeds). Introducing and strengthening existing two-way channels (i.e. a call centre) as part of VFC could enable farmers to actively source the information they need, rather than merely being the recipient of information experts perceive to be relevant.

Nutrition content was not popular/perceived as relevant by most male farmers; however, it was valued and acted upon by female farmers. In many rural contexts (in Ghana and beyond), females are responsible for the bulk of the domestic and caring activities; consequently, nutrition information is most likely to get traction with females, although they may generate greater awareness about nutrition in some men.

While VFC uses strategic applications of different types of messages tailored to farmers' specific needs (e.g. based on the crops they cultivate), VFC currently does not support the generation of an enabling environment that supports farmers willing to adopt new practices. To increase impact, mobile phone-based services could be joined up with other ongoing interventions (e.g. livelihood improvement programmes or social protection programmes, access to financial services).

Table of contents

List of tables and figures

List of abbreviations

CMO	Context–Mechanism–Outcome
CR	Central Region
DFID	Department for International Development
EA	Enumeration Area
FBO	Farmer-Based Organisation
FGD	Focus Group Discussion
GHS	Ghana *Cedis*
GPS	Global Positioning System
GSMA	GSM Association
IDI	In-Depth Interview
IDS	Institute of Development Studies
IFPRI	International Food Policy Research Institute
KII	Key Informant Interview
MNO	Mobile Network Operator
OPM	Oxford Policy Management
PDA	Participatory Development Associates
SIM	Subscriber Identity Module
SMS	Short Message Service
UWR	Upper West Region
VFC	Vodafone Farmers' Club

1 Introduction

1.1 The mNutrition intervention in Ghana

mNutrition is a five-year global initiative supported by DFID since 2013, organised by GSMA and implemented by in-country MNOs and third-party providers to use mobile technology to improve the health and nutritional status of children and adults in low-income countries around the world. mNutrition is implemented through 14 mAgri and mHealth programmes in 12 countries throughout sub-Saharan Africa and South Asia. mNutrition has two major anticipated outcomes. The first is developing cost-effective, sustainable business models for mobile phone-enabled nutrition and agriculture services for one million households in Africa and Asia that can be replicated in other countries. The second is to promote behaviour change in key farming practices and dietary practices that is likely to result in improved nutritional health within a household (see Annex A for the mAgri Theory of Change).

DFID has committed to conducting an independent evaluation of mNutrition. Given the budgetary limitations, the decision was made to select two countries for inclusion in the evaluation: an mHealth programme in Tanzania and an mAgri programme in Ghana. The mNutrition intervention that is the focus of the evaluation in Ghana is the 'VFC. The service is a 'bundled solution', offering agricultural and nutrition information in addition to SMS (or text messages) and voice services.

The main channels of content delivery are SMS for weather and price information and recorded voice messages for agriculture and nutrition information. While SMS is available in English, recorded voice messages are available in ten local languages. The content for all agricultural messages is provided by Esoko Ghana, a mobile phone-based rural information service, with support from the Global Alliance for Improved Nutrition, which has helped Esoko to develop production, processing, and consumption information for 13 nutritious crops.

The VFC product is available only through a dedicated VFC SIM card and is activated upon subscribing to the service. VFC is available to farmers and people in the farming ecosystem, such as market women and input dealers in 71 districts of Ghana, although promotion and active subscription of farmers via VFC agents varies between regions.

1.2 Evaluation design

The evaluation is intended to assess and measure the impact, cost-effectiveness, and commercial viability of VFC using a mixed-methods evaluation design. The evaluation includes a quantitative component, a qualitative component, and a business model analysis.

The evaluation will address the following research questions, as stated in the DFID Terms of Reference (see Annex B):

1. What is the impact and cost-effectiveness of mobile phone-based nutrition services on nutrition, health, and livelihood outcomes, especially among women, children, and the extreme poor?
2. How effective are mobile phone-based services in reaching, increasing the knowledge of, and changing the behaviour of the specific target groups?
3. Has the process of adapting globally agreed messages to local contexts led to content that is relevant to the needs of children, pregnant women, and mothers in their specific context?

4. What factors make mobile phone-based services effective in promoting and achieving behaviour change (if observed), leading to improved nutrition and livelihood outcomes?
5. How commercially viable are the different business models being employed at country level?
6. What lessons can be learned about best practice in the design and implementation of mobile phone-based nutrition services to ensure (a) behaviour change and (b) continued private sector engagement in different countries?

The evaluation is being conducted by a consortium of researchers from Gamos, IDS, and IFPRI.

The impact evaluation is being conducted in two regions of Ghana: CR and UWR. The team draws on several methods and interlinked components to gather evidence about the impact of the mNutrition intervention in Ghana, including:

- a **quantitative impact evaluation**, employing a randomised encouragement design to determine the causal effect of the programme on dietary diversity, agricultural income, and production. A household survey will be conducted at the start of the programme and two years later in treatment communities, which receive the encouragement in the form of additional marketing and promotion; and in control communities, which do not receive the encouragement but still have access to the mNutrition intervention;
- a **qualitative impact evaluation**, which consists of three qualitative data collection rounds (i.e. an initial exploratory qualitative study, in-depth case studies at midline, and rapid explanatory qualitative work after the quantitative endline survey data collection), aiming to provide understanding of the context, underlying mechanisms of change, and the implementation process of VFC; and
- a **business model and cost-effectiveness evaluation**, employing stakeholder interviews, commercial and end user data, document analysis, and evidence from the quantitative and qualitative evaluations to generate a business model framework and estimate the wider imputed benefits from the value-added service for the range of stakeholders involved.

1.3 Purpose and scope of the qualitative midline study

This midline report presents the findings of the second round of qualitative data collection conducted in March 2018. Data collection was carried out by PDA in close coordination with the IDS qualitative team led by Dr Inka Barnett.

The qualitative midline uses a qualitative case study design to explain how and why (or not) farmers take up and engage with VFC and how VFC may trigger behaviour change related to agriculture and nutrition practices.

To achieve this, the midline has the following objectives:

1. to document the implementation of VFC at community level and its effects on the uptake of VFC;

2. to explore acceptance of VFC at household level and its effects on uptake and engagement with VFC; and

3. to explore key barriers to the adoption of VFC advice and pathways of change.

Findings from the qualitative midline study will be combined and triangulated with the quantitative endline and business model/cost-effectiveness endline in 2019 (see Annex C for a timeline of the

different components of the evaluation). All findings will be shared with the VFC team (i.e. Esoko, Vodafone, GSMA) as part of ongoing regular communication between evaluation and programme staff to support and inform programme decision making.

1.4 Organisation of the report

Following the description of the methodology in section 2, profiles of the villages selected for the qualitative data collection will be given in section 3. That section will highlight differences in agriculture and nutrition that may be relevant for the uptake and effectiveness of the VFC interventions. Sections 4, 5, and 6 present the thematic findings of the analysis structured around the three aims of the qualitative midline study (see section 2.1). For each aim, potential implications of the findings are presented at the end of the section. Section 7 draws together the findings of the qualitative midline and provides preliminary recommendations for policy and practice.

2 Methodology

2.1 Aims of the midline qualitative study

Agriculture- and nutrition-related behaviours and practices are complex and the result of an interplay of psychological, social, economic, and environmental factors (Glanz, Rimer and Viswanath 2008, Korda and Itani 2013). Consequently, changing these behaviours is difficult and maintaining newly-adopted behaviours is even more challenging (Briscoe and Aboud 2012, Kelly and Barker 2016). VFC provides mobile phone-based agriculture and nutrition information to farmers, aiming to improve existing practices and promote the adoption of new practices, with the goal of improving the agricultural productivity and income and the nutritional well-being of smallholder farmers. Three interconnected components can influence whether information sent as part of behaviour change intervention is taken up by the intended recipients and is effective in changing behaviours and practices (Dombrowski, O'Carroll and Williams 2016):

- the behaviour change technique/s used by VFC (i.e. the targeting and the content of the information provided by VFC);
- the delivery mode for VFC (here remote mobile phone-based services); and
- a multitude of contextual factors that may hinder behaviour change in response to VFC.

The qualitative midline is guided by the overarching question: How and why (or not) do farmers take up and engage with VFC and how can VFC trigger behaviour change related to agricultural and nutritional practices?

To address this question, the midline will:

1. **document the implementation of VFC at community level and the effects on uptake:** this will explore how VFC is working in practice and how subscribers are experiencing the service, focusing on key implementation processes and experiences. It also aims to explore engagement with the services, for example whether farmers listen to the recorded voice messages, read the SMS, and contact the call centre, as well as other issues related to programme implementation;

2. **explore acceptance of VFC at household level and the effects on uptake and engagement:** the qualitative acceptance assessment focuses on farmers' acceptance of the content of the various behaviour change information delivered by VFC as well as the delivery mode of VFC (i.e. mobile phones). High levels of acceptance of both content and delivery mode are critical for uptake and sustained engagement with the service and are pre-conditions for the adoption of new behaviours and practices in response to it. Drawing on the Technology Acceptance Model, we conduct a comprehensive assessment of farmers' acceptance, including perceived usefulness, perceived ease of use, trust, and social influences on use (Davis, Bagozzi and Warshaw 1989, Venkatesh and Davis 2000, Venkatesh and Bala 2008). In this section we will also present unintended consequences of the VFC; and

3. **explore key barriers to the adoption of VFC advice and pathways of change:** this includes a documentation of key external and internal factors that may hinder change in response to VFC. It also explores key pathways of change in response to VFC.

The qualitative evaluation work stream is closely integrated with the quantitative and business model/cost-effectiveness evaluation at all stages to inform, enhance, and triangulate the design,

data collection, and analysis within the overall mixed-methods design framework. The midline qualitative study aims to build on findings and questions raised from the quantitative, qualitative, and business model baseline analysis, and to inform the design of the quantitative endline survey, ongoing business model analysis, and follow-up qualitative study planned for early 2019.

2.2 Sampling strategy

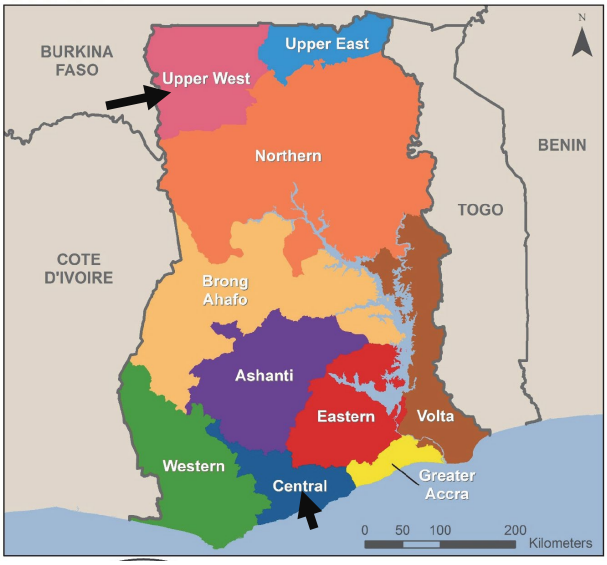
2.2.1 Community selection

Selection of sites for qualitative midline

The sample selection for the midline qualitative study was purposive and a sub-sample of the quantitative sample.[2] Only enumeration areas (EAs)[3] that were part of the quantitative treatment group (i.e. EAs in which farmers were selected to receive VFC) were considered for the qualitative sample.[4]

The initial aim was to select a total of three case study sites (i.e. EAs) from the quantitative sample in CR and UWR (see the black arrows in Figure 2.1).

Figure 2.1 Map of Ghana showing the two study regions



Source: (Ghana Statistical Service 2014)

The qualitative site selection started with GPS (Global Positioning System) mapping of all treatment EAs (based on GPS coordinates collected as part of the quantitative baseline). The mapping aimed to inform the identification of typical and extreme case EAs. An extreme case EA would be, for example, in a remote area far from main roads and towns as identified by the mapping, whereas a typical EA would be close to other villages, roads, and towns. Once the mapping had been completed, the latest VFC user statistics from Esoko were consulted to identify EAs with VFC farmers who regularly listened to recorded voice messages.[5] It soon became

[2] It should be noted that the qualitative impact evaluation is not based on a longitudinal qualitative sample; rather, in each qualitative data collection round, communities were purposively selected based on the specific aims of the respective round. The site selection for the qualitative midline was informed by the quantitative baseline data.
[3] EAs are the small geographical units covered by Census Enumerators.
[4] A total of 104 EAs were assigned as treatment villages. This included 1,811 individuals who agreed to be registered for the VFC service.
[5] The evaluation team only had access to user statistics for VFC farmers' engagement with recorded voice messages and not with the other VFC services.

obvious that the number of VFC farmers who still actively engaged with recorded voice messages was very low; according to user statistics, most farmers had not picked up voice messages in the last five months or even longer/never. Therefore, it was impossible to find EAs with enough active VFC farmers for data collection (i.e. around 30 VFC farmers per EA to enable several focus group discussions (FGDs) and in-depth interviews (IDIs)).

As the main research aims were to explore why and how users take up and engage with VFC (and in particular the recorded voice messages, as the main source for agriculture and nutrition information) and how the service may trigger behaviour changes, it was essential for the sample to include VFC farmers who still actively engaged with the service (i.e. had listened to at least one recorded voice message per month in the last three months). The sampling approach had to be adapted and several EAs were clustered together to have enough VFC farmers (around 35 per EA cluster) who still engaged with the service.

This meant that a total of 16 villages (11 in CR, five in UWR) were sampled from four districts across the two regions (Asikuma Odoben and Ajumako districts in CR, and Nadowli and Jirapa district in UWR). Two of the districts had also been part of the qualitative baseline study. Working in the same districts as the baseline would allow the team to draw on the existing rapport with district-level authorities and community members.

Table 2.1 Districts and villages sampled for midline data collection

Region	District	District included in baseline?	Village	Village included in baseline?
CR	Asikuma Odoben	Yes	Dokono Nkwanta	No
			Gyamra	No
			Mpechim	No
			Ohurobo	No
	Ajumako	No	Amoanda	No
			Esikando	No
			Kyebi	No
			Ahamakomua	No
			Ohyira	No
			Kokoben	No
			Bawura	No
UWR	Nadowli	Yes	Mwanware	Yes
			Tankasie	No
			Dapuoh	No
			Daa	No
	Jirapa	No	Baazu Yiepel	No

2.2.2 Community engagement

In each district, the research team visited the local assembly to introduce themselves and the study to the district authorities. The district authorities were very helpful. Two of the districts (Asikuma Odoben and Nadowli) had already been visited by the team during the baseline phase, so officials were already familiar with the research team and the aims of the study. Prior to the in-person visits, team leaders tried to phone VFC farmers to introduce themselves, invite them to participate in the qualitative interview, and check their availability. Many (30 per cent) of the telephone numbers selected during the quantitative baseline could not be reached (despite repeated attempts to call them) and this often made it challenging for the team to contact the farmer

2.2.3 Participant selection

VFC farmers were identified from the quantitative baseline data. Given the low levels of engagement with VFC, all farmers who still actively engaged with the services and lived in the selected EAs were included in the sample and invited for an interview. To explore why farmers dropped out, we also included farmers who no longer engaged with the service (based on user statistics). Table 2.2 further describes the selection of VFC farmers.

Table 2.2 Sample of VFC farmers contacted and interviewed for the qualitative midline

	CR	UWR
VFC farmers contacted	75	75
VFC farmers interviewed	46	51
Level of engagement with voice messages among interviewed VFC farmers		
Listened to at least one message each month	32	34
Listened to less than one message each month	43	41
VFC farmers not interviewed because…		
Unreachable (i.e. number inactive)	23	22
Lost mobile phone	2	1
Lost VFC SIM card	3	0
Refused to be interviewed	1	1

In CR, a total of 31 IDIs, three FGDs with VFC farmers, and four key informant interviews (KIIs) were carried out across the two districts. A further three community FGDs were conducted with elderly women, mothers, and youths. In UWR, a total of 31 IDIs, five FGDs, and four KIIs were carried out across the two districts. Two FGDs were also conducted with community members. See Table 2.3 for a detailed breakdown.

Table 2.3 Detailed breakdown of VFC farmers included in the qualitative sample by region, district, and EA

Interview category	CR												UWR					TOTAL
	Asikuma Odoben					Ajumako							Nadowli				Jirapa	
		Dokono Nkwanta	Gyamra	Mpechim	Ohurobo	Amoanda	Esikando	Kyebi	Ahamakomua	Ohyira	Kokoben	Bawura	Mwanware Tankasie	Tankasie	Dapuoh	Daa	Baazu Yiepel	
IDIs																		
VFC farmer (male)		3	1	4	3	2	1	1	0	0			2	3	1	6	3	30
VFC farmer (female)		2	0	2	3	4	1	3	2	2			2	3	2	3	3	32
FGDs																		
VFC farmer (male)											4	6		6	4	4		24
VFC farmer (female)									5				6	6				17
TOTAL																		**75**

[a] Six VFC farmers were included in both the IDIs and the FGDs in UWR.

2.3 Data collection methods

Multiple data collection tools were used to obtain qualitative data from different sources and perspectives. The use of different data sources is important, as it allows for triangulation of different qualitative findings. At community level, the main data collection tools were semi-structured IDIs with treatment farmers (farmers who were signed up to receive VFC information by the Institute of Statistical, Social, and Economic Research survey team during the quantitative baseline survey – i.e. VFC farmers), KIIs with agriculture extension officers, and FGDs with VFC farmers. FGDs were also conducted with mothers, elderly women, and youths in some communities, as they were considered an important information source in relation to agriculture and nutrition.

IDIs – these were conducted with male and female VFC farmers who had signed up to and were registered to receive the VFC service on their phone or their partners' mobile phone as part of the evaluation's baseline survey. Interviews were only conducted with VFC farmers who had activated the VFC SIM card successfully after registration (based on user statistics from Esoko; see also section 5.1.2). Interviews included both farmers who actively engaged with the recorded voice messages (i.e. based on user statistics from Esoko these farmers picked up at least one recorded voice message in November 2017, December 2017, and January 2018, respectively) and farmers who were engaged at one point but who no longer engaged (i.e. had not picked up any recorded voice messages in the three months). IDIs were considered the most suitable method of capturing male and female farmers' personal experiences with and acceptance of the service, and of exploring barriers to and pathways of change. IDIs were guided by a semi-structured topic guide to ensure that the same themes were covered in each interview (see Annex E).

KIIs – these were conducted with influential people in each village, including agriculture extension officers, village chairmen, and community health workers. The purpose was to explore their knowledge, awareness, and opinion of VFC services, as well as to capture information on current contextual issues relating to agriculture and nutrition. Interviews were guided by a semi-structured interview schedule (see Annex E).

FGDs – these were carried out primarily with VFC farmers. The discussions were designed to openly explore farmers' likes and dislikes about the content and delivery mode of VFC and to gather ideas and suggestions for improvements. The FGDs included a participatory ranking methodology to further facilitate discussions about the different features of the service (see Annex D for further details on the participatory ranking). FGDs were also conducted with mothers, elderly women, and youths in some communities to explore the beliefs and practices around agriculture and nutrition in the community. Topic guides led all FGDs and provided enough flexibility to allow participants to raise and discuss matters they felt were relevant and important (Annex E).

To examine the underlying mechanisms that influence whether, how, for whom, why, and in what contexts VFC information is translated into actual behaviour change, a realist evaluation approach was used as part of the qualitative midline. Data for the realist analysis were extracted from the IDIs, FGDs, and KIIs described above.

2.3.1 Development and pilot testing of the tools

As per the baseline phase, the qualitative fieldwork was conducted by PDA in close collaboration with IDS. IDS drafted the data collection tools (topic guides with lists of questions and probes). These were informed by findings from the baseline phase of the evaluation conducted in 2017, including the initial exploratory qualitative study (Barnett, Srivastava and Gordon 2018), the

Quantitative Baseline Report (Gilligan, Hidrobo, Ledlie and Palloni 2018), and the Business Modelling Baseline Report (Batchelor, Scott and Sharp 2018). The tools were also informed by external evidence from other existing literature, including on behaviour change models, realist evaluation methods, and GSMA analysis of service use.

Once drafted, the topic guides were shared with the external peer reviewer and programme and evaluation partners for their input. Following feedback received, IDS reworked the tools and presented them for discussion and refinement as part of a joint IDS–PDA researcher training workshop held from 05 to 09 March 2018 in Accra. The topic guides were piloted in a treatment village in the Asikuma Odoben district in CR on 08 March. Following the piloting process, the tools were further discussed and modified by the research teams (e.g. the order of questions and required prompts). The final set of topic guides are included as Annex E.

2.3.2 Data collection implementation

The midline data collection took place from 11 to 21 March 2018 across four districts in UWR and CR, Ghana. Data collection was carried out by six qualitative researchers (two females and four males), who were split into two teams of three (each team covering one region) based on their knowledge of the region and local languages spoken. Each regional team had an allocated team leader, and overall management and quality control was provided by the PDA research manager in communication with IDS. The researchers worked in pairs, with one adopting the role of interviewer/facilitator and the other the role of note taker. Each team discussed their findings extensively in debriefing sessions that were organised each evening after the data collection.

2.4 Data management and analysis

IDIs and FGDs were conducted in local languages: Twi (CR) and Dagaare (UWR). Interviews were audio-recorded (with consent), transcribed, and translated into English by the qualitative team. After data collection was completed, the field research team reconvened for a three-day synthesis workshop (with IDS participating remotely). During the workshop, initial emerging themes from the data were explored and discussed.

Final data analysis was undertaken by the qualitative research team at IDS led by co-Principal Investigator Dr Inka Barnett together with Dr Becky Faith and Jessica Gordon. Qualitative data analysis software (NVivo) was used to manage and code data. Qualitative data were analysed using a directed content analysis approach focused on the main qualitative evaluation question, the three central midline study objectives. Data analysis started with open coding of several interviews and the development of an initial coding scheme that guided the coding of the remaining data. To enhance the rigour of the data analysis, coding was carried out by three researchers independently. Their coding schemes were then discussed and modified into one joint scheme (see Annex F for the coding scheme that was used). While the scheme guided the coding, it was flexible enough to allow for unforeseen topics that emerged to be added at any point.

A separate coding scheme and process was undertaken for the realist sub-component to identify specific contexts ('C), mechanisms ('M), and outcomes ('O) from the data to test and refine the set of initial context–mechanism–outcome (CMO) configurations. Figure 2.2 illustrates one possible CMO configuration that was identified as part of the analysis (the full list of CMOs is included as part of section 7).

Figure 2.2 Illustration of CMO configuration

The draft midline report was shared with the PDA team to ensure that the IDS team correctly interpreted the raw data collected and to allow for additional details to be added that would enhance the quality of the report.

2.5 Ethical approval

As an overall guiding principle, the research team sought to conduct itself in a professional and ethical manner throughout the midline phase of the study, with respect for integrity, honesty, confidentiality, voluntary participation, impartiality, and the avoidance of personal risk. These principles were guided by the Organisation for Economic Co-operation and Development's (2010) Development Assistance Committee Quality Standards for Development Evaluation and DFID's (2011) Ethics Principles for Research and Evaluation, which are being followed for the duration of the evaluation.

National-level ethical approval that had been granted for the initial exploratory qualitative study by the University of Ghana's Ethics Committee for the Humanities in October 2016 had to be renewed and was granted in September 2017 prior to the start of the fieldwork. The ethics approval granted for the project by the IDS Research Ethics Committee in 2016 remains in place for the duration of the project.

Confidentiality and data protection issues were discussed with the data collection team prior to starting data collection and included as part of a detailed field manual shared with the PDA team during training. Informed written or oral consent was collected from all participants prior to the start of the interviews. Participants did not receive any reward or financial compensation for their participation in the interviews.

For confidentiality, all identifying variables – such as village or community names, district capitals, and other locations – have been replaced by pseudonyms in this report. All files containing raw and analysed data are securely stored in password-protected databases.

IDS and all sub-contracted partners undertaking data collection have specific arrangements in place for handling data generated from the project in accordance with the Data Protection Act (1998),[6] which includes the processing and storage of any sensitive personal data and maintenance of privacy. All intellectual property rights in any materials produced from the evaluation (including publication of research findings and any associated reports and data) remain the property of IDS and associated sub-contracted collaborators. DFID has unlimited access to any material produced from the evaluation. To promote use and uptake of the evaluation findings, and

[6] And more recently the General Data Protection Regulation implemented on 25 May 2018.

in line with DFID's Open and Enhanced Access Policy, the evaluation team is committed to ensuring that all major report outputs and associated data generated from this project are made publicly available in an accessible format.

2.6 Limitations and challenges

Several methodological limitations need to be considered.

We were able to interview only 97 of the sampled 150 VFC farmers (65 per cent). This limits the conclusions that could be drawn. However, most of the VFC farmers that could not be interviewed could simply not be reached (as all telephone numbers provided were incorrect). As the telephone numbers used to sign up for VFC were no longer active, farmers could no longer engage with VFC. We still interviewed 97 farmers, which is a considerable size for a qualitative study.

Second, low engagement with VFC and resulting low numbers of actively engaged VFC farmers prompted us to adapt the sampling approach and cluster EAs across four districts. Consequently, logistics for the data collection in 16 villages became more challenging. It was also impossible to conduct in-depth contextual analysis for all 16 villages. However, as the villages in each of the four selected districts were located close to each other, the context is likely to be very similar in each cluster (see also the village profiles presented in section 4).

Third, all interviews were conducted by a team of young, educated field researchers. The characteristics of the field team might have affected participants' comfort and degree of honesty when answering questions (e.g. introducing social desirability bias). However, the team was very experienced, was familiar with the local customs, and dressed appropriately according to local custom; a session was also organised at the end of the training to explain to the team how bias can have an influence on data quality (e.g. social desirability bias on the part of the participants). All these factors helped to make participants feel at ease.

3 Village profiles

This section provides a brief description of the districts and villages selected for the midline collection. Given the high numbers of villages (n = 16), an in-depth contextual analysis of each village was impossible within the timeframe of the qualitative midline data collection.

Table 3.1 Community profiles

Region	Description
CR	Mixed farming is practised in most of the communities, as farmers grow cash crops (cocoa or rubber) alongside food crop subsistence farming. Vodafone and MTN network connections are available in all three communities. In CR, most farmers do not own their land and have no or limited control over what they plant due to existing land tenure systems. In some communities, land is allocated by local chiefs. Although proceeds from cocoa cultivation need to be shared with the landowner, food crops are not necessarily shared with the owner. All the communities have access to electricity regardless of how remote they are. Network coverage is very poor in almost all the communities. The main roads are good, but connecting roads to villages are very bad and untarred. Very few communities have school buildings in good shape. In Kyebi, one of the communities in the Ajumako district, children in Junior High School need to walk for almost an hour to Ajumako to attend the nearest lower secondary school in the area. The only school in the Kyebi community enrols up to primary six. In one surveyed community (Ahamakomuah), members come together to build schools and keep their village clean. They are organised around community centres for such meetings. We observed, as was the case in one community, that failure to observe these ordinances attracted a fine of ten Ghana *cedis* (GHS). This is a common practice in all the communities. The communities are small, and people generally know each other. Communities visited had some form of traditional leadership. These were either chiefs or clan heads that had authority recognised by the entire community.
UWR	The four communities visited in the Nadowli district – Mwanware, Tankasie, Dapuoh, and Daa – were located near the main road between Wa and Jirapa. Daa was an exception, as it was quite remotely located off the main road. It was also the least developed (with no electricity, poor mobile network connectivity, and a bad road network) in comparison to the others. Food crop subsistence farming is common across all three communities and livestock rearing is an additional source of income. Vodafone and MTN are common networks across the three communities. Christianity is the predominant religion. The chief is the supreme authority in the community, followed by elders and opinion leaders, among whom are women. The main source of livelihood is agriculture and farmers grow food and (to a lesser extent) cash crops. They also rear animals for sale and consumption. Most farmers go to the neighbouring market or the district town market to sell their produce and animals. There is no public school in the community and children go to the school in the neighbouring community. The communities visited are patriarchal in social structure. The main ethnic group in the district is the Dagaaba and the language spoken is Dagaare. A few community members spoke Twi, the most widely spoken language in Ghana. Christianity and Traditional religion are the dominant religions in the district. Community members were very receptive, and are generally hospitable.

4 Experiences with the implementation of VFC at community level and effects on uptake

The following section presents the findings regarding farmers' experiences with the implementation of VFC.

4.1 Implementation

This section focuses on key implementation processes and experiences related to the enrolment, registration, and activation of the VFC SIM card, uptake of the different VFC services (i.e. recorded voice messages, SMS with weather and price information, call centre, free calls to other VFC members), and experiences of frequency and regularity in accessing the services.

4.1.1 Key motivators for treatment households to sign up

All treatment households were introduced to VFC by the quantitative field team using the script that is currently used by Vodafone to advertise VFC to farmers.[7] The script was read out to all treatment farmers and includes details on the different services included in the VFC package, although the script currently does not distinguish between the types of information sent through recorded voice messages and SMS:

> *The Farmers' Club is an association for farmers in Ghana with a special SIM made only for farmers and other agric people. If you have this SIM, you can call an agric expert for free. This expert can give you agricultural information and tips that are useful for your crops and region, like an agricultural extension worker that you can contact at your convenience and for free on your mobile phone. The package also gives you weather and farming advice and helps you find the best prices for your crops, all from your phone. The advice is tailored to your geographic region, in the language of your choosing, for the two crops you are most interested in. Once you are a member, you can call any other farmer in the association for free.*
>
> (*Current Vodafone script for VFC*)

A total of 91.5 per cent of all treatment households agreed to be registered for VFC (Billings *et al*. 2018). The process of registering households was as follows: the team completed the new member SIM registration, handed out a VFC SIM card, and recorded information for profiling the new member to the service, before leaving the household. If the targeted individual already had an existing Vodafone SIM, they could opt to migrate their existing number to the VFC service rather than receive a new SIM. In these cases, the team sent the migration requests to Esoko in batches to complete the migration for existing Vodafone numbers that wished to become VFC members. Individual farmers' and/or households' underlying motives for signing up to the service varied and may influence uptake and likelihood of maintained utilisation.

[7] In fact, the quantitative team randomly assigned two scripts: 1) a script that focuses on the agriculture value added of the product (Vodafone's current script), and 2) a script that augments the agriculture focus with additional information about the added nutrition value of the product.

Perceived need for information on farming

Most farmers said they had signed up as they wanted to learn more about farming and how to increase their yield. Many farmers described that they did not have many opportunities to learn about best practices of farming and thus had to take advantage of every opportunity to learn.

For example:

> *I signed up because I thought the service would provide me with information on best farming practice, like how to cultivate maize and get a bumper yield.*
>
> *(Female farmer, Tankasie, UWR)*

> *We decided to join the Vodafone Farmer's Club because the messages will be a guide during farming.*
>
> *(Male farmer, Mpechim, CR)*

A few farmers hoped that VFC would help them with their specific farming-related questions, for example about the correct use of fertilisers, pest control, and planting procedures:

> *I expected the club to help me especially with how to apply fertiliser, the right time to plant cocoa seedlings, and application of pesticides on my cocoa farm.*
>
> *(Male farmer, Dokono Nkwanta, CR)*

Some farmers wanted support in dealing with changes in weather rainfall patterns:

> *I joined it because I thought it would bring some development. I expected to receive information about farming because the rainfall pattern has changed, so we were expecting information on the seasons – when to farm and when not to.*
>
> *(Male farmer, Baazu Yiepel, UWR)*

A clear priority for farmers was information on farming practices, and only two female farmers in UWR mentioned that they would also be interested in learning more about good nutrition from VFC.[8]

Expectations of financial and material benefits

Other farmers were convinced that by joining VFC they would gain access to much-needed financial and material support. For example:

> *I thought they will come back and give me soap, a mobile phone, fertiliser, and chemicals for spraying my farm; that was why I agreed to register.*
>
> *(Female farmer, Ahamakomua, CR)*

> *I expect some benefits from the club like fertiliser to increase my produce. This is why I took the decision to sign up to the club.*
>
> *(Male farmer, Tankasie, UWR)*

[8] It should be highlighted that one of two scripts was used by the quantitative team to encourage farmers to sign up to VFC. Script 1 focused on the agriculture value added by the product (Vodafone's current script), and script 2 augmented the agricultural focus with additional information about the added nutrition value of the product. By comparing outcomes from the two scripts, the quantitative evaluations aim to discover whether emphasising the nutrition component of the programme leads to larger changes in impact on nutritional outcomes.

Many of these farmers said they stopped engaging with VFC once they realised they would not receive material support (although of course the farmers had never been told they would receive any material benefits from VFC during the registration process)

Perception that they would join an alternative FBO

Many farmers believed that by signing up for VFC they would join a new type of FBO. FBOs have been heavily promoted by both public and private sector actors in Ghana in the last decade and have thus gained increasing popularity (Salifu, Francesconi and Kolavalli 2010). Farmers explained that they hoped to receive support and assistance from VFC, similar to what other FBOs offered their members. A farmer explained:

> *I signed up because I want to get logistical support from the club as a member. Some of the logistical support mentioned includes a cutlass, boots, fertiliser, and a spraying machine.*
>
> *(Male farmer, Mpechim, CR)*

A few farmers who were very committed and attached to their membership in VFC felt that the group identity could be further strengthened with some visible signs of the VFC branding. This would also help them to identify other group members more easily:

> *They should provide VFC shirts or anything for us to identify members in other places.*
>
> *(Male farmers, Dapuoh, UWR)*

Interpersonal contact during registration was an important motivator for sign-up

Many farmers said that the interpersonal interactions with the quantitative team for the household survey had been very pleasant and that this had motivated them to sign up for the service:

> *I signed up to VFC because a team came to our community to explain to us what VFC was all about. We were told that we would receive voice and text messages from Vodafone on agric and nutrition. I liked this.*
>
> *(Male farmer, Mwanware, UWR)*

In this context it should be mentioned that a few farmers believed the quantitative survey team was from VFC. For example:

> *They (VFC people) are always coming; last year they came twice; however, we haven't seen them for some time now.*
>
> *(Female farmer, Baazu Yiepel, UWR)*

Most farmers decided themselves to sign up

Most farmers had decided by themselves to sign up. Only very few consulted with family members regarding whether to sign up, as the following quote highlights:

> *I consulted my mother and she also advised that I should join and it will help me.*
>
> *(Female farmer, Mwanware, UWR)*

4.1.2 Experiences with the SIM card activation

After the VFC SIM was successfully registered, households were required to activate their new SIM cards by using the phone to check the balance or by sending a text message to start receiving VFC information. Data from Vodafone on the activation status of the VFC SIM card from April 2017 (shortly after the completion of the quantitative baseline survey and registration with VFC) suggested that only 25 per cent of farmers had activated their SIM card.

The qualitative data suggest several region-specific reasons for the delay in the SIM activation. In CR the main reason for the delay in the activation seems to be:

- **Poor Vodafone network signal**: in CR, Vodafone network coverage was often patchy and/or poor (according to the interviewed farmers and also based on a signal strength test conducted by the qualitative field team in each village and household). Consequently, many farmers preferred other mobile network providers (e.g. MTN), and were not in a hurry to insert the VFC SIM card into their phone for activation. A female farmer from Mpechim recalled her experience:

> *I kept the SIM card for about a month before putting it into my phone; however, it did not work. There was no network signal and all that appeared on the screen was 'invalid'. A friend tried the SIM in her phone as well but the same appeared on the screen.*
>
> *(Female farmer, Mpechim, CR)*

In UWR several other reasons for the delay in the SIM activation emerged:

- **No mobile phone access:** farmers who did not own a mobile phone[9] were often unable to use and activate the SIM card. All farmers said they had access to a mobile phone during the quantitative survey, but in practice access was frequently irregular or restricted to occasionally calls in case of emergencies. Some of these farmers did nothing with the SIM card, as the following quote highlights:

> *My card is not activated; I couldn't activate my SIM because I have no phone to insert the VFC SIM card into.*
>
> *(Male farmer, Daa, UWR)*

Other farmers without a phone gave the SIM to a family member or friend who owned a phone; however, only a few of those farmers knew whether the SIM had been activated by the new owner. For instance:

> *I don't know [whether the VFC SIM has been activated], I do not have a phone, I used a friend's number to register and gave him the SIM, but I don't know whether he activated it. I don't get any information on farming or nutrition because my friend has never informed me about anything and I have also not asked.*
>
> *(Male farmer, Mwanware, UWR)*

[9] Based on the quantitative sample, 45 per cent of female famers and 80 percent of male farmers in the treatment sample own a mobile phone, and the majority of the remaining farmers said they had access to a mobile phone.

- **No need for a new SIM card:** some farmers who owned a phone gave the VFC SIM card away because they did not want to use a new SIM, as the following quote describes:

> *When they came they gave me the SIM card but I have a one-SIM phone so I gave it [the VFC SIM] to one of my wives to use. Her phone broke so we just put the SIM down.*
>
> *(Male farmer, Baazu Yiepel, UWR)*

- **Unsure how to activate:** a few farmers were unsure how to activate the card and complained that they had never been told how to do it:

> *I cannot tell whether it was easy or difficult but what we were told is that we should insert the SIM card into our phones. We were not taught how to activate it by either checking the balance or sending or calling any short code.*
>
> *(Male farmer, Tankasie, UWR)*

- **Could not read activation instructions:** others said they were unable to activate the SIM as they could not read and therefore could not follow any written instructions during the activation process. For example:

> *Activating the SIM card was difficult in my view because I could not read, so the Vodafone people had to activate it for me.*
>
> *(Female farmer, Mwanware, UWR)*

To encourage and facilitate the activation of the VFC SIM cards, the quantitative team conducted a brief follow-up visit of all households in July 2018 during which the team encouraged farmers to activate the services and also explained to them how to activate (i.e. check the balance or by sending a text message). As a result, the SIM card activation could be increased significantly.

4.1.3 Time between activation and receiving first VFC service

When asked when they received the first VFC service (i.e. the first recorded voice messages or SMS with weather or price information), most farmers said they received the first recorded voice messages a few days or weeks after the activation.

A smaller number said they received their first recorded voice messages a few months later and others said they never received any VFC service. When they explored further, the qualitative team often learned that the farmers only irregularly used the VFC SIM card, and spent most of their day in areas with no Vodafone network coverage and thus were likely to have missed recorded voice messages.[10] Other farmers had lost the SIM card.

4.1.4 Implementation challenges with the VFC

The qualitative team interviewed 97 farmers who were registered with VFC and who successfully activated the VFC SIM card (either by themselves or with assistance of the quantitative field team in the quantitative follow-up visit). Table 4.1 presents the self-reported use of the various VFC services by the farmers. The qualitative sample is not a representative sample, nor does it aim to

[10] Esoko made around 15 attempts each month to reach VFC members with recorded voice message calls.

provide generalisable findings. Nevertheless, the qualitative data provide some ideas with regards to the general uptake of the different services and potential regional patterns in uptake.

Table 4.1 Uptake of the different VFC services by region

Farmers who ….	CR	UWR
Registered and activated VFC	46 (100%)	51 (100%)
Listened to at least one VFC recorded voice message	35 (76%)	33 (65%)
Read or asked somebody to read at least one VFC SMS	16 (35%)	24 (47%)
Called VFC call centre	6 (13%)	12 (24%)
Used the free VFC farmer-to-farmer call	2 (4%)	10 (20%)

The qualitative uptake data suggest that farmers in UWR are more likely to take up the VFC services compared with farmers in CR (except for recorded voice messages). Furthermore, while around three-quarters of the farmers in the qualitative sample said they had listened to at least one recorded voice message, many said that now they no longer or only very occasionally listen to a recorded voice message. In fact, Esoko reports on the use of recorded voice messages among the treatment group suggest that the uptake of recorded voice messages is alarmingly low. Based on user statistics from December 2017, 81 per cent of the calls with recorded voice messages are declined without answering ('hung-up calls') and another 7 per cent are disconnected calls ('dropped call'). Only 4 per cent of calls are successfully answered and another 2 per cent leave a voicemail.[11]

In the following sub-sections, implementation issues that may help to explain the difficulties in the uptake of the different VFC services will be explored. In section 6 the acceptance of the VFC and perceptions of the usefulness of the agriculture and nutrition content delivered through the service will be presented.

Experiences with the implementation of the recorded voice messages

Farmers who picked up recorded voice messages regularly described the process as easy, and '*like picking up a normal telephone call*'. While no farmer could remember the number that was used for the recorded voice messages, those who had basic numeracy skills said they recognised the number on their mobile phone screen and knew it would be a VFC recorded voice message before picking up. For example:

> *[…] I am familiar with the number that comes through. It is a landline that begins with 030. Once I pick up the call, I am allowed to select the language in which I wish to listen to the call. So I press the option for Twi and I listen.*
>
> *(Male farmer, Ohyira, CR)*

> *You will realise when you receive a voice message; they call with a specific number and that is what appears on the screen when they call. But I do not know the number off the top of my head.*
>
> *(Female farmer, Dokono Nkwanta, CR)*

[11] Per month Esoko makes between nine and 16 attempts to reach each farmer with VFC recorded voice messages.

Farmers who could not read numbers said they picked up all calls and then decided whether to listen to the caller:

> *I don't know what number appears on the screen of the phone because I am illiterate. When the phone rings I just pick up without knowing who or what number is calling.*
>
> *(Male farmer, Mwanware, UWR)*

Reasons for missing recorded voice messages

Most farmers were aware that they missed many recorded voice messages, with some messages being missed deliberately and others due to external reasons beyond the farmers' control.

- **Poor Vodafone network signal makes it difficult to pick up recorded voice messages:** especially in CR, many farmers complained that they struggled to receive calls (including VFC recorded voice messages) due to the poor Vodafone network signal. For example:

> *Please tell Vodafone that their network is very bad here; it is very difficult to receive phone calls here on Vodafone unless you get to a special spot where you can get the messages and calls. The network also makes it difficult to access the VFC.*
>
> *(Female farmer, Ohyira, CR)*

One farmer (from CR) described that he had only received one recorded voice message since joining the VFC. He went on to explain that he got this message while visiting his brother in a different village with better Vodafone coverage.

- **Bad timing of the VFC recorded voice messages and no voicemail set up:** almost all farmers said they regularly missed recorded voice messages as they were preoccupied with other activities and thus did not have time nor interest in receiving recorded voice messages.

> *I did get voice messages several times (about seven) within a week and at times I see it as disruptive when I'm busy working. For example, just yesterday they called me when I was busy preparing to go and get food in the farm for the house. When it happens that way it's annoying and I don't pick up.*
>
> *(Female farmer, Tankasie, UWR)*
>
> *I am a farmer and spend most of my days on my farm. As a result, I have very little time to receive voice messages.*
>
> *(Male farmer, Mpechim, CR)*
>
> *I only have time to listen when I am free. The calls can come at any time. Some of those moments are ones you are very busy, so you are not willing to pick up.*
>
> *(Male farmer, Bawura, CR)*

No farmer in the qualitative sample had set up voicemail or knew how to access voicemail (in the case it was set up by default). Commonly cited reasons for this were lack of technical know-how and illiteracy. Consequently, it was impossible for Esoko to leave recorded voice messages for the farmer to pick up at a more convenient time (e.g. in the evening after the farm work was done or in the early morning).

- **Common misconception that Vodafone would reduce mobile phone credit when listening to recorded voice messages:** many farmers (especially in UWR) believed that they

would be charged when picking up a voice message. Some farmers said they had never picked up a recorded voice message because of this fear. Others said they picked up but usually dropped the call after a few seconds:

I was able to follow advice [in the voice message] as it was spoken in Dagaare [local language], but I was unable to listen to all the information because I thought it was consuming my credit and hung up.

(Female farmer, Tankasie, UWR)

I usually disconnect their voice calls because I think I am being charged for it.

(Male farmer, Tankasie, UWR)

In this context a few farmers voiced their frustration that they had not been made aware of the fact that they would be charged for picking up recorded voice messages when they signed up for the VFC (it is important to note here that farmers are not being charged for recorded voice messages).

We were not well educated on the services. They did not tell us that they would be deducting our phone credits. They should have told us.

(Female farmer, Daa, UWR)

The findings from the qualitative midline (and from the initial qualitative study: Barnett *et al*. 2018) stress the importance of educating farmers on the use of recorded voice messages, including the set-up of voicemail and the fact that recorded voice messages are free of charge. Educating farmers on how to operate recorded voice messages was also one of the key recommendations of the initial qualitative evaluation study and should be considered in future versions of this intervention. These measures are likely to improve uptake of the recorded voice messages considerably.

- **Phone is switched off:** some farmers said they regularly missed recorded voice messages as their phone was switched off. Reasons for this included flat batteries (and no time to go to the nearest mobile phone kiosk to charge the phone, which was a critical issue in UWR, where most households are not connected to the national electricity grid[12]) or technical problems with the phone.

The only problem is that when the phone battery is low and is on charge I am unable to pick up their call.

(Male farmer, Dapuoh, UWR)

If the phone's battery is low, there is no electricity here so we send it elsewhere to charge.

(Female farmer, Tankasie, UWR)

- **Dual SIM card use, with the non-VFC SIM card being the preferred one:** many farmers said they used several SIM cards from different MNOs in parallel to capture the best network coverage and tariffs available (see also the initial qualitative study by Barnett *et al*. 2018). As a result, they frequently missed VFC voice calls (especially if they owned a one-slot mobile phone and the VFC SIM card was inserted only infrequently). For example:

[12] Only few households had access to solar panels as the panels are expensive (see also the initial exploratory qualitative report)

I don't see all calls. There are two chips in my phone, and I usually confuse the VFC with my MTN pay as you go calls. So I miss most voice messages, but I do occasionally listen to these messages.

(Male farmer, Bawura, CR)

Introducing a new SIM card to farmers may be an important barrier to uptake as farmers usually already own at least one (preferred) SIM card that they regularly use. They are thus reluctant to use another SIM (especially if they only have a one-slot phone). As described above, farmers with existing Vodafone SIM cards could upgrade the card to include VFC. However, as Vodafone often was not the preferred network, pre-existing Vodafone SIM ownership was limited.[13]

Experiences with receiving VFC SMS with weather and price information

Most farmers (who had at least some level of literacy) said they had received VFC SMS and that they could recognise the messages easily, as they always came under the 'Farmer Club' sender name. Poor network signal (especially in CR), switched-off mobile phones, and dual SIM card use were mentioned as reasons for why an SMS may have been missed. However, according to the qualitative data, problems with receiving SMS were not the main barrier to the uptake of VFC.

Illiteracy as a major barrier to the uptake of VFC SMS

Illiteracy is high in UWR where only 27 per cent of the adult population can read. In CR around 60 per cent of adults can read. Consequently, illiteracy was frequently mentioned as a barrier to the take-up of and engagement with the SMS, especially in UWR. For example:

I am not able to read and write. I don't make much of the messages, but use only the calls. The only function that I use on my phone is the receiving of calls and making calls.

(Male farmer, Tankasie, UWR)

Some farmers asked their school-aged children or a friend to read the messages for them. However, this only happened occasionally.

Inability to understand SMS in English

Many farmers also complained that the SMS were written in English[14] and that they were unable to comprehend English:

Again, regarding sending text messages, most of us cannot read English so the information becomes difficult to understand, unless you get someone to read and interpret to you in Dagaare.

(Female farmer, Tankasie, UWR)

However, as I have explained, I do not understand the English language. Consequently, I do not comprehend any SMS that comes through.

(Male farmer, Dokono Nkwanta, CR)

When asked how the VFC could be improved, several farmers said the content of the SMS should be delivered as a recorded voice message and preferably in one of the local languages rather than

[13] 370 (20 per cent) of 1,811 treatment farmers used existing Vodafone SIM cards to received VFC.
[14] The principal written Ghanaian languages are the Twi dialects of Asante, Akwapim, and Fante. Other written languages are Nzema, Ewe, Dagbane, Ga, and Kasena and of course English.

in English.[15] However, as pointed out above, there were clear challenges involved in the uptake of recorded voice messages.

The qualitative data in Table 4.1 suggest that the uptake of SMS was slightly higher in UWR than in CR. An explanation for this may be that farmers in UWR generally seem to value weather and price information more compared with farmers in CR (see also section 6.1 on the perceived usefulness of the VFC service).

4.1.4.1 Experiences with the VFC call centre

Reasons for not using the call centre

Only 13 per cent of the farmers in the qualitative sample in CR and 24 per cent of farmers in UWR said they had ever attempted to contact the VFC call centre. A large proportion of the farmers that had never used the call centre said they simply had not been aware of the call centre function, as highlighted, for example, by a farmer from Dokono Nkwanta:

Yes, that is so, I never knew about the free call centre. But now that I know, we will try and call them.

(Male farmer, Dokono Nkwanta, CR)

It should nevertheless be highlighted that the script used to explain VFC to farmers repeatedly stated that farmers could call agriculture experts free of charge with the VFC SIM card (see section 5.1.1.). To improve uptake, further details and explanations about the call centre and its function should be included in the initial script, as many farmers clearly did not understand this aspect.

The remaining farmers mentioned various reasons for not using the service, including:

- fear that they would be charged for the call and lose mobile phone credit;
- a misperception that they would need to be able to communicate in English to speak with a call centre expert; and
- no need to call as they had no specific questions related to agriculture or nutrition.

Experiences when using the call centre

Farmers' experiences when contacting the call centre varied. The majority of farmers (five out of six) from CR and four out of 12 farmers from UWR said they were dissatisfied with the service and would not attempt to call again. The most commonly cited reason was that they had not received an answer to their specific questions or concerns. Most of them had been promised by the call centre agent that they would be called back with an answer to their question. However, none of the farmers had actually been called back:

Once I complained about pests on my farm to the call centre and they promised to call me back. Yet up till now, after several months, I have not had any feedback.

(Male farmer, Dokono Nkwanta, CR)

When I called, I was told that my message was being forwarded to an appropriate channel for me to be talked to. However, I got no reply and the call hung up. That is my only problem with it.

[15] Some farmers said they had already received some weather and price information in a recorded voice message.

(Female farmer, Ohyira, CR)

Two farmers complained they had to wait for a long time to speak to a call centre expert and thus had given up trying to contact the centre.

However, there were also a few positive experiences with the call centre. Farmers in UWR believed a call centre had huge potential, as explained by several farmers in an FGD in Dapuoh:

> *Farmer 1: During farming season, when we don't know the rainfall pattern and want to know when it will rain, we can call to find out and prepare accordingly with regards to planting.*
>
> *Farmer 2: You may want to plant groundnut, and the season is already over, and you go and blindly invest in it and may lose and because you can call and request info, you avoid losses from the wrong time of planting.*
>
> *Farmer 3: On ignorance too, you can call to clear doubts and make the right decisions at the right time. Knowing what to do and what to eat at certain times and calling there helps.*
>
> *(Male farmers, Dapuoh, UWR)*

The qualitative data also showed that better educated farmers were generally more likely to have attempted to use the call centre compared with less well-educated farmers. For example, a farmer who also works as a teacher stated:

> *Since the service is free and I can call and get any information, I just call them when I need information. For example, I used to plant along slopes but I was advised by the service to cultivate across so my crops do not get washed away during flood periods. Also, I was taught to plant millet and beans in rows/lines. It helped me to get more yields.*
>
> *(Male farmer, Baazu Yiepel, UWR)*

In UWR several farmers recalled they had used the call centre several times to enquire about messages they might have missed or to reactivate the service (while there was no need to reactivate the service, several farmers believed they had to reactivate the VFC when they had not received a message for some time). This suggests either some problems with the Vodafone network coverage or a temporary lapse in the VFC service.

Overall, the qualitative data suggest there was clearly interest in and potential for the call centre (especially in UWR), but that capacity issues at the call centre as well as lack of awareness of the service among farmers may have reduced its uptake and effectiveness.

Experiences with the free farmer-to-farmer call service

Very few farmers were aware of this service and only 4 per cent of farmers in CR and 20 per cent in UWR had ever used it.[16] The farmers who used the service liked it and used it frequently to call family members. However, their calls were usually not about farming issues, as one farmer recalled:

> *[…] with the free calls I don't necessary call about farming but there may be a problem that you can communicate; if there is an emergency I can call my neighbour to inform them about what is happening and get help.*

[16] In contrast, GSMA's own research found that the free farmer-to-farmer calls were very popular among farmers and often used as a key feature by agents to promote VFC to farmers.

(Male farmer, Dapuoh, CR)

Several farmers pointed out that the free farmer-to-farmer service was not useful to them as they were unaware of who was and was not a VFC member.

I don't personally have the contact of the other subscribers to the VFC, so it is very difficult to contact them. So I have not personally benefited from the free calls.

(Male farmer, Kyebi, CR)

During the qualitative pilot, two farmers also mentioned that it was easier for them to just '*walk over to their neighbour*' rather than trying to call them.

Perceptions about the frequency of VFC voice messages and SMS

When asked how frequently they received VFC voice messages and SMS, subscribers indicated a range of frequencies. Some said they received both voice messages and SMS very frequently and with a predictable pattern several times each week (e.g. *every Wednesday; every Thursday and Sunday at 4pm*). Others reported only receiving occasional messages and with no specific pattern (e.g. *I received messages three times since I activated VFC*; *some months I get six messages and then none for a month*). A few farmers felt the frequency of messages was too high (in particular the recorded voice messages were sometimes perceived as a disturbance), whereas others wished to receive more messages.

While this may indicate some implementation issues, the variation may also be explained by poor network signals (which made it impossible to receive messages), irregular use of the VFC SIM card, or switched-off phones.

4.1.5 Implications for intervention uptake and recommendations for programme design

Table 4.2 presents the key findings from the implementation assessment of VFC and draws conclusions about the potential implications for the uptake of the service. The last column presents recommendations for the programme design and implementation.

Table 4.2 Key findings from the implementation assessment of VFC

Key finding	Potential effect on message uptake	Recommendations for programme design
Poor Vodafone network signal (especially in CR) is a barrier to the activation of the VFC SIM card and to the use of VFC services, especially recorded voice messages.	Poor network signal may prevent farmers from using VFC services effectively or at all.	No recommendations for programme design as this is a Vodafone network issue.
Most farmers signed up for VFC services as they want to learn about farming. However, only 25 per cent were able to activate the SIM; the remaining 75 per cent were unable to activate due to various technical reasons including poor network coverage, no access to a mobile phone, and uncertainty over how to activate.	Active demand for farming advice may increase likelihood of uptake.	Encourage and facilitate activation by explaining how to activate and also by clearly and enticingly explaining what type of information farmers will receive. To facilitate sustained engagement with the product, ensure that context-specific farming concerns are sufficiently addressed in the voice messages and SMS.
Only a few (female) farmers signed up to receive nutrition information in addition to farming advice.	Lack of active demand for nutrition advice may reduce likelihood of uptake (especially among male farmers, who did not voice an interest in nutrition information).	Actively generate interest in nutrition content (e.g. content tailored to male farmers, promotion of nutrition component).
Face-to-face interaction with the registration team encouraged several farmers to sign up. A second face-to-face interaction facilitated activation of VFC and effective use of recorded voice messages.	Personal interaction may increase the likelihood of registration and activation of VFC services and can also help to ensure effective use of the different services.	Continue promoting VFC services through field teams who actively engage with the community (e.g. consider including respected community members, and agriculture extension workers as promoters of the service). Field teams should also facilitate the activation of VFC SIM cards and provide basic training on recorded voice messages (e.g. how to set up voicemail).
VFC is an alternative to traditional FBOs (especially for female farmers, who often distrust traditional FBOs).	Personal attachment to VFC and a perceived group identity may increase likelihood of uptake and engagement with the services. Realisation that VFC cannot deliver other membership support (e.g. financial help) may result in disenchantment with VFC.	Consider promoting VFC as a new type of FBO (however, be transparent about the limitations of the virtual club to prevent disappointment and dropouts).

Lack of a perceived need for an additional SIM card (especially if Vodafone is not the preferred network) prevents activation and use and is an important barrier to uptake.	Farmers who use and are satisfied with the service they receive through their existing SIM card are less likely to activate and actively use the VFC SIM card.	Promote the benefits of the VFC SIM and the different VFC services.
Poor timing of the VFC recorded voice message calls (i.e. when farmers are preoccupied with daily activities), combined with no voicemail set-up/inability to access voicemail, results in many/most recorded voice messages being missed.	Most recorded voice messages are missed.	To ensure effective uptake of the recorded voice messages, offer basic training in the use of recorded voice messages (including set-up and access to voicemail) as part of the registration process.
Common misconception that they would be charged for listening to recorded voice messages prevented many farmers from listening to them, or promoted premature hung-up calls.	Recorded voice messages are missed.	Ensure that VFC promotion materials highlight the fact that recorded voice messages are free of charge.
Illiteracy and inability to read/understand English were the main barriers for the uptake of VFC SMS.	A considerable proportion of the farmers never engaged with any of the VFC SMS.	Deliver the content of the VFC SMS in a recorded voice message, preferably in local languages (and address issues with the uptake of recorded voice messages).
Most farmers were not aware of the VFC centre and/or that they could call the centre free of charge.	Call centre uptake is very low.	Promote the VFC call centre and its features more. However, ensure that there is the capacity to respond to the demand.
Poor performance of the VFC call centre prevented some farmers from using this service again.	The full potential of the call centre is not realised.	Address capacity issues at the VFC call centre.

5 Acceptance of VFC and effects on uptake and engagement

The following section presents the findings on the acceptance assessment of VFC. The focus was on assessing farmers' acceptance of (1) the content of the behaviour change messages (i.e. the recorded voice messages, SMS, and call centre advice) and (2) the mode of delivery of VFC (see also section 3). Acceptance of VFC is a critical determinant for farmers' uptake and sustained engagement with VFC and a precondition for the adoption of new practices and behaviours in response to the service (Davis 1993). Drawing on the Technology Acceptance Model, we conduct a comprehensive assessment of acceptance and explore different elements, including perceived usefulness, perceived ease of use, trust, and social influences on use. In this section we will also present the unintended consequences of the VFC.

It should be noted that the acceptance assessment focused on the acceptance of recorded voice messages and SMS – the two services that were used most frequently from the VFC service package. Out of 97 farmers who were interviewed for the qualitative midline, 68 reported that they had listened to at least one recorded voice message and 40 said they had read at least one SMS message.

5.1 Perceived usefulness

Perceived usefulness has frequently been highlighted as a key determinant for uptake and sustained use of new technologies (Venkatesh *et al.* 2000, Venkatesh *et al.* 2008). Usefulness is defined as the service subscriber's (farmer's) belief that VFC will enhance their agricultural and/or nutritional well-being.

Most farmers who reported listening to at least one recorded voice message and/or reading at least one SMS message said they found the service useful and relevant. The qualitative data suggest a **regional pattern with regard to perceived usefulness, with VFC subscribers in UWR generally being more engaged with the different services of VFC**. This observation was supported by the uptake statistics presented in Table 4.1 and by the results from the ranking exercise conducted during the eight FGDs with VFC subscribers (five in UWR and three in CR). Farmers were asked to identify and then rank the VFC services they liked best[17] (Table 5.1). Farmers in all FGDs identified recorded voice messages as the VFC service they valued most in both CR and UWR. However, farmers in only one focus group in CR said they liked SMS, the VFC call centre or the free calls. In contrast, farmers in all FGDs in UWR identified the SMS and the free calls as key features they liked about VFC. This indicates that the different VFC services are valued more in UWR compared with CR (however, as presented in section 5, network problems may have prevented many farmers in CR from receiving VFC to start with).

[17] Each farmer was given a fixed number of small objects (e.g. stones) depending on the number of VFC services they had identified (e.g. three stones if three services were identified and ranked by the group). Then farmers were asked to distribute the small objects according to what service they personally liked most (i.e. score each service).

Table 5.1 Results from ranking exercise conducted during FGDs with VFC farmers

	CR				UWR					
	Bawura N = 6	Kokoben N = 4	Ahamakomua N = 5	Total	Daa N = 4	Mwanware N = 6	Tankasie _1 N = 6	Tankasie_2 N = 6	Dapuoh N = 4	Total
Recorded voice messages	8/12	8/12	4/4	20/28 (72%)	7/12	6/12	14/18	5/18	3/16	35/76 (46%)
SMS	4/12	0	0	4/28 (14%)	1/12	3/12	2/18	6/18	5/16	17/76 (22%)
VFC call centre	0	2/12	0	2/28 (7%)	4/12	3/12	2/18	1/18	6/16	16/76 (21%)
Free farmer-to-farmer call	0	2/12	0	2/28 (7%)	0	0	0	6/18	2/16	8/76 (11%)

Note: Each farmer was given a fixed number of small objects (e.g. stones) depending on the number of VFC services the group had identified. The farmers were then asked to distribute the small objects according to what service they personally liked most (i.e. score each service).

Farmers in UWR were also able to provide more and usually very detailed examples of the content of recorded voice messages they had received, which suggests more engagement and perceived relevance of the message content. In CR most farmers could only recall one to two examples (and usually with little detail). One potential explanation for this regional difference is that farmers in UWR often had less and usually more difficult access to agriculture extension services compared to farmers in CR.

In the following sub-section, the three overarching key themes that emerged from the qualitative data relating to the perceived usefulness of VFC are presented: 1) VFC as a substitute for the lack of an agriculture extension service; 2) perceived usefulness of the content of the messages (both voice and SMS); and 3) perceived usefulness of mobile phone-based delivery over other channels for agriculture and nutrition information.

5.1.1 VFC as a substitute for the lack of agriculture extension services

Most farmers in both CR and UWR complained about a lack of access to agriculture extension services. Agriculture officers would only very rarely, or never, visit their farms to provide guidance or advice. The following quote captures the feelings of many farmers:

> *Agriculture officers do not come and visit anymore. When they do, they come at an unexpected time and to a faraway community I can't have access to; I just have some questions.*
>
> *(Female farmer, Dokono Nkwanta, CR)*

A few farmers also suspected that agriculture extension workers were selective in reaching farmers and mainly provided support to larger farms and wealthier farmers (an observation that has also been described repeatedly in the literature (Rivera and Qamar 2003, Anderson and Feder 2004)):

> *Agriculture extension officers do not visit us [small-scale farmers]. With the exception of very wealthy farmers who get links with the extension officers, we don't manage to get into contact with them.*
>
> *(Female farmer, Ohyira, CR)*

KIIs with agriculture extension workers in both CR and UWR shed more light on the challenges the public agriculture extension service system in Ghana currently faces. In the following quote an agriculture extension worker reflects on the staff shortages and how these have increased the workload for him:

> *The agriculture department has inadequate staff; the government should recruit university graduates from the agricultural colleges to come and serve as extension agents. Currently, there is a ban on employment and due to this each operation area in the district, which has about 14 communities, has only one agriculture extension officer; the ratio is approximately 5,000 farmers to one extension officer.*
>
> *(Agriculture extension worker, Nadoli district, UWR)*

Low wages and high transport costs were other challenges many agriculture extension workers faced and that were likely to affect their presence in rural communities negatively:

> *The issue with mobility is one many of us face. You have to travel a lot [between communities and between farms], which demands that you spend a lot of time*

travelling, which increases expenditure, although we are given an allowance for maintenance and fuel. We use motorbikes as a means of transport to the various communities we are assigned to and because there are not many extension officers, the coverage area becomes big. This requires that we travel long distances before we can get to our farmers. And this takes a toll on our motorbike, which calls for regular maintenance. The motorbike given to us is deducted from our salary. It's like you are buying the motorbike. At the end of the day, it eats into your income.

(Agriculture extension worker, CR)

A female extension worker also told the qualitative team that she had reduced her travel to local rural communities as she feared for her personal safety when travelling and staying in communities by herself. She now mainly works from the central agriculture offices in the district town:

Visiting farm sites is very risky and needs caution as a lady. I had an ordeal with a farmer who wanted to harass and abuse me sexually. Also, there is difficulty in reaching farm sites as many villages are not close by. I have to walk to villages with bad roads, which can be dangerous.

(Female agriculture extension worker, Asikuma, CR)

When asked why they found VFC useful, many farmers explained that the services were their only source of reliable agriculture information and helped them to address (at least some of) their information demands:

It is easy to obtain the information via my personal phones. Agriculture extension officers do not visit the community; hence the VFC information has provided the only reliable source of info on agro-practices and nutrition.

(Male farmer, Ohurobo, CR)

It is difficult for extension officers to get time and visit every individual farmer and share information about agriculture with them. However, the VFC has filled this gap for me.

(Male farmer, Bawura, CR)

Messages are important and relevant because agric officers don't come to our communities or farms to educate us any longer, so these messages tell or teach us what to do.

(Male farmer, Tankasie, UWR)

VFC to address information needs of female farmers

Female farmers in particular described that they often struggled to access agriculture extension services as they did not have enough time or were unable to leave the farm long enough to seek advice:

Agriculture offices are not even available in the community and I don't have the time to travel to them. Via VFC is time-convenient, it saves you money travelling to the agriculture office.

(Female farmer, Baazu Yiepel, UWR)

Female farmers were also less likely to join farming associations or groups due to time constraints or because they distrusted the group processes:

People in this community join some farmer groups and go for meetings, but I have not joined such groups as they tend to be corrupt, wasting resources on themselves rather than sharing it among members.

(Female farmer, Ohyira, CR)

VFC helped many of the sampled female farmers who had accessed the service to address their agriculture information needs. Some of these female farmers said they now felt more empowered as they had access to more information. Compared with male farmers, female farmers in the qualitative sample could usually recall considerably more content from the recorded voice messages (including detailed information on food hygiene, food preservation, and environmental hygiene, which only one male farmer could recall). This suggests that female farmers may perceive the content of VFC voice messages as particularly useful.

A considerable barrier to accessing VFC for female farmers was the access to and ownership of a mobile phone (see section 5.2.2).

5.1.2 Perceptions of usefulness of the content of VFC recorded voice messages and SMS

Factors that make VFC recorded voice messages and SMS useful

Voice messages/SMS are tailored to practical agricultural needs

Many farmers appreciated that the messages were specifically tailored towards their practical agricultural needs and the crops they cultivated. A farmer described practical advice he had received through the voice messages on how he can ensure that his maize is stored safely (loss of maize because of spoilage during storage is a huge concern for many farmers in UWR and is mainly caused by too-high moisture levels in the maize when storing it).

I grow maize and I was informed that when I store maize I should re-dry it when I see an insect infestation. Also, I was informed that to check for moisture content on my maize I should put salt in water and put maize inside; if it sinks it is wet, if it suspends it is dry. This helps me to know when to re-dry.

(Male farmer, Tankasie, UWR)

The need for agriculture information to be highly practical to convince farmers was also highlighted by two agriculture extension workers.

A few farmers pointed out that they felt the messages were more relevant to their specific needs compared with the information they had received during more general discussions in agricultural meetings in their village. In this context, several farmers pointed out that the call centre could probably provide even more tailored information and answer their specific questions. However, none of these farmers had ever used the call centre (due to budgetary concerns or language skills).

This finding stresses the importance of careful profiling of farmers in the initial registration phase to ensure that agriculture information is highly tailored to their needs.

Provider of general agriculture knowledge

Many farmers explained they did not have many opportunities to learn about best farming practices in their communities and that they therefore valued any reliable agriculture information they could get:

> *I am a simple farmer; my whole life revolves around farming. Anything that is in favour of farming and helps me is a good thing and useful to me.*
>
> *(Male farmer, Tankasie, UWR)*

In this context, many farmers pointed out that the voice messages often provided general farming knowledge, much of which was already '*commonplace knowledge'* and '*practised since a long time'*. Nevertheless, the messages could often add some additional details to existing knowledge, which farmers liked:

> *Regardless of the fact that I know most of the information already, there are often some slight variations and new details from which I learn a great deal.*
>
> *(Male farmer, Dokono Nkwanta, CR)*

While providing general agriculture information may be valued by some farmers, other farmers perceived it as irrelevant and 'old knowledge', and disengaged.

As a reminder for best agriculture practices

Some farmers praised the recorded voice messages as a welcome reminder for important practical farm activities (e.g. the importance of regular weeding, how to prevent bush fire). Three farmers from CR remembered that the voice messages reminded them to wear protective gear when handling fertilisers and insecticides:

> *They are useful, especially the messages on putting on nose mask, goggles, and overalls before spraying a cocoa tree. These messages serve as a reminder during spraying.*
>
> *(Male farmer, Mpechim, CR)*

The farmers had all been aware of and actively followed these practices before VFC, but still appreciated a reminder.

SMS with price information empowers farmers in negotiations with traders and when selling products on local markets

Several farmers (mainly in UWR) said that SMS with price information helped them to achieve a better price for their products both on local markets and when selling to traders who came to their community.

Several men in an FGD in Dapuoh described how the price information helped them in their negotiation with traders:

> *The pricing helps because previously buyers came here to cheat us but now we are aware of the prices and how to set them. The messages are easy to understand because we are farmers.*
>
> *(Male farmers, Dapuoh, UWR)*

Unfortunately, a considerable number of farmers said they had never engaged with any of the price messages as they could not read. Some of these farmers said they would be interested in price information if it could be delivered through voice message.

SMS with weather information to guide farm activities

The weather information messages were perceived as useful by many farmers. Several farmers complained that weather patterns had become more and more difficult to predict in recent years, and that a reliable weather forecast was vital to many of their farm activities. For example:

> *I benefited immensely from the messages, especially the weather information. For instance, I once avoided spraying my farm with insecticides because I was cautioned about an imminent rainstorm.*
>
> *(Male farmer, Kyebi, CR)*

As with the price information, illiterate farmers emphasised the need for weather information via voice message.

Nutrition messages support mothers in taking care of their households

A few female farmers said they valued the nutrition messages because the advice was close to their hearts and helped them to improve the health and well-being of their family. For example, the messages taught them how to feed their children well, maintain a healthy lifestyle, or prevent sickness in the household. For several female farmers, messages on nutrition (in addition to messages on farming) symbolised that VFC was concerned about their and their family's well-being beyond their livelihoods.

> *I think that VFC sends us nutrition info as well [as agriculture information], that is my favourite part. They tell us how to eat good foods and what the benefits on our well-being will be. I think it is a good thing and shows that they are interested in your health and longevity.*
>
> *(Female farmer, Bawura, CR)*

The messages on food safety, storage, and environmental hygiene were particularly popular among women, as the advice was perceived as very practical and easy to implement (with no additional costs and only little effort). A woman from Mpechim, CR described:

> *Some of the messages on the nutritional value of food, how to preserve food and personal hygiene, is very conforming because it is understandable and practicable in our everyday life.*
>
> *(Female farmer, Mpechim, CR)*

In rural Ghana, women are usually responsible for the bulk of childcare and food preparation activities and other domestic chores (see also the qualitative baseline study: Barnett *et al*. 2018). Therefore, it is unsurprising to find that women were interested in recorded voice messages with content related to, and aiming to support, these activities. Male farmers hardly ever mentioned the nutrition content of VFC.

In CR, both male and female farmers mentioned the usefulness of one specific recorded voice message. The message promoted the health benefits of eating dinner early (around 5pm). The issue of an appropriate time for dinner had already been raised as a concern for many farmers in CR during the initial qualitative data collection (Barnett *et al*. 2018). For example:

They [recorded VFC voice messages] told me to avoid eating in the night. I have been able to follow the late-night eating advice and now I don't eat late. I eat before 5pm in the evening.

(Male farmer, Mpechim, CR)

The farmer continued to explain how the implementation of the advice had not always been easy, but that he had developed some personal coping strategies:

It [not eating after 5pm] was challenging from the beginning. For instance, I now sometimes take a beverage in the evening when I am hungry after supper.

(Male farmer, Mpechim, CR)

The scientific justification for this advice is unclear, although there is some emerging literature on the association between meal times and the risk of being overweight or obese (Jakubowicz, Barnea, Wainstain and Froy 2013, Bo *et al*. 2014, Nikkhah 2017). CR has a very high prevalence of overweight among women, with almost every second woman being classified as overweight (40.3 per cent), but only 2.5 per cent of women being classified as underweight (Ghana Statistical Services 2014). In this context, measures to address overweight (and its associated co-morbidities) is desirable to improve the health and well-being of the adult population. However, CR also has medium/high levels of both childhood stunting (low height-for-age) and being underweight, and restricting children's food intake in the evening may have negative consequences (e.g. if the total energy and nutrient intake of children declines). Nutrition messages need to be based on solid evidence and should be based on holistic contextual analysis to avoid potential unintended negative effects.

Factors that limit the usefulness of VFC recorded voice messages and SMS

Insufficient tailoring of voice messages or messages just repeat common knowledge

Poor tailoring of the messages and the regular receipt of messages with content that was not relevant to their personal needs resulted in frustration and disengagement among many farmers.

For example, a subsistence farmer from Baazu Yiepel was annoyed about the frequent SMS with price information that was irrelevant for him as he did not sell any agricultural products:

I find the price information to be irrelevant and a disturbance; I don't have those crops to sell.

(Male farmer, Baazu Yiepel, UWR)

This highlights the importance of careful profiling of farmers during the initial registration process.

Other farmers said they found the messages generally useful, but that they often did not address their specific and/or current farming challenges, for example:

Recorded voice messages give me lots of information about general pest control; however, I have not yet received an answer on how to kill a special type of parasite that has now invaded my farm.

(Male farmer, Dokono Nkwanta, CR)

Content generally useful, but VFC service does not deliver expected financial or material help

While most farmers said they generally perceived VFC to be useful, many of those farmers also voiced disappointment. They felt that VFC had not delivered what they had expected from it, mainly financial and/or material help for their farms. The following quote illustrates what many farmers said:

> *More support measures ought to be incorporated into the services of the VFC. For instance, we need financial help as farmers. We also need technical support, for example, fertilisers, synthesised manure, farming tools; that is what makes people join groups; else we will get fed up very soon with the messages.*
>
> *(Male farmer, Mpechim)*

Unsurprisingly, when asked how VFC could be improved, most farmers said it should also provide material support, or at least provide information on where and how farmers could get access to grant opportunities.

> *Support with farming equipment and material (boots, cutlasses, fertiliser, pesticides) as well as financial support will be very necessary to keep people like me in the club. I believe that lots of people would listen to the messages if they were given a little assistance to practise the many things they are taught via the recorded voicemails.*
>
> *(Female farmer, Dokono Nkwanta, CR)*
>
> *Other services must be incorporated into the VFC, such as awareness of scholarship schemes and granting of educational support to children of VFC subscribers.*
>
> *(Female farmer, Ohyira, CR)*

The request for information on how to get access to agricultural grants or credit also emerged as one of the key information needs for farmers in the initial qualitative study, and should be included in the tailored recorded voice messages.

5.1.3 Perceptions of usefulness of the mode of delivery of VFC (mobile phone-based messages) over other communication channels

Opinions on whether mobile phone-based agriculture and nutrition information was more useful than other communication channels (e.g. radio; TV) varied greatly among farmers. Some highly valued the privacy and convenience mobile phone technology could bring, although none of the interviewed farmers could make full use of the convenient access to recorded voice messages, as none of them had set up voicemail. Other farmers clearly preferred traditional communication channels (radios) and feared that mobile phone-based services would exclude many farmers who did not own a mobile phone.

These farmers also often believed that community meetings and FBOs were more social and inclusive and could potentially reach more farmers. The desk-based literature review conducted by the IDS qualitative team during the preparatory phase found that, while mobile phone penetration in Ghana was overall very high only around 50 per cent of poor rural households own a mobile phone (Barnett and Srivastava 2017). This suggests that a significant proportion of rural households may not have access to a mobile phone and may thus be excluded from the VFC service.

Busy farmers found mobile phone-based agricultural information more convenient than actively seeking other sources

Many farmers explained that they lacked time and resources to seek advice from the agriculture extension worker or attend local meetings on agriculture practices. As agriculture workers did not come to their communities regularly, farmers often had to travel to the local agriculture office to seek advice. Some farmers had mobile phone numbers of local agriculture extension workers, but many farmers did not. In this context, mobile phone-based messages were appreciated as more convenient information sources.

> *I have learned a lot from the messages because they come solely to me and on my phone, while I might not always get the chance to go for meetings and listen to agriculture extension officers.*
>
> *(Male farmer, Tankasie, UWR)*

Mobile phone-based information is perceived as more personalised and easier to absorb

Several farmers felt that mobile phone-based information was more personalised and private than other sources. One farmer felt that the recorded voice message came solely to him and his phone. This made him feel special and motivated him to take the messages seriously and listen carefully. Other farmers described how they found it easier to concentrate on and absorb information that they received in private on their phone than information delivered in group settings (e.g. during an agricultural meeting).

> *I can absorb the information better. Because I listen to it alone, it increases my concentration on the content of the messages.*
>
> *(Female farmer, Ohyira, CR)*

Radio is perceived as a more accessible, inclusive, and ubiquitous communication channel for agriculture information than mobile phones

When asked which communication channel for agriculture information they would prefer, almost half of all farmers said that the radio was still their channel of choice. Farmers said they usually listened to the radio most of the day (or all evening). They used the radio function on their mobile phone (in the field) or a traditional radio with batteries. Listening to the radio was perceived as easier than picking up a voice call as it did not interrupt their other activities (as picking up a call did):

> *I like the radio better as I am a very busy person and spend the entire day attending to my farm. I can't spend time receiving calls. With the radio I can work and listen to the VFC agro tips at the same time.*
>
> *(Male farmer, Ohyira, CR)*

Similarly, a farmer from UWR explained:

> *I prefer to listen to it [the VFC agricultural messages] on the radio because I am always with my radio, but sometimes I leave my phone in the house.*
>
> *(Male farmer, Baazu Yiepel, UWR)*

A few farmers also believed that the radio might be a more reliable (as it was not dependent on network strength) and inclusive (most farmers owned a radio) medium to share information.

The radio is good because most of us [farmers] have radios, it [radio] can increase the number of people who get the messages because many people listen in public spaces.

(Male farmer, Dapuoh, UWR)

Five farmers also suggested that the content of VFC information could be sent through both the mobile phone and radio to increase both reach and impact. Combining radio and information technology, also known as technological blending, has become increasingly popular in development in recent years (e.g. participatory community radio campaigns in which farmers can participate in radio shows through their telephone) (Asiedu 2012).

Lack of interpersonal contact and chance for interaction is perceived as a major shortcoming of VFC service and may affect adherence

Many farmers stated that they missed interpersonal contact with the VFC team. While they perceived the purely information-based messages as useful, they also wished to engage with and build rapport with the team behind the recorded voice messages and SMS. Farmers in an FGD in Tankasie stated:

Farmer 1: How can you send us messages and we never see you physically?

Farmer 2: I think the people providing the information should occasionally come around for the farmers to see them physically; this has more impact for believing the information.

(Male farmers, Tankasie, UWR)

This quote also highlights that interpersonal contact can be important to increase the perceived credibility of the content of the messages, and is an observation that has also repeatedly been documented in the health promotion literature (Wathen and Burkell 2002).

Even if face-to-face communication was impossible, many farmers were eager to engage with the person behind the recorded voice messages, for example, to get clarification or ask questions. Several farmers recalled that they had attempted to talk to the voice caller, but had given up as soon as they realised it was a recorded message. For several farmers this was a sobering experience that negatively influenced their attitude towards and engagement with the recorded voice messages:

I listened. But my attitude changed a little bit once I realised it was not a real person behind the phone. I talk to them and they don't respond. I make complaints and no one talks back. They [the VFC people] just speak their mind and then hang up.

(Male farmer, Bawura, CR)

Including a face-to-face component in the delivery of VFC is likely to increase uptake and long-term engagement with the service. Examples could include local VFC groups, regular VFC community events, or local VFC agents that continuously promote the service.

5.2 Perceived ease of use

Perceived ease of use is defined as the degree to which the use of VFC will be free from additional effort for farmers (Ketikidis, Dimitrovski, Lazuras and Bath 2012). Perceived ease of use has been

identified as one of the key predictors of sustained engagement with new technologies and services such as mobile phone-based advisory services (Ketikidis *et al*. 2012).

5.2.1 Ease of comprehending the content of the recorded voice messages and SMS

Literacy levels and the ability to comprehend English emerged as the key determinants for farmers' engagement with the SMS (as discussed in section 5).

With regards to understanding the content of the recorded voice messages, the majority of active VFC users found it easy to understand and self-explanatory. Farmers liked the fact that the messages were sent in their local language and said that this was essential for comprehension. For instance:

> *Information from VFC is easy to understand and I make sense out of it. They speak the local language, which makes understanding easier, and the information is also detailed enough.*
>
> *(Male farmer, Baazu Yiepel, UWR)*

Several farmers in UWR complained that they occasionally received recorded voice messages only in English. As they could not understand English, these messages were of no use to them, which annoyed the farmers. As several farmers in UWR had this experience it could suggest occasional implementation issues with the recorded voice messages.

A few farmers said they occasionally did not understand a message or felt that the message content conflicted with other information they had. Two of these farmers tried to contact the call centre for further information (with varying success). The others talked with other farmers to get clarification.

> *I however faced a dilemma when we were advised to allow sunlight to beam into the cocoa farms by the VFC information, while agriculture extension officers advised against that. I went to my neighbour to discuss what to do [the farmer then decided to try the method suggested in the VFC information, with good success].*
>
> *(Male farmer, Dokono Nkwanta, CR)*

5.2.2 Ease of accessing the VFC related to the mode of delivery of VFC

Major barriers to the access of VFC have already been presented in section 5, including poor Vodafone network strength (especially in CR), timing of the recorded voice calls, an absence of voicemail set-up, and use of dual SIM cards. Perceived ease of access to VFC also varied depending on who in the household owned the mobile phone and received the service.

Access to VFC can be difficult for female farmers who do not own a phone

Six female farmers said they did not own a mobile phone and thus had subscribed using their husband's or son's mobile phone number. Two of the six women regularly listened to the voice messages and read the SMS together with their husbands. The other four women described that they experienced resistance when attempting to access the service through their husband's/son's phone.

Two female farmers said that their husbands picked up recorded voice messages but never shared the content with them (even after the women had asked them to). They doubted that their husbands were aware of and/or used other services of VFC (e.g. free farmer-to-farmer calls).

The other two women regularly asked their husband/son to insert the VFC SIM card into their phones. While both were able to use the VFC SIM occasionally, getting permission was difficult and usually short-lived, as one of the farmers described:

> *I use the VFC SIM through my son's phone […]. I do plead with him every time to allow me to insert the SIM for a few days to hear from VFC. After that he will remove the SIM card again.*
>
> *(Female farmer, Baazu Yiepel, UWR)*

Female farmers who owned a phone all said they did not face any challenges when accessing the service (other than the technical barriers presented in section 5).

5.3 Trust in the credibility of VFC recorded voice messages and SMS

Trust has been identified as an important factor in determining behavioural intentions towards adopting new technologies (Bahmanziari, Pearson and Crosby 2003). In the context of this evaluation, trust refers mainly to trust in the benevolence and credibility of the content of the recorded voice messages and SMS. Trust in information is a multi-dimensional construct and generally results from an interaction of source characteristics (e.g. perceived trustworthiness), message characteristics (related to message content, perceived relevance, and quality), and receiver characteristics (e.g. background, previous beliefs) (Wathen *et al.* 2002). There are a range of different reasons why farmers trusted the VFC service, as well as some threats to that trust.

5.3.1 Reasons for trust in VFC

Trust as content very relevant to their livelihoods

The most commonly cited reason for trust in the credibility of the content of the VFC message was the fact that farmers perceived the content as highly relevant for their personal lives. Farmers were all deeply involved in the topic of the messages (i.e. agriculture) and felt a personal need for agricultural information (especially as there were shortcomings in the agriculture extension services). Farmers generally perceived the content to be of high-quality, reliable, and well-tailored (e.g. agricultural season). All these factors helped to increase their trust in the messages.

> *The messages are important for me as a farmer and address my needs for information; therefore I believe they are true.*
>
> *(Male farmer, Mwanware, UWR)*

Familiarity with the content or parts of the content provided in a message helped to increase farmers' trust in the messages (especially if they had also heard the information from agriculture extension workers). As highlighted in the initial qualitative study (Barnett *et al*. 2018) and in the quantitative baseline, agriculture extension workers were the most trusted source for agriculture information for farmers. Consequently, close collaboration with agriculture extension services when designing the content of the VFC may help to increase credibility and consequent uptake of the services.

Positive experiences when following the advice increased and strengthened trust

Positive experiences and satisfaction with the results when implementing advice provided in the VFC information increased and strengthened farmers' trust in the credibility of the content. As a cocoa farmer noted:

> *Yes, everything they say [in the recorded voice messages] is true. Because I put what they teach into practice and realised that my cocoa is doing better than before, which means I can trust the source.*
>
> *(Male farmer, Dokono Mkwanta, CR)*

When trying to follow advice, farmers usually started by experimenting with small (no-cost) activities (e.g. increased weeding). Once they experienced positive change they attempted larger changes.

Trust as messages are sent by Vodafone, a large and well-known organisation

To our surprise,[18] several farmers said they trusted in the credibility of the content of the messages because they were from Vodafone. Farmers assumed that a large, well-known MNO such as Vodafone had the required expertise and competence to gain access to and disseminate advice on best farming practices.

> *I trust the messages if they are from Vodafone. Vodafone has taken the initiative and the messages are good.*
>
> *(Male farmer, Baazu Yiepel, CR)*

In this context, several farmers also praised the fact that Vodafone offered VFC free of charge. This was perceived as a clear indication that VFC was trustworthy:

> *I do trust the information I receive from Vodafone. If someone goes this distance to teach you things about agriculture without a fee, you should know the person [organisation] is caring and interested in your well-being.*
>
> *(Female farmer, Ohyira, CR)*

It should be noted that VFC is no longer available free of charge.[19] This may potentially affect farmers' trust in and uptake of the service negatively, especially as many were still suspicious that Vodafone (and other MNOs) would reduce their credit without their knowing. As a farmer from Ohurobo explained:

> *I trust them [VFC recorded voice messages] because they do not talk about money. They have never asked me to pay any money, so I trust them. They just talk about agriculture.*
>
> *(Female farmer, Ohurobo, CR)*

[18] The initial qualitative study found that famers often distrusted MNOs, including Vodafone.
[19] The VFC remains free of charge for the treatment group of this impact evaluation until the end of the intervention period.

Trust as farmers can specify the language in which voice messages are provided

Many farmers praised the fact that they could choose the language in which the messages were provided (i.e. Fante, Twi, or Dagaare). This not only ensured that they understood the message, but also indicated that VFC 'cared' and tried to truly help farmers.

Face-to-face promotion and registration for VFC was perceived as important for building initial trust

Several farmers said they believed in the credibility of the messages as they had personally met the team responsible for sending the messages. The explanations the team had provided had been very detailed and good, which is why they had agreed to join. As a farmer explained:

> *We were home when they [quantitative field team] came to us and told us about VFC. They explained very well and I understood everything. I agreed based on everything they said, and I had faith in what they said. So I registered. They also told me that at the right time they will come back and call us all, so that if there are any arrangements to be made regarding the registrations, they would do as required.*
>
> *(Male farmer, Kokoben, CR)*

The quantitative follow-up visits to support farmers with the activation of the VFC SIM cards helped to further strengthen the trust in the credibility of the service.

This observation corroborates findings from the health promotion literature that stress the importance of interpersonal contact to build trust in the information provided (Fry and Neff 2009). These findings suggest once again that an interpersonal face-to-face component in the promotion and operation of VFC may increase uptake of the service.

Weather forecast messages as a trust builder

The reliability and accuracy of the weather forecast messages were mentioned by many farmers as an important reason why they trusted in the credibility of VFC. Several farmers recalled how they had delayed farming activities (e.g. spraying insecticides, planting, harvesting) because the SMS message predicted adverse weather events. The events had all occurred as predicted and could have resulted in considerable loss for the farmer. A female farmer recalled:

> *I trust the information I get from the [recorded voice] calls. Over time, I have realised that the speaker is very knowledgeable, especially about the weather; she can predict the weather change. I trust the information I receive because it has saved me several times […]. For example, my mother and I were about to cultivate four acres of maize and because of the information [that there would be a heavy thunderstorm], we ploughed only two acres. The rains still affected us, but if we had cultivated the four acres it would have been bad.*
>
> *(Female farmer, Daa, UWR)*

The importance of accurate weather forecasts for farmers and the fact that reliable weather information may help to increase farmers' trust in the service was also highlighted by all three agriculture extension workers who were interviewed for this evaluation.

Threats to the trust in VFC

Lack of contact with the persons behind VFC can reduce trust in service

As has already been highlighted on several occasions in this report, interpersonal contact with the VFC team was perceived as an important factor for building trust and enabling effective and sustained uptake of the service. When asked whether they trusted in the credibility of VFC, several farmers said they did because they had 'seen the team' or 'got to know the persons behind VFC' (i.e. the quantitative survey team). The farmers went on to explain that without this visual contact they would find it difficult to trust the service. This was also the reason why some of them trusted the TV more than mobile phone-based services, as explained in the following quote:

> *I trust the TV more [as a source of information]; it is more reliable than phone. You can be deceived easily when you do not see the person. It is best when you see the person and get to know the person.*
>
> *(Male farmer, Mpechim, CR)*

Errors in the implementation of the VFC (unrelated to the content) can negatively influence trust

Several farmers shared experiences that had annoyed them and negatively affected their attitude towards the service. For example, two farmers explained that they had received the same messages on the use of fertilisers several times. It had frustrated them and reduced their overall engagement with the service (i.e. they were no longer so eager to pick up voice message calls).

Several farmers in UWR complained that they sometimes received voice messages in English even though they had selected to receive voice messages in Dagaare only. Farmers were unsure why this happened. As none of them understood English the messages were of no use to them.

5.4 Social influences on uptake of VFC

Social influence has been identified as an important determinant of an individual's acceptance, adoption, and maintained utilisation of new technological interventions (Malhotra and Galletta 1999).

The qualitative data suggest that VFC was generally approved of by family members, other farmers, and friends. As a female farmer said:

> *My husband and family are positive about VFC; they don't have any issues with me using the services. Also when I receive the information I share the content of the message with them, which they are happy about.*
>
> *(Female farmer, Baazu Yiepel, UWR)*

None of the interviewed agriculture extension workers (n = 5) was aware of the VFC (although one of them was familiar with its predecessor Farmerline, by Esoko). They also said that no farmer had ever talked to them about the service. Nevertheless, all agriculture extension workers were supportive of the service and believed it could support their own work, as described in the following:

> *It is a good format to send voice messages to farmers, as the farmer illiteracy rate is high. Voice messages should be followed by visits from us [agriculture extension workers]. It will be very useful. Electronic messages can get to the*

target group [the farmers] easily, and reach a wider number than physical contact. Messages can also be timelier regarding advice for the dry and rainy seasons.

(Agriculture extension worker, district-level agriculture extension office)

5.5 Unintended consequences

Mobile phone-based services may generate new inequalities as not every farmer can afford a mobile phone

Several farmers, agriculture extension workers, and two village chiefs were concerned that not every farmer could benefit from the VFC service because many farmers in their community did not own a mobile phone. Delivering the agriculture advice only through mobile phone technology would therefore potentially exclude many farmers (especially very poor farmers who needed support the most). Interviewees suggested that VFC information should also be delivered through the radio, TV, and agriculture meetings in the community, to facilitate access for every farmer.

With prices for mobile phones and network coverage rapidly decreasing, one can expect that mobile phone penetration in rural Ghana will increase rapidly. This and low/no subscription fees for VFC may help to ensure that VFC will become accessible for even poor farmers.

VFC membership may restrict access to other Vodafone services

Several farmers (all from CR, and all previous Vodafone users, who had migrated their SIM card to receive VFC) complained that they no longer had access to other Vodafone services (e.g. weekly call bundles; SOS credit). For instance:

Since I am part of VFC I can't access some Vodafone services. For instance, I am no longer able to do data subscription and weekly call bundles on their airtime. I would be very happy if this error is corrected. It has cost me more money as I had to spend more on airtime than I previously did. In addition, I also cannot access SOS services. As a preacher man, I used to call congregants and other members regularly for morning prayers and devotions. These unfortunate high tariffs have made it impossible to continue this exercise.

(Male farmer, Bawura, CR)

This observation may suggest an implementation error, or it may be a deliberate measure by Vodafone.

Change in attitude towards and use of Vodafone

Membership in VFC affected many farmers' attitudes towards, and use of, Vodafone in general. Several farmers who were satisfied with VFC and regularly engaged with the voice calls and SMS said they trusted Vodafone more now, especially as Vodafone had never reduced any credit for the service. The farmers went on to explain that they were more loyal to their Vodafone SIM now (as they did not want to miss voice message calls) and bought more Vodafone airtime in general.

One female farmer noted that she did not use Vodafone before the intervention but that Vodafone was now her favourite network.

In contrast, farmers who were generally less engaged with VFC said that their attitude towards Vodafone had not changed. They still distrusted the network and worried that Vodafone would reduce their credit:

> *My attitude towards Vodafone has not changed at all. Vodafone allows you to borrow when you run out of credit, and they deduct more of your credit when you recharge – that is bad, and I don't like that behaviour.*
>
> *(Female farmer, Tankasie, UWR)*

5.6 Would farmers pay for VFC?

VFC is provided free of charge to all farmers in the quantitative treatment group included in this impact evaluation.[20] When asked whether they would be willing to pay for the service, most farmers said they would not pay or only pay a very small subscription fee:

> *I like the service but no, I will not pay for it and will quit using the VFC service then.*
>
> *(Male farmer, Dokono Nkwanta, CR)*

Four out of six female farmers who were part of an FGD in Tankasie said they would pay for the service in future, as they were convinced of the benefits of VFC:

> *Farmer 1: We would pay in future for the services because of its benefit to our farm productivity*
>
> *Farmer 2: … and our health.*
>
> *(Female farmers, FGD, Tankasie, UWR)*

The women were willing to pay between GHS 0.10 and GHS 1.00 per month. Most other farmers who were willing to pay said they would pay around GHS 1.00 per month but not more.

A few farmers (who were slightly wealthier) and one farmer who used to be an agricultural worker said they would be willing to pay GHS 2.00 or even more per month for the service, as they valued the information.

This finding suggests that a user fee for VFC (especially a fee of above GHS 1.00 per month) could reduce farmers uptake of the service drastically.

5.7 Ideas for additional content for VFC

Various information needs that are currently not addressed by VFC were highlighted by farmers, including: information on grant opportunities both for agriculture-related and non-agriculture funding (e.g. school fees), more advice on how to combat different types of pests and plant diseases, and local sources for high-quality seeds and seedlings (e.g. cocoa). No information needs related to nutrition were identified.

[20] The VFC service was available free of charge during the time of registration for the service. However, this has changed and farmers must now pay a small fee if they want to access the service. Farmers in the treatment group are exempt from this fee.

Two (educated and well-off) farmers suggested that VFC could take a more holistic approach to farmers' well-being and could also include other services such as health insurance schemes for farmers:

> *Farmers face a lot of problems. But the most insurmountable problem of them all is health issues. Because farmers don't have a steady salary, it is difficult to finance their own health needs. TIGO [mobile phone company] has a system where GHS 0.20 is deducted periodically for such emergency health situations. If VFC could devise such similar means, I would be very happy with it.*
>
> *(Male farmer, Mpechim, CR)*

5.8 Potential implications for the effectiveness of VFC and lessons learned

Table 5.2 presents key findings from the acceptance assessment of VFC and draws conclusions about the potential implications for the effectiveness of the service. The last column presents recommendations for the programme design and implementation.

Table 5.2 Key findings on the acceptance of VFC and implications for its effectiveness

Key findings	Factors that may make VFC effective	Factors that may limit the effectiveness of VFC	Lessons for design and implementation
Regional pattern in uptake and perceived usefulness of VFC, with farmers in UWR engaging more with the different services than CR.	Regional differences in perceived usefulness may mean that VFC is more successful in informing farmers and triggering behaviour change in UWR compared with CR.	Lack of engagement with VFC in CR (partly due to poor network coverage) may result in limited effectiveness of VFC.	Promotion strategies for VFC may need to be different depending on region and contextual conditions (e.g. areas with low Vodafone network strength). Ensure that all components of VFC are advertised.
VFC is a substitute for the lack of agriculture extension services.	VFC may help to address shortage in agriculture extension services in rural Ghana and address farmers' information needs.	Information provided needs to be relevant to farmers' needs.	Ensure high-quality messages that are co-developed with farmers and agriculture extension workers and continuously revisited to ensure farmers' sustained engagement.
Female farmers are excluded from traditional information sources due to time constraints (e.g. farm work, household chores). VFC can provide an alternative and accessible information source.	Female farmers actively demand agriculture information but are unable to travel to see agriculture extension workers or attend community meetings. VFC may provide a more accessible service.	Ownership and access to mobile phones is more difficult for female farmers (e.g. as they do not control household finances).	Promote VFC to female farmers (and consider challenges regarding mobile phone ownership by female farmers).
Perceptions of usefulness of the content of VFC.	Farmers appreciated practical and tailored agriculture information.	Insufficient profiling during the registration process may result in farmers receiving content that is not relevant.	Careful profiling is required to ensure that tailored messages are sent. Ensure that messages are highly practical and context-specific.
	Farmers valued general agriculture education, as they had limited opportunities to learn about agriculture.	Risk that farmers disengage if information is perceived as not relevant or already established knowledge.	Offer a mix of tailored and more general agriculture advice.
	Price and weather information was valued by farmers.	Illiteracy and lack of English prevented engagement with the SMS for many farmers. Contextual barriers (e.g. access to farm equipment, safe grain storage) prevented farmers from reacting to price and weather information.	Provide price and weather information as recorded voice messages in local languages. Contextualise price and weather information if possible (e.g. consider cost of travelling to a different market).

	Nutrition information was valued mainly by female farmers and helped them to care for their families.	Male farmers may not engage with nutrition information as not perceived as important.	Highlight nutrition content to male farmers (e.g. by promoting the benefits of good nutrition for the household's capacity to work).
Perceived usefulness of mobile phone-based services over other communication channels.	Because of the convenient access to mobile phone-based information, farmers' exposure to agriculture and nutrition information may be increased, which may increase the chance of behaviour change.	Lack of voicemail set-up, poor network coverage, and dual SIM card use may limit exposure.	Ensure that messages are sent frequently to build some momentum (but not too frequently, as some farmers were irritated by high frequency).
	Mobile phone-based information is more convenient, tailored, and sent to personal phone.	Radio was preferred by many farmers as more inclusive, available, and would not disturb them from farm activities (as picking up the phone does).	Consider blending radio and mobile phone-based approaches for wider reach.
		Lack of interpersonal contact was perceived as a major shortcoming that affected perceptions of credibility of the content and engagement with the service.	Consider introducing some interpersonal elements into VFC (e.g. community-based meetings, local VFC agents).
Ease of understanding message content.	Easy-to-understand messages may facilitate uptake of the information and avoid misinterpretation.	Simple messages may not always reflect the complex realities and contexts within which many subscribers live; consequently, contextual barriers may prevent subscribers from acting on the advice.	Ensure contextualisation of messages wherever possible, as this may increase the likelihood of information being translated into action.
Ease of accessing messages.		Access to mobile phone-based services was a challenge for female farmers who did not own a phone, as husbands did not share.	Ensure promotion of VFC to both male and female farmers and encourage sharing of the content within the household and beyond.
Trust in the credibility of the content.	Registration procedures for the treatment group could increase trust in and uptake of the messages.		Promote sign-up strategies that involve face-to-face contact to build trust in the credibility of the messages and support continued use of the service.

	Relevant and tailored content in local language facilitated trust in the credibility of the information.	Insufficient tailoring of information may reduce trust.	Ensure that messages are well-tailored by careful profiling.
	Assumptions about the sender of the messages contribute to perceived credibility.	Uncertainty about who sends the information may affect credibility negatively.	Be transparent and inform farmers about who sends the information, to build trust.
	Well-implemented service helps to build trust.	Errors unrelated to the content of VFC may negatively influence trust (e.g. voice messages sent in English, repeated messages).	Ensure good implementation processes (e.g. with no lapses in services and no waiting times when contacting the call centre).
Social influence on uptake of messages.	Farmers trust and accept the messages more easily, as they feel they have social approval since friends and family like the messages.		Promoting the benefits of VFC to the wider social environment can help to maintain an enabling social environment for uptake of the messages.

6 Contextual barriers to the adoption of VFC advice

Sections 5 and 6 explored farmers' experiences, perceptions, and acceptance of both the content and the mode of delivery of VFC. The qualitative data suggest that various implementation issues (both at the intervention and at farmers' level) may impede uptake, engagement, and adoption of new behaviours and practices negatively. The qualitative data also identified several factors that may enhance or reduce farmers' acceptance of the content and delivery mode of VFC. As has already been stressed above, acceptance of VFC is critical for the uptake, engagement, and effectiveness of VFC in changing farmers' behaviour and practices.

This section presents qualitative findings on contextual factors that may hinder farmers from acting and improving nutrition and farming practices in response to VFC. Behaviour change literature emphasises that providing information and knowledge in contexts where the environment does not enable and support the recipients (here the farmers) to act often has a limited potential to succeed and bring about long-term behaviour change (Briscoe *et al*. 2012, Kelly *et al.* 2016). This section starts by exploring the pathways and processes of behaviour change that were triggered or supported by VFC.

It should be noted that behaviour change pathways and contextual factors could be explored only for the sub-sample of qualitative interviewees who received and had ever listened to recorded voice messages and/or read SMS (n = 68 for voice messages; n = 40 for SMS). The remaining subscribers did not change their behaviours or adopt new behaviours in response to VFC.

6.1 Pathways to behaviour change in response to VFC

Acting upon VFC is more likely if farmers face an acute problem and VFC presents a solution

Farmers who experienced a specific acute and/or significant problem related to farming (e.g. pest infestation of crops; spoilage of maize during storage; low yields) or nutrition (e.g. low weight of children as detected during growth monitoring check-up; frequent illness of household members) were usually more receptive and likely to act upon information suggesting a solution for this problem. A few farmers even said they tried to reach out to the call centre when they faced an acute challenge to get advice.

Farmers were less likely to consider changing practices and experiencing with new ones when they did not perceive a problem. This suggests that the dissemination of perceived necessary agriculture and nutrition information without active dialogue and the co-development of content together with farmers might not be very effective. Or, as the popular self-help coach Tony Robbins once said: People only change when the pain of remaining the same becomes greater than the pain of changing.

VFC is not usually a stand-alone agent of change, but may facilitate change in combination with other information sources

Many farmers said they did not want to rely on a single source of information when considering whether to change an established farming practice. To judge and validate the trustworthiness and accuracy of the content of VFC information, they tried to consult other sources of information

(including informal sources such as a discussion with peers). A farmer from Ahamakomua described what several farmers said:

> *I cannot rely or depend on one piece of advice only, and I like to explore more to get a better understanding and then select the best one. Advice needs to be compared and contrasted, based on the source from where the advice comes, and then you select the best one either from the radio, television, mobile phone or elsewhere.*
>
> *(Male farmer, Ahamakomua, CR)*

Similarly, a farmer from Mwanware explained:

> *Messages from different sources like radio and television will be compared in order to select the right ones.*
>
> *(Male farmer, Mwanware, CR)*

One of the agriculture extension workers from CR also explained that farmers do not usually rely on one information source when considering changes, but look for additional information:

> *Yes, farmers do question information, especially with regards to chemicals. You know, the regulation on chemicals is not fixed, so anybody at all can pick a chemical and start selling to communities. Some of them come to the office here to cross-check the information other sources give them. They even come to cross-check information I have given them before.*
>
> *(Agriculture extension worker, Asikuma, CR)*

How to verify the accuracy of the content of the VFC information was a concern for many farmers (especially farmers who had no access to agriculture extension services at all). In an FGD in Tankasie, female farmers' final question to the qualitative team was:

> *How can we verify the information VFC gives us? How do we know if it is true or false?*
>
> *(Female farmers, Tankasie, UWR)*

This observation is consistent with findings from other behaviour change intervention trials which suggest that behaviour change is more likely if recipients can verify educational messages by comparing information from various channels (Bhandari *et al*. 2005).

This suggests that VFC information may be more likely to be taken up and acted upon when co-created and in dialogue with other information sources that are frequently consulted by farmers.

With regards to voice messages giving nutrition advice, female farmers (who mainly described that they acted upon nutrition messages) felt less of a need for verification and triangulation of the message content. Women said that most of the messages related to practical small changes that did not require much effort or financial input (e.g. feeding children a nutritious mix out of beans and small dried fish, covering food to prevent contamination, trying to cook more varied foods).

Call centre can be very effective in changing behaviours when implemented well

As highlighted in sections 5 and 6, farmers' interaction with the call centre was very low, with only 12 of 97 active VFC users that were included in the qualitative interview having ever attempted to

contact the call centre. Furthermore, half of the farmers who contacted the centre did so simply to enquire whether they missed any recorded voice calls.

Nevertheless, two farmers who called the centre with specific questions had very good experiences and received highly tailored and relevant advice that helped them to preserve their harvest. One farmer recalled:

> *Call experts [from the call centre] supported me when I had a pest infestation on my tomato farm. The experts recommended an insecticide, which I purchased as soon as I had enough money. After the insecticide was applied it killed all the pests on the tomatoes. I was very happy.*
>
> *(Male farmer, Mpechim, CR)*

Changing behaviours of others: spill-over

When asked whether they regularly shared the information they had received through VFC with others, most farmers said they shared the content with their spouse and occasionally other family members.

However, only a few farmers shared VFC information with people outside their household. Some said they did not share it because they feared others would not believe them:

> *I keep the information to myself and share only with my family. I don't share the information with others outside my family, because if I share it they won't believe me.*
>
> *(Female farmer, Baazu Yiepel, UWR)*

Others were very protective over their membership in VFC and said that others should join too if they want to receive the information:

> *I don't share the messages with friends and relatives because everybody has a phone these days and can get VFC information.*
>
> *(Male farmer, Ahamakomua, CR)*

If the impact of VFC is to be extended beyond active subscribers, more encouragement for users to share content is needed (e.g. recorded voice messages promoting the sharing of messages).

VFC did not trigger any change in behaviour among several farmers

A few farmers revealed that they found the VFC recorded voice messages and SMS useful, but that they had never felt motivated to change or try anything in response to the information. The main reason for this was that they felt the messages did not provide them with any new information and they were either already practising the advice or they had previously decided not to. As a farmer summarised:

> *I never tried any of their advice because it is something I am already doing. However, it serves as a reminder.*
>
> *(Male farmer, Baazu Yiepel, UWR)*

6.2 Initial hypotheses on how VFC may work in different contexts

Based on the midline data analysis, a refined list of CMOs considered to be the most plausible theories based on the available evidence gathered so far are included in Table 6.1 below. These theories focus on the most common set of scenarios that explain why and how mothers' behaviour changes (the 'outcome') might have been influenced by their pre-existing knowledge or circumstances (the 'context'), and how this interacted with a feature of the intervention (the 'mechanism').

For example (see CMO 1 below), most farmers reported having very limited or no access to technical support from government agriculture extension officers, who are meant to provide advice on appropriate and effective farming techniques (context). This meant they often based their farming practices on limited informal knowledge sources or trial and error (context). Regular VFC recorded messages sent to farmers provided useful evidence-based tips and information on effective crop management and production, which farmers trusted because they felt it was from a credible source (mechanism). Farmers were therefore inclined to test out this new farming advice, which often led to improved crop management and farming practices (e.g. better weed control, modified seed planting techniques), which in turn resulted in increased crop quality, yield, and sales (outcome).

The CMOs help to illustrate the complex set of personal factors that might influence whether, how, and under what circumstances the VFC service might influence farmers' practices related to agriculture and nutrition.

Table 6.1 Initial CMO configurations

	Context	Mechanism	Outcome
CMO 1	Farmers have very limited or no access to agriculture extension officer support to provide technical advice and support on farming practices, so rely on limited and informal information sources and trial and error.	Regular VFC recorded messages received on farmers' phones provide useful new information on crop management and production, which farmers trust.	Farmers follow farming advice, leading to improved farming practices, increased crop yields, and sales.
CMO 2	Farmers have accumulated farming knowledge from different sources (e.g. agriculture extension officer, TV), but forget to/lack motivation to apply their knowledge.	Regular VFC recorded messages reinforce existing knowledge and act as a useful reminder of optimum agricultural practices.	Farmers are more likely to apply optimum and safe farming practices, which maximises yield and quality of crops and prevents damage to personal health e.g. caused by chemical fertilisers.
CMO 3	Farmers have accumulated some farming knowledge from range of informal sources but lack relevant and up-to-date information on modern farming practices and techniques relevant to their situation.	Regular tailored VFC information fills gaps in existing agricultural knowledge and replaces outdated/inaccurate knowledge.	Farmers more likely to apply optimum farming practices e.g. on land preparation, crop planting, harvesting etc. to maximise yield and quality of crops they produce.

CMO 4	Farmers have accumulated farming knowledge from range of informal sources e.g. radio, TV, but are unsure if it is relevant to their situation and whether to follow it.	Farmers feel that information provided via VFC is personalised and tailored to their specific needs and situation compared with other sources of information (e.g. TV, radio), so believe it will lead to better farming outcomes.	Farmers are more likely to follow advice given in VFC information e.g. on land preparation, crop planting, harvesting etc., and to apply optimum farming practices, leading to improved yield and quality of crops.
CMO 5	Farmers are busy working in the fields all day and do not have the time to seek out agricultural advice e.g. from extension workers when they occasionally visit the village.	Farmers receive new tips directly on their phone during the day while working on their farms, and can easily listen to and absorb the information without having to disturb their work or travel to a separate location.	Farmers can immediately apply new knowledge to their farming practices, e.g. changing crop planting methods, weeding techniques etc., which in turn leads to improved yield and quality.
CMO 6	Low levels of education and high rates of illiteracy among farmers, many of whom lack up-to-date sources of information on farming techniques, weather, and crop prices.	Farmers receive and listen to VFC recorded voice messages, which they appreciate; however, they are unable to read the VFC SMS received on their phone with weather forecasts and crop price information because they are illiterate and/or cannot understand English.	Farmers apply new farming knowledge but are unable to absorb and apply information sent via SMS, so continue to be unable to plan effectively for weather changes and fluctuations in crop prices, and are left feeling frustrated.
CMO 7	Farmers are busy working in the fields all day, where they rarely answer phone calls. They tend to listen to the radio while working and use their phone for calls either early morning before they leave home for work or during the evenings.	VFC recorded voice messages call farmer's phone at any time during the day and farmers are often unable to answer because they are busy working in the fields and do not know how to access the voice messages later. They would prefer to hear information on the radio so they do not have to stop work to listen.	Farmers do not receive and absorb agriculture and nutrition information sent via recorded voice message, so their level of knowledge does not improve, and they are left feeling frustrated that they are unable to benefit from the service.
CMO 8	Many farmers have a very low income, lack money and financial support for farming inputs, and are unable to access/afford a varied nutritious diet.	VFC recorded voice messages provide useful new advice on farming inputs (e.g. fertiliser use, equipment) and nutrition (e.g. eating well, varied diet), which farmers receive but are unable to act on due to financial constraints.	Farmers' level of farming and nutrition knowledge may improve but practices requiring additional financial resources remain unchanged, leaving farmers demotivated and frustrated with the lack of financial support from VFC.

CMO 9	Farmers have very limited or no access to agriculture extension officer support to provide technical advice and support on farming practices, so rely on limited and informal information sources and trial and error.	VFC recorded voice messages provide concise advice on crop/farming practices. Farmers receive the messages but are unable to seek additional detail, clarification, or support from agriculture extension workers (who are not available) or VFC call centre (which often fails to respond when farmer calls for additional information).	Farmers' level of knowledge improves, but limited changes in farming practices seen due to lack of confidence in understanding and applying new advice from VFC information to their situation.
CMO 10	Farmers lack basic health and nutrition-related knowledge, support, and awareness.	VFC recorded voice messages provide advice on healthy and nutritious eating practices (e.g. consuming eggs), which farmers like because it is new information they have not heard before.	Farmers more likely to follow healthy eating and food preparation practices (e.g. not eating too late in the evening, hand washing), leading to improved personal and household health.
CMO 11	Farming communities have limited and patchy Vodafone network coverage and poor access to electricity supply to charge their phones.	VFC recorded messages and SMS often do not get through to farmers' phones when they are in areas with poor reception, meaning they often miss calls and SMS and do not receive them at regular intervals.	Farmers only receive very infrequent VFC information when they have reception (if at all), so are unable to access the full benefits of the service.

6.3 Contextual barriers to behaviour change in response to VFC

Various external and intrinsic factors prevented farmers from acting on the VFC, as described below.

Costs of purchasing agriculture inputs or recommended foods outweigh perceived benefits

Many farmers claimed that financial constraints prevented them from adopting new practices suggested by VFC (both agriculture and nutrition practices).

> *I don't have money to buy the fertiliser and hire a tractor to plough my land and get water in the dry season to grow the vegetables and other recommended foods the VFC information says we should eat.*
>
> *(Male farmer Baazu Yiepel, UWR)*

When exploring further, we found that farmers were often unconvinced that the costs of purchasing inputs, equipment, and chemical fertiliser, and managing pests and diseases using industrial insecticides would be justified by the expected benefits, especially as the benefits were often uncertain.

Several female farmers also explained that there were many competing demands on their very limited financial resources and that allocating money towards better and more nutritious foods just could not be the main priority:

> *Just that I'm not able to follow all their advice like eating one egg each day…there is no money to buy eggs every day and to eat eggs every day as there are other more important things like paying children's school fees.*
>
> *(Female farmer, Baazu Yiepel, UWR)*

Farmers are risk-averse and do not want to change established practices

Farmers, especially very poor farmers with small farms, were often reluctant to change established agriculture practices and to take the risk of investing time and money in experimenting with new practices (with often uncertain benefits). Farmers' priorities were to secure the household's livelihood and get food on the table regularly. Taking unnecessary risk was perceived as impossible:

> *I usually rely on the traditional knowledge regarding my farming. I have always used this knowledge when cocoa farming. I don't want to experiment with using fertilisers, especially because it is more expensive, and I can't afford it.*
>
> *(Male farmer, Esikando, CR)*

Some farmers added that they might be more comfortable trying out new agricultural practices if they could see practical proof of the effectiveness of the new approach. Without these practical examples, the effort and risk of trying something new was perceived as too high. For example:

> *I received information [from VFC] on how to store maize and other farm produce better. The information is important because it teaches us how we can store our farm produce and also preserve our food. However, I haven't tried any of their advice because I am yet to see the effect of their storing method.*
>
> *(Female farmer, Mwanware, UWR)*

Better-off and/or highly motivated farmers were often more inclined to experiment with new practices and techniques. For example, a successful female farmer who cultivated different crops together with her children in UWR, described how the messages encouraged her to attempt pig farming. She followed the advice after some consideration and is now also a successful pig farmer.

Travel costs and lack of storage facilities impeded the adoption of market price information

Many farmers highly valued the VFC market price SMS and said that the information empowered them in their negotiations with traders.

However, there were also many farmers who said that economic constraints (e.g. travel costs to local markets) and/or the lack of safe storage facilities prevented them from acting on the price information.

> *Some are about cocoa and other crops that we farm. But the issue is that often the crops may be ready for harvesting but the prices for those crops will be low; even so we are forced to harvest and sell, and this is because we do not have storage facilities for the crops.*

(Male farmer, Dokono Nkwanta, CR)

Travelling to another place where prices [for my crops] are better is more expensive.

(Male farmer, retire agriculture extension worker, Tankasie, UWR)

An agriculture extension worker further elaborated:

The problem is that farmers cannot sell some of their produce when the price is good and so some crops rot [due to lack of storage]. Other farmers [who want to avoid losing crops due to spoilage] sell to traders who are willing to purchase at a lower price.

(Agriculture extension worker, Asikuma, CR)

6.4 Potential implications for the design of VFC

Table 6.2 presents key findings from the exploration of pathways of change and barriers to change. The second column in the table suggests learning for future programme design and implementation.

Table 6.2 Key findings on contextual barriers to the adoption of VFC advice and pathways of change

Key findings		Lessons for design and implementation
Barriers to behaviour change	Perception that costs of purchasing agriculture inputs and/or more nutritious foods would outweigh the benefits of adopting new practices.	Ensure that only inexpensive agriculture inputs and foods are promoted and highlight how the benefits will outweigh the costs.
	Poor farmers are risk-averse and do not want to invest limited resources and time in new practices with uncertain benefits.	Highlight the benefits of adoption of new practices (preferably visual, with examples).
	Lack of safe grain storage and travel cost prevents farmers from reacting to market price information.	Consider more contextualisation of market price messages.

7 Conclusions and recommendations

The aim of the qualitative midline was to assess how and why (or not) farmers take up and engage with VFC and how VFC triggers behaviour change related to agricultural and nutritional practices. To achieve this, the midline explored (1) farmers' experiences with the implementation of VFC and how these may have affected uptake; (2) farmers' acceptance of VFC with regards both to content and delivery mode and to implications on uptake and engagement; and (3) contextual barriers that may impede farmers from acting on the VFC information. In this section, key findings from the analysis will be summarised and recommendations will be presented both with regards to VFC and also more generally for mobile phone-based services.

7.1 Key findings

7.1.1 Key findings from the assessment of implementation processes

In contexts with no/irregular access to agriculture extension services and smallholder farmers with busy daily timetables, remote delivery of agriculture and nutrition content (through mobile phone technology) seems both feasible and relevant. More specifically, the qualitative data suggest that:

- obtaining agricultural information remains a central and ongoing challenge for farmers in both CR and UWR, and may constrain the improvement of farmer livelihoods. VFC, if well designed, targeted, and delivered, may help to address this gap; and
- farmers prioritise information on agriculture, and only a few (female) farmers showed active interest in nutrition content as part of agricultural services. VFC needs to package and advertise nutrition content well to ensure effective uptake.

VFC is only effective in changing farmers' agriculture and nutrition practices when farmers actively engage with the service. Current user statistics of VFC and self-reported service use among the farmers in the qualitative sample suggest that engagement with the different components of the service is very low and may decline further (e.g. when service charges are reintroduced). There was also a clear regional pattern with VFC (and the different services within VFC) being taken up more in UWR than in CR. The analysis of implementation processes of VFC at community level suggests the following issues that may help to explain the low engagement and the regional difference in uptake.

- Poor Vodafone network coverage and signal was a major barrier to the activation of VFC SIM cards and to the use of VFC (especially in CR). In particular, recorded voice messages were frequently missed as farmers did not have network coverage. This is an important shortcoming for the implementation of VFC in CR, but it does not indicate an issue with the programme design *per se*.
- Recorded voice messages seem to be the best delivery channel in areas with high levels of illiteracy. However, farmers missed a large proportion of the recorded voice messages as they were preoccupied with daily activities and had no voicemail set up/were unaware of how to access their voicemail to capture missed voice calls. This implementation challenge at the end user level is easy to address and is likely to have a significant impact of the effective uptake of recorded voice messages.
- Illiteracy and the inability to understand English were major barriers to the uptake of VFC SMS on price and weather. As there was a clear demand for weather and price information

(especially from farmers in UWR), we recommend offering the content of SMS as recorded voice messages (in local languages). However, as the weather and price information are highly time-sensitive and context-specific, providing this information in recorded voice messages may increase the implementation costs of VFC considerably.

- There is clearly interest in and potential for the VFC call centre; however, based on the qualitative data only a few VFC members were aware of the centre and even fewer knew that they could consult the centre free of charge. Most of the small number of farmers that contacted the centre were not impressed by the performance as they had not received an answer to their question or had not been called back (as had been promised to them). To fully realise the potential of the centre, farmers' awareness of this service must be increased and capacity issues at the centre level need to be addressed.
- Errors in the implementation that are unrelated to the content can lead to distrust in VFC and disengagement (e.g. receiving occasional voice messages in English despite having chosen a local language).

The findings also suggest how farmers' initial engagement with and uptake of VFC could be improved.

- Agents that promote VFC to farmers should explain the different services to farmers, potentially with some examples of the content they can expect in the messages. To ensure that all services are covered, the promotion script should be revised (e.g. to better explain the call centre and what voice messages are).
- Interpersonal contact with VFC promoters was perceived as important for building trust and convincing farmers to sign up. Interpersonal support is also important to facilitate the correct activation of the VFC SIM cards and to ensure that farmers take up recorded voice messages effectively (e.g. by setting up voicemail to capture missed calls). This suggests that an interpersonal component during the promotion, and as ongoing support, may increase both uptake and sustained use.
- VFC was perceived as an alternative to traditional FBOs by some farmers. While this may strengthen uptake and engagement with the service, it can also result in disappointment once members realise that VFC cannot deliver many of the benefits of an FBO (e.g. material support, interpersonal contact).

7.1.2 Key findings from the acceptance assessment of VFC

High levels of acceptance of both content and delivery mode are critical for uptake and sustained engagement with the service and are a precondition for the adoption of new behaviours and practices in response to the service. The qualitative data found:

- VFC is valued as a service with an expansive reach that is not limited by space, resources, or time (as agriculture extension services often are). In the absence of well-functioning agriculture extension services (due to staff shortage or lack of funding), VFC can provide reliable agriculture information to farmers (as do other channels such as radio and TV). In contrast to radio and TV, VFC can be more tailored and targeted towards farmers' specific needs;
- VFC can help to empower female farmers (who are often excluded from traditional information sources, such as FBOs and agriculture meetings, due to time constraints) by providing much-needed tailored agriculture information. However, female access to mobile phones may impede access to VFC;
- farmers value practical, easy-to-understand information that is tailored towards their agricultural activities (e.g. crops they cultivate). Insufficient tailoring or information that merely repeats

established agricultural knowledge can result in disengagement with the service. Careful profiling of farmers to ensure highly tailored content is essential for uptake and sustained engagement;

- market price and weather information is highly valued and acted upon if resources to act are available (e.g. farm equipment, safe storage for grains, financial resources to travel to different markets). High levels of illiteracy and the inability to comprehend English prevent most farmers from using the price and weather information;
- nutrition information is perceived as useful and acted upon mainly by female farmers, who are usually responsible for all domestic chores including food preparation and childcare. Nutrition information as part of VFC enhanced female farmers' attitude towards the service, as it was perceived as an indication that VFC cares for the health and well-being of its members;
- radio is preferred over mobile phones for the delivery of information by many farmers. The reasons for this are that radios are perceived as more inclusive (not everybody can afford a mobile phone) and less distracting during farm work and daily chores than voice calls. Blending of mobile phone-based information and radio might make use of the advantage of both technologies;
- VFC is currently predominately a one-way mobile phone-based intervention. The lack of interpersonal contact is perceived as a major limitation of VFC. Farmers miss personal rapport, dialogue, and support from human beings. Over time the lack of interpersonal contact can also negatively affect farmers' trust in the credibility of the information. Introducing occasional interpersonal interactions (e.g. community-based VFC meetings) and strengthening the call centre capacity may help to address this shortcoming and ensure sustained engagement;
- farmers' trust in the credibility of the information is generally high; even so, many farmers are unsure about the source of the information. Reasons for trust include the perceived relevance of the content, assumptions about the source of the information (e.g. Vodafone or the team that visited for the quantitative survey and follow-up), and accuracy of the weather forecast (i.e. if weather predictions are true, other information must also be true);
- VFC can improve attitudes towards and trust in Vodafone and increase customer loyalty and airtime purchases. However, the main reason for the change in attitude was the fact that VFC was free of charge. Reintroducing user fees for the service may negatively affect uptake and engagement; and
- most farmers are unwilling to pay for VFC or only want to pay small sums. This may pose a threat to the long-term financial sustainability of VFC and suggests the need for additional ongoing funding.

7.1.3 Key findings on contextual barriers to adoption of VFC advice

Successful uptake and high levels of acceptance of VFC are critical for farmers' engagement with the service. However, contextual barriers may impede the translation of the advice into practice. The following key barriers emerged:

- financial constraints and the belief that costs for purchasing agriculture inputs and/or more nutritious food may outweigh their benefits (especially as benefits are often uncertain); and
- the risk-averse attitude of farmers and their unwillingness to invest time and resources in new practices with uncertain benefits.

7.1.4 Recommendations for policy and practice

Mobile phone-based advisory services such as VFC are unlikely to be effective as a stand-alone channel for behaviour change; however, the qualitative data and also evidence from other studies (Free *et al*. 2013) suggest they may perform best when integrated with traditional media and channels as part of a multi-level strategy. Mobile phone-based information could thereby be one part of a broad many-pronged policy, and not the only component aiming to change behaviours and practices.

It should be noted that mobile phone-based interventions may generate new inequalities, as not everybody can afford or has access to a mobile phone. In particular, very poor and already marginalised farmers who may benefit most from the information may be excluded. A blended approach combining different technologies and approaches to disseminate information may increase inclusiveness and address some of these newly-generated inequalities (e.g. mobile phone and radio, or mobile phone and community meetings that are open to non-subscribers).

The behaviour change literature suggests that the transmission of information to passive audiences without an element of interactive engagement has limited effectiveness in changing behaviour and practices (Adewuyi and Adefemi 2016). Very limited uptake and various implementation issues of the interactive VFC call centre meant that farmers did not experience any peer, social, or emotional support when attempting to adopt the advice VFC provided. Social support has been shown to be critical in effective behaviour change intervention (Portsmouth, Trede and Olsen 2012).

VFC includes two interactive components that could (if advertised and implemented well) provide the desired interactive and supportive components: the call centre and the free farmer-to-farmer calls.

The call centre could be a powerful agent for change if implemented well. It could deliver both tailored agriculture and nutrition advice and be a source of support and reassurance for farmers. To fulfil this potential, the capacity of the call centre needs to be strengthened and farmers need to be made aware of its existence and the conditions of its use (e.g. that calls to the centre will be free of charge and that they can speak to a call centre agent in their preferred language).

The free farmer-to-farmer calls could provide farmers with channels for ongoing peer and emotional support, such as behaviour change interventions based on interactive social media approaches. There is emerging evidence to suggest that social media interactions (e.g. WhatsApp groups) may be very effective in promoting and supporting behaviour change (Wakefield, Loken and Hornik 2010, Maher *et al*. 2014). To make more use of this feature, VFC could for example be integrated/promoted to existing FBOs in which farmers know each other and could make more use of the free calls to contact and communicate with each other.

With regards to content, farmers are interested in and receptive to agricultural content. Content needs to be tailored, context-specific, relevant to farmers' changing needs, and cognisant of farmers' characteristics (e.g. limited literacy skills or low school education). Farmers frequently look for specific information that can help them address acute individual farming problems (e.g. pest infestations or access to seeds). Introducing and strengthening existing two-way channels (i.e. a call centre) as part of VFC could enable farmers to actively source the information they need, rather than merely being the recipient of information that experts perceive to be relevant.

Nutrition content was not popular/perceived as relevant by most male farmers; however, it was valued and acted upon by female farmers. In many rural contexts (in Ghana and beyond), females

are responsible for the bulk of the domestic and caring activities; consequently, nutrition information is most likely to get traction with females, although they may generate greater awareness about nutrition in some men.

While VFC uses strategic applications of different types of messages tailored to farmers' specific needs (e.g. based on the crops they cultivate), VFC currently does not support the generation of an enabling environment that supports farmers willing to adopt new practices. The behaviour change literature suggests that behaviour change interventions that provide both (i.e. information and a supportive enabling environment) may be more effective in changing behaviour (Briscoe *et al.* 2012). To increase impact, mobile phone-based services could be joined up with other ongoing interventions (e.g. livelihood improvement programmes or social protection programmes).

The branding and the chosen name for a mobile phone-based service may encourage people to sign up and engage with it. Farmers said they joined VFC as they perceived it to be a club, like a farmers' association or group. However, it is important to highlight from the start what the service can and cannot provide for its members (e.g. no financial help, limited peer-to-peer support, and limited interpersonal interaction).

A potentially major challenge to a mobile phone-based service may be financial sustainability. Farmers interviewed for the qualitative midline were unwilling to pay for the service or said they would only be willing to pay a very small amount of money. Alternative funding sources may be necessary to support the service.

References

Adewuyi, E.O. and Adefemi, K. (2016) 'Behavior Change Communication Using Social Media: A Review', *International Journal of Communication and Health* 9: 109–16

Anderson, J.R. and Feder, G. (2004) 'Agricultural Extension: Good Intentions and Hard Realities', *The World Bank Research Observer* 19.1: 41–60

Asiedu, C. (2012) 'Information Communication Technologies for Gender and Development in Africa: The Case for Radio and Technological Blending', *International Communication Gazette* 74.3: 240–57

Bahmanziari, T.; Pearson, J.M. and Crosby, L. (2003) 'Is Trust Important in Technology Adoption? A Policy Capturing Approach', *Journal of Computer Information Systems* 43.4: 46–54

Barnett, I. and Srivastava, S. (2017) *External Evaluation of Mobile Phone Technology Based Nutrition and Agriculture Advisory Services in Africa and South Asia: Desk Review: Smallholder Farming, Nutrition and m-Agriculture Services in Ghana*, Brighton: IDS

Barnett, I.; Srivastava, S., Gordon, J., Kyei-Mensah, G. and Sefa-Nyarko, C. (2018) *External Evaluation of Mobile Phone Technology Based Nutrition and Agriculture Advisory Services in Africa And South Asia: Mobile Phones, Nutrition and Agriculture in Ghana: Initial Exploratory Qualitative Study Report*, Brighton: IDS

Batchelor, S.; Scott, N. and Sharp, J. (2018) *External Evaluation of Mobile Phone Technology Based Nutrition and Agriculture Advisory Services in Africa and South Asia: Mobile Phones, Nutrition and Health in Tanzania Business Model Baseline Report*, Brighton: IDS, Gamos

Billings, L.; Gilligan, D.; Hidrobo, M.; Ledlie, N. and Palloni, G. (2018) *External Evaluation of Mobile Phone Technology Based Nutrition and Agriculture Advisory Services in Africa and South Asia: Mobile Phones, Nutrition, and Agriculture in Ghana: Quantitative Baseline Report*, Brighton: IDS, IFPRI

Bo, S. *et al*. (2014) 'Consuming More of Daily Caloric Intake at Dinner Predisposes to Obesity. A 6-Year Population-Based Prospective Cohort Study', *PLoS One* 9.9: e108467, doi:10.1371/journal.pone.0108467

Briscoe, C. and Aboud, F. (2012) 'Behaviour Change Communication Targeting Four Health Behaviours in Developing Countries: A Review of Change Techniques', *Social Science & Medicine* 75.4: 612–21

Davis, F.D. (1993) 'User Acceptance of Information Technology: System Characteristics, User Perceptions and Behavioral Impacts', *International Journal of Man-Machine Studies* 38.3: 475–87

Davis, F.D.; Bagozzi, R.P. and Warshaw, P.R. (1989) 'User Acceptance of Computer Technology: A Comparison of Two Theoretical Models', *Management Science* 35.8: 982–1003

Dombrowski, S.U.; O'Carroll, R.E. and Williams, B. (2016) 'Form of Delivery as a Key "Active Ingredient" in Behaviour Change Interventions', *British Journal of Health Psychology* 21.4: 733–40

Free, C. *et al.* (2013) 'The effectiveness of mobile-health technology-based health behaviour change or disease management interventions for health care consumers: a systematic review', *PLoS med* 10.1: e1001362, doi:https://doi.org/10.1371/journal.pmed.1001362

Fry, J.P. and Neff, R.A. (2009) 'Periodic Prompts and Reminders in Health Promotion and Health Behavior Interventions: Systematic Review', *Journal of Medical Internet Research* 11.2: 20–25

Ghana Statistical Service (2014) *Ghana 2014 DHS Final Report*, Accra: Ghana Statistical Service

Gilligan, D.; Hidrobo, M.; Ledlie, N. and Palloni, G. (2018) *External Evaluation of Mobile Phone Technology Based Nutrition and Health Advisory Services in Africa and South Asia: Mobile Phones, Nutrition, and Health in Tanzania: Quantitative Baseline Report*, Brighton: IFPRI, IDS

Glanz, K.; Rimer, B.K. and Viswanath, K. (2008) *Health Behavior and Health Education: Theory, Research, and Practice*, London: John Wiley

Jakubowicz, D.; Barnea, M.; Wainstein, J. and Froy, O. (2013) 'High Caloric Intake at Breakfast vs. Dinner Differentially Influences Weight Loss of Overweight and Obese Women', *Obesity* 21.12: 2504–12

Kelly, M.P. and Barker, M. (2016) 'Why Is Changing Health-Related Behaviour so Difficult?', *Public Health* 136: 109–16

Ketikidis, P.; Dimitrovski, T.; Lazuras, L. and Bath, P.A. (2012) 'Acceptance of Health Information Technology in Health Professionals: An Application of the Revised Technology Acceptance Model', *Health Informatics Journal* 18.2: 124–34

Korda, H. and Itani, Z. (2013) 'Harnessing Social Media for Health Promotion and Behavior Change', *Health Promotion Practice* 14.1: 15–23

Maher, C.A. *et al*. (2014) 'Are Health Behavior Change Interventions That Use Online Social Networks Effective? A Systematic Review', *Journal of Medical Internet Research* 16.2: 40–51

Malhotra, Y. and Galletta, D.F. (1999) 'Extending the Technology Acceptance Model to Account for Social Influence', *Systems Sciences*, 1999. HICSS-32. Proceedings of the 32nd annual Hawaii international conference on, Hawaii, IEEE

Nikkhah, A. (2017) 'Maternal and Pediatric Obesity Prevention by Early Dinner and Late Breakfast: Insights from Livestock', *Perspective* 2.3: 15–21

Portsmouth, L.; Trede, F. and Olsen, M. (eds) (2012) 'Communicating with the Community about Health', *Communicating in the Health Sciences*, New York, NY: Oxford University Press, 249–59

Rivera, W.M. and Qamar, M.K. (2003) *Agricultural extension, rural development and the food security challenge*, Rome: Food and Agriculture Organization of the United Nations

Salifu, A.; Francesconi, G.N. and Kolavalli, S. (2010) *A Review of Collective Action in Rural Ghana*, Washington DC: IFPRI

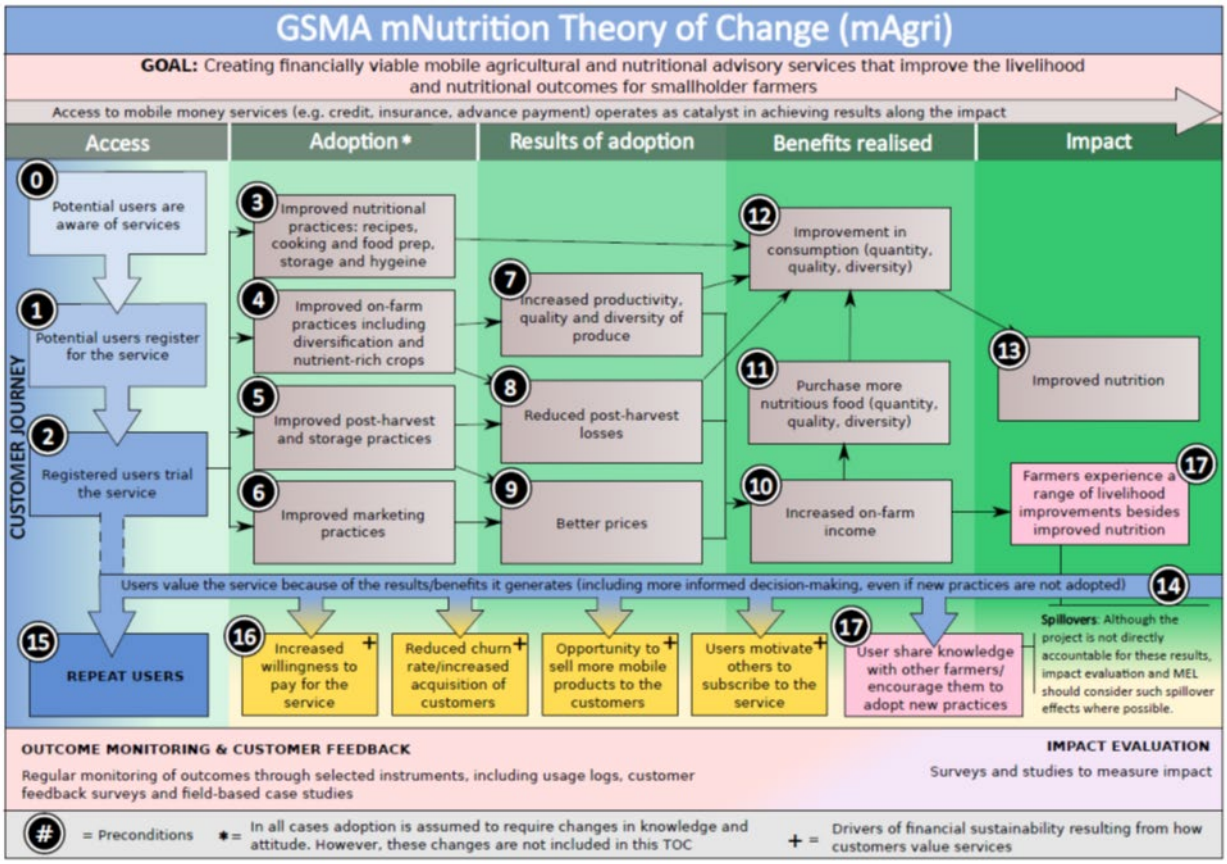
Venkatesh, V. and Bala, H. (2008) 'Technology Acceptance Model and a Research Agenda on Interventions', *Decision Sciences* 39.2: 273–315

Venkatesh, V. and Davis, F.D. (2000) 'A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies', *Management Science* 46.2: 186–204

Wakefield, M.A.; Loken, B. and Hornik, R.C. (2010) 'Use of Mass Media Campaigns to Change Health Behaviour', *The Lancet* 376.9748: 1261–71

Wathen, C.N. and Burkell, J. (2002) 'Believe it or not: Factors Influencing Credibility on the Web', *Journal of the American Society for Information Science and Technology* 53.2: 134–44

Annex A GSMA mAgri VAS Theory of Change



Annex B Terms of Reference

Section 4, Annex A

Call-down Contract

Terms of Reference

PO 6420: External evaluation of mobile phone technology based nutrition and agriculture advisory services in Africa and South Asia

Introduction

DFID (Research and Evidence Division) wishes to commission an external impact evaluation of mNutrition, a mobile phone technology based nutrition and agricultural advisory service for Africa and South Asia. mNutrition is a programme supported by DFID that, through business and science partnerships, aims to build sustainable business models for the delivery of mobile phone technology based advisory services that are effective in improving nutrition and agricultural outcomes.

mNutrition is primarily designed to use mobile phone based technologies to increase the access of rural communities to nutrition and agriculture related information. The initiative aims to improve knowledge among rural farming communities especially women and support beneficial behaviour change as well as increasing demand for nutrition and agriculture extension services. The mNutrition initiative launched in September 2013 will work in 10 countries in Africa (Cote d'Ivoire, Ghana, Malawi, Mozambique, Nigeria, Tanzania, Kenya, Rwanda, Uganda, Zambia) and four countries in South Asia (Bangladesh, India, Pakistan and Sri Lanka). The desired impact of mNutrition will be improved nutrition, food security and livelihoods of the poor.

Mobile phone based services have been endorsed by WHO as an effective strategy for behaviour change and for driving adherence to anti-retroviral treatment protocols (Horvath, Azman, Kennedy and Rutherford 2012). There is currently scant evidence on the impact and cost-effectiveness of mobile phone technology based services for nutrition and agriculture and on the sustainability of different business models for their provision. A rigorous evaluation of mobile phone technology based nutrition services would add significantly to the current evidence base. An external evaluation team managed by the Evaluator, independent of the programme delivery mechanism, will conduct an assessment of the impact, cost-effectiveness and sustainability of mobile phone technology based information and behaviour change messages for nutrition and agriculture.

Background to mNutrition

Introduction

Undernutrition is a major challenge to human and economic development globally. It is estimated that almost one billion people face hunger and are unable to get enough food to meet their dietary needs. Agriculture is a major source of livelihood in many poor countries and the sector has a potentially critical role in enhancing health, specifically maternal and child health and nutritional status. A well-developed agriculture sector will deliver increased and diversified farm outputs (crops, livestock, non-food products) and this may enhance food and nutrition security directly through increased access to and consumption of diverse food, or indirectly through greater profits to farmers and national wealth. Better nutrition and health of farmers fosters their agricultural and

economic productivity. Current agricultural and health systems and policies are not meeting current and projected future global food, nutrition and health needs.

Despite major investment in agricultural and nutrition research and its uptake and application, there is significant social and geographic inequality in who benefits from these investments. Furthermore, in many developing countries, public extension systems for agriculture, health and nutrition are inefficient, have limited capacity and have a poor track record of delivery, especially in terms of supporting women and girls and the most marginalised populations (Alston, Wyatt, Pardey, Marra and Chan-Kang 2000; Anderson 2007; IFPRI 2010; Van den Berg and Jiggins 2007).

Several research and mobile network operators (MNOs) are testing a range of information and communication technology (ICT) solutions for improving access to a wide range of information and advisory services. Mobile phone based technologies are among the most promising ICT strategies, although current initiatives in nutrition are relatively small and fragmented.

What is mNutrition?

Enhancing access to the results of nutrition and agricultural research and development is potentially critical for improving the nutrition, health and livelihoods of smallholders and rural communities. mNutrition will harness the power of mobile phone based technologies and the private sector to improve access to information on nutrition, health and agricultural practices especially for women and farmers (both male and female). Specifically, mNutrition will initiate new partnerships with business and science to deliver a range of services including:

- An open-access database of nutrition and agriculture messages for use in mobile phone based communication (for example, information and behaviour change messages on practices and interventions that are known to have a direct impact on nutrition or an indirect impact via for example agriculture);
- A suite of mobile phone based nutrition and agriculture information, extension and registration services designed to: improve knowledge and generate beneficial behaviour change in nutrition and agriculture; increase demand for nutrition, health and agriculture goods and services; register and identify target populations for support; and, using real-time monitoring, support the conduct of nutrition risk assessments by community health workers.

The impacts of mNutrition are expected to include improved nutrition, food security and livelihoods of the poor, especially women in 10 countries in Africa (Cote d'Ivoire, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zambia) and 4 countries in South Asia (Bangladesh, India, Pakistan and Sri Lanka). This impact will result from the increased scale and sustainability of mobile phone based nutrition and agricultural-based information services, delivered through robust public private partnerships in each country.

mNutrition has two major outcomes. One outcome will be cost-effective, sustainable business models for mobile phone enabled nutrition and agriculture services to 3 million households in 10 countries in Africa and 4 countries in South Asia that can be replicated in other countries. Linked to this outcome, the second outcome will expect these services to result in new knowledge, behaviour change and adoption of new practices in the area of agriculture and nutrition practices among the users of these mobile phone based services.

These outcomes will be achieved through four outputs:

- Improved access to relevant mobile based health, nutrition and agricultural advisory services for 3 million poor people and community health workers across 10 SSA and 4 Asian countries;

- Launch and scaling of mobile phone based health, nutrition and agricultural advisory services targeted to poor people and community health workers;
- Generation and dissemination of high quality research and evidence on the impact, cost-effectiveness and sustainability of mobile phone based advisory services in nutrition and agriculture in South Asia and SSA; and
- Development of locally relevant content for mobile phone technology based agriculture and nutrition services meeting demands from users and community health workers.

In terms of promoting behaviour change and/or adoption of new practices, mNutrition will seek to achieve changes in one or more of the following areas:

- Adoption of new agricultural practices that are nutrition sensitive, improve agricultural productivity and utilise post-harvest technologies
- Changes in nutrition practices in either one or several knowledge domains including improved maternal nutrition practices during pregnancies; infant and young child feeding practice; and micro-nutrient supplementation to children at risk (i.e. Vitamin A, Zinc and Oral Rehydration Solution (ORS)).

mNutrition has started implementation from September 2013. For the 2 countries selected for the impact evaluation (Tanzania and Ghana), mobile network operators and content providers have been identified through a competitive process during the first half of 2014. The MNOs and content providers started developing and launching their services during the 4th quarter of 2014 and early 2015. The mobile phone based advisory services are expected to run at least till 3rd quarter of 2018.

mNutrition Project Coordination

DFID support to mNutrition will be channelled to GSMA, as well as directly to this associated independent external impact evaluation. GSMA is a global body that represents the interests of over 800 mobile operators. GSMA already works with the major mobile operators across Africa, (including Airtel, MTN, SafariCom/VodaCom) with a collective mobile footprint of more than 67% of total African connections. GSMA has a number of existing development initiatives, including mHealth and mFarmer, that are part of GSMA's Mobile for Development which brings together mobile operator members, the wider mobile industry and the development community to drive commercial mobile services for underserved people in emerging markets. GSMA will provide technical assistance to mobile phone operators, and support new partnerships with content providers to develop and scale up new nutrition and agriculture message services. GSMA will ensure sharing of best practices and promote wider replication and uptake of effective business models.

Objective and Main Questions

The objective of this work is to conduct an external evaluation of the impacts and cost-effectiveness of the nutrition and agriculture advisory services provided by mNutrition compared to alternative advisory services available in the two selected countries (Ghana and Tanzania), with particular attention paid to gender and poverty issues. The impact assessment is required to answer the following questions that relate to impact, cost-effectiveness and commercial viability:

- What are the impacts and cost-effectiveness of mobile phone based nutrition and agriculture services on nutrition, health and livelihood outcomes, especially among women, children and the extreme poor?

- How effective are mobile phone based services in reaching, increasing the knowledge, and changing the behaviour, of the specific target groups?
- Has the process of adapting globally agreed messages to local contexts led to content which is relevant to the needs of children, women and poor farmers in their specific context?
- What factors make mobile phone based services effective in promoting and achieving behaviour change (if observed) leading to improved nutrition and livelihood outcomes?
- How commercially viable are the different business models being employed at country level?
- What lessons can be learned about best practices in the design and implementation of mobile phone based nutrition services to ensure a) behaviour change and b) continued private sector engagement in different countries?

Further evaluation questions related to other aims of mNutrition will be addressed in at least 1 country (either Ghana and/or Tanzania):

- Are mobile phone based services a cost-effective way to register and identify at risk populations to target with nutrition support?
- Are mobile phone based services a cost-effective way for community health workers to improve the quality and timeliness of data surveillance (a core set of nutrition-related indicators)?

The content for the mobile phone based advisory services will be based on international best practices and widely endorsed protocols (i.e. by the World Health Organisation) and evidence-based nutrition-sensitive agricultural practices identified by international experts. Through an iterative multi-stakeholder process, international and country experts will localise and adapt the content to make it relevant to the specific target audience in the 14 countries. The adapted content and nature of messages is expected to vary across specific target audiences within and across countries. The main purpose of assessing the relevance of the content is not to evaluate the overall health and nutrition content but on how this content has been localised and adapted and to what extent the needs of the specific target groups within their particular context have been met.

In assessing the commercial viability, it is recognised that evaluating the sustainability/long-term financial viability of the mobile phone based advisory services will be difficult as mobile network operators may not be willing to provide this potentially commercially sensitive information. Therefore, GSMA will provide support through its access to aggregated confidential financial results of the mobile network operators providing the service. GSMA will provide a financial summary report on the commercial viability of the business models without compromising the commercial sensitivity of the data for the mobile network operators. The evaluator will assess and validate commercial sustainability through an analysis of the aggregated information provided by GSMA and additional qualitative business analysis approaches.

The Evaluator has the option of proposing refinements of the existing evaluation questions during the inception phase as part of developing the research protocol. These suggestions will be considered by the Steering Committee and an independent peer review during the review of the research protocol as part of the inception phase.

Output

The output of this work will be new and robust evidence on the impact, cost-effectiveness and commercial viability of mobile phone based advisory services focusing on nutrition and agriculture delivered by public and private partners, and including the development of robust methodological approaches to impact assessment of phone based advisory services.

Recipient

The primary recipient of this work will be DFID, with the beneficiaries being GSMA, governments, international agencies, foundations, MNOs and other private companies and civil society involved in policies and programmes in nutrition and agriculture that are aimed at improving nutritional, health and agricultural outcomes. The findings of this impact evaluation are intended as global public goods.

Scope and timeline

The scope of this work is to:

- Develop a research protocol for the external evaluation of mNutrition;
- Design and undertake an external evaluation of mNutrition in two countries: Ghana and Tanzania;
- Contribute to the communication of the learning agenda, evaluation strategy and evaluation results.

The evaluation will be in two of the 14 mNutrition target countries; Ghana and Tanzania. These countries have been selected based on the phased start-up of mNutrition programme activities. The focus and approach in the two respective countries will be different allowing for a comparison of the effectiveness of approaches applied. In Tanzania, mNutrition will focus on mobile phone technology based nutrition and health services and registration and identification of target population. In Ghana, the mobile phone technology will focus on nutrition and agriculture sensitive services.

In terms of coverage in number of people being targeted for these services, in total 3 million people will be reached through mNutrition; including 2 million for nutrition sensitive agriculture advisory messages in 4 Asian and at least 2 African countries and about 1 million beneficiaries for mobile phone based nutrition services in 10 countries in SSA.

The evaluation contract period will be September 2014 to 31st December 2019. The development of the research protocol must be completed by month 4 for review and approval by DFID. Full details on tasks and deliverables are provided in sections below.

Statement on the design of the mNutrition evaluation

The evaluation design is expected to measure the impact, cost-effectiveness and commercial viability of mNutrition, using a mixed methods evaluation design and drawing on evidence from two case study countries and the M&E system of the programme. Overall, the proposed design should ensure that the evidence from the two case study countries has high internal validity and addresses the priority evidence gaps identified in the Business Case. Being able to judge the generalisability/replicability of lessons learned from the programme is of equal importance and so a credible approach to generalization and external validity will be an important component of the overall evaluation design. The final evaluation design and methodology to generate robust evidence will be discussed in detail with DFID and GSMA before implementation.

For assessing cost-effectiveness, the Evaluator will further fine-tune their proposed evaluation approach and outline their expectations in terms of data they will require from implementers. A theory based evaluation design, using mixed methods for evaluating the impact has been proposed. During the inception phase, the Evaluator will put forward a robust evaluation design for the quantitative work, either an experimental or a quasi-experimental method, with a clear outline of the strengths and limitations of the proposed method relative to alternatives. During the inception phase, the Evaluator is also expected to identify clearly what will be the implications of the design for implementers in terms of how the overall programme would be designed and

implemented and for evidence to be collected in the programme's monitoring system. The Evaluator will also assess the degree to which it is realistic to assess impacts by early 2019 for a programme where implementation started mid 2015 and, if there are challenges, how these would be managed.

The Evaluator, in its 6 monthly reports, will be required to provide information to feed into the DFID Annual Review and Project Completion Report of mNutrition.

Gender and inclusiveness

The impact evaluation will pay particular attention to gender and other forms of social differentiation and poverty issues. From current experiences, it is clear that access to and use of mobile services is differentiated along a range of factors, including gender, poverty, geographic marginalisation, education and illiteracy levels. Therefore, the impact evaluation will look at and analyse differentiated access to and potential utilisation of mobile phone based services for improved nutrition and agricultural production. Based on the findings, it will identify opportunities and challenges in having an impact on women in general and more specifically the poor and the marginalised.

Tasks

The Evaluator will perform the following tasks:

A. Finalise a coherent and robust evaluation approach and methodology based on their proposal (inception phase)

- Conduct landscape analysis of existing experiences in mobile phone based services for nutrition and agriculture based on available publications and grey project documents to identify additional critical lessons and priorities for evidence gathering and programme design and implementation;
- Ensure that gender issues and poverty issues are well integrated into the impact evaluation design;
- Develop robust sampling frameworks, core set of indicators and research protocols that allow the consistent measurement and comparison of impacts across study countries, taking into account differences in business models and programmes as needed;
- Work closely with mNutrition programme team in GSMA to familiarise them with impact assessment methodology, discuss evaluation approaches, identify and agree on data provided by programme monitoring system and possible modifications to design;
- Identify risks to the evaluation meeting its objectives and how these risks will be effectively managed;
- Review existing evaluation questions and if deemed relevant propose refinement of existing questions and/or add other questions;
- Prepare a research protocol, including an updated workplan, project milestones and budget. The research protocol will be subject to an independent peer review organised by DFID; and
- Develop a communication plan.

B. Implement and analyse evaluations of impact, cost-effectiveness and commercial viability in accordance with established best practices

- Based upon the agreed evaluation framework, develop and test appropriate evaluation instruments which are likely to include data collection forms for households, community health workers, service providers including health and agricultural services, content providers and

private sector stakeholders including mobile network operators. Instruments will involve both quantitative and qualitative methods;

- Register studies on appropriate open access study registries and publish protocols of studies where appropriate;
- Conduct baselines and end-lines, qualitative assessments and business model assessments in both of the two impact evaluation countries;
- Conduct and analyse the evaluations and present findings in two well-structured reports addressing the evaluation questions. The reports should follow standard reporting guidelines as defined by, for example, the Equator Network. Primary findings should be clearly presented along with a detailed analysis of the underlying reasons why the desired outcomes were/were not achieved;
- The Evaluating Organisation or Consortium may sub-contract the administration of surveys and data entry, but not the supervision of those tasks, study design, or data analysis; and
- The country-specific mixed methods evaluation reports, cost effectiveness and business models studies and final evaluation report will be subject to an independent peer review organised by DFID.

C. Contribute to the communication of the learning agenda, impact evaluation strategy, and evaluation results.

- Develop a communication plan outlining the main outputs and key audiences;
- Conduct lessons learnt workshops in each of the 2 impact evaluation countries and key dissemination events; and
- Assist in communicating the results of the evaluation and contribute to the development and communication of lessons learnt about mobile phone based extension approaches in nutrition and agriculture.

Deliverables

The Evaluator will deliver the following outputs[21]**:**

During the design and study inception phase of maximum 4 months:

- A publishable landscape analysis report highlighting lessons learnt from existing initiatives on mobile phone based advisory services related to nutrition and agriculture by month 4;
- A updated work plan with project milestones and budget by end of month 1 (possibly adjusted based on the approved research protocol by month 4);
- A communication plan outlining the key outputs, audience and timeline for review and approval by month 4; and
- A full research protocol by month 4 for review and approval. The research protocol should be registered with appropriate open access study registries;

Interim reports:

- 4 biannual progress reports for the External Evaluation as a whole, and for each country evaluation, against milestones set out in the workplan;
  - Two desk reviews submitted by June 2016
  - Two Baseline quantitative reports submitted by April 2017

[21] Exact timeframe of deliverables will be agreed on during the design phase as appropriate.

  - Two Baseline qualitative reports submitted by February 2017
  - Two Cost-effectiveness reports 1 submitted by March 2017
  - Two Business Model reports 1 submitted by March 2017
  - Two Mixed Methods Baseline reports completed by September 2017
  - Two Midline qualitative reports submitted by March 2018
- All survey data collected during the evaluation provided in a suitable format to DFID for public release.

At project's end:

- Two Endline quantitative reports submitted by June 2019
- Two Endline qualitative reports submitted by August 2019
- Two Cost-effectiveness report 2 submitted by July 2019
- Two Business Model report 2 submitted by July 2019
- Two Evaluation reports submitted by October 2019
- At least 1 article, based on the findings from the country evaluation reports, published in a research journal;
- A shared lesson learnt paper published and at least one presentation highlighting key lessons for similar initiatives of promoting mobile based technologies for providing extension services and the promotion of uptake of technologies by December 2019.

Research protocol and all final reports will be independently peer reviewed. This will be organised by DFID. Outputs are expected to be of sufficiently quality so that a synthesis of findings can be published in a leading peer-reviewed journal.

Coordination and reporting requirements

A mNutrition Advisory Group (AG) will be established for the programme which will a) provide technical oversight and b) maximise the effectiveness of the programme. The Advisory Group will meet on a bi-annual basis and comprises of representatives of DFID, NORAD and GSMA representatives and independent technical experts. The Evaluator will be managed by DFID on behalf of the mNutrition Advisory Group. The Evaluator will work closely with the mNutrition programme team in GSMA and its specific country implementing partners. The Evaluator will:

- Ensure coherence and lesson learning across all pilot impact assessments on the key evaluation questions and indicators identified.
- Incorporate a clear code of ethics; incorporate plans for open access publications and public access to data sets.

The Evaluator will work closely with the mNutrition project management team, in particular in the design of the overall evaluation framework and the evaluation plan for the specific project components and the countries selected for the evaluation. Collaboration and regular communication between Evaluator and mNutrition project management team and implementing partners in selected case study countries is crucial as the evaluation design may have implications for project implementation and vice versa. The mNutrition project management team will lend support in communication as requested by the Evaluator or the Advisory Group. The Evaluator will report directly to DFID who will manage the evaluation on behalf of the mNutrition Advisory Group. The main point of contact for technical matters is Louise Horner, Livelihoods Adviser and Hugh McGhie, Deputy Programme Manager for all other project related issues. The mNutrition Advisory

Group will be the arbiter of any disputes between the evaluation function and the overall programme implementation.

At the end of each 6 months, the Evaluator will submit a brief report outlining key achievements against the agreed deliverables. Pre-agreed funding will then be released provided that deliverables have been achieved.

In addition to the 6 monthly reports outlined above, the Evaluator will provide information to feed into the DFID Annual Review of mNutrition. The 6 monthly reports will be a key source of information used to undertake the Annual Review and Project Completion Report for the programme. These reviews will be led by the Livelihoods Adviser and Deputy Programme Manager, in consultation with the mNutrition AG. All reviews will be made available publicly in line with HMG Transparency and Accountability Requirements.

Mandatory financial reports include an annual forecast of expenditure (the budget) disaggregated monthly in accordance with DFID's financial year April to March. This should be updated at least every quarter and any significant deviations from the forecast notified to DFID immediately. In addition the Evaluator will be required to provide annual audited statements for the duration of the contract.

Contractual Arrangements

The contract starts in September 2014 and will run till end of December 2019 subject to satisfactory performance as determined through DFID's Annual Review process. Progression is subject to the outcome of this review, strong performance and agreement to any revised work plans or budgets (if revisions are deemed appropriate).

A formal break clause in the contract is included at the end of the inception period. Progression to the implementation phase will be dependent on strong performance by the Evaluator during the inception period and delivery of all inception outputs, including a revised proposal for implementation period. Costs for implementation are expected to remain in line with what has been agreed upon for this contract, with costs such as fee rates fixed for contract duration. DFID reserves the right to terminate the contract after the inception phase if it cannot reach agreement on the activities, staffing, budget and timelines for the implementation phase.

DFID reserves the right to scale back or discontinue this assignment at any point (in line with our Terms and Conditions) if it is not achieving the results anticipated. The Evaluator will be remunerated on a milestone payment basis. DFID has agreed an output based payment plan for this contract, where payment will be explicitly linked to the Evaluator's performance and effective delivery of programme outputs as set out in the ToR and approved workplan. The payment plan for the implementation phase will be finalised during the inception period.

Open Access

The Evaluator will comply with DFID's Enhanced and Open Access Policy. Where appropriate the costs of complying with out open access policy should be clearly identified within your commercial proposal.

Branding

The public has an expectation and right to know what is funded with public money. It is expected that all research outputs will acknowledge DFID support in a way that is clear, explicit and which fully complies with DFID Branding Guidance. This will include ensuring that all publications

acknowledge DFID's support. If press releases on work which arises wholly or mainly from the project are planned this should be in collaboration with DFID's Communications Department.

Duty of Care

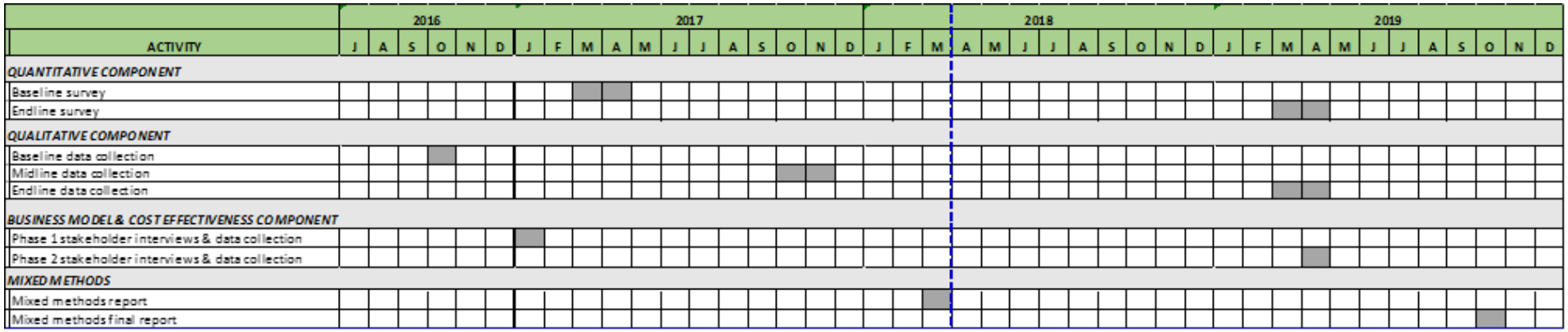
The Evaluator is responsible for the safety and well-being of their Personnel (as defined in Section 2 of the Contract) and Third Parties affected by their activities under this contract, including appropriate security arrangements. The Evaluator is responsible for the provision of suitable security arrangements for their domestic and business property. DFID will share available information with the Evaluator on security status and developments in-country where appropriate.

The Evaluator is responsible for ensuring appropriate safety and security briefings for all of their Personnel working under this contract and ensuring that their Personnel register and receive briefing as outlined above. Travel advice is also available on the FCO website and the Evaluator must ensure they (and their Personnel) are up to date with the latest position.

The Evaluator has confirmed that:

- The Evaluator fully accepts responsibility for Security and Duty of Care.
- The Evaluator understands the potential risks and have the knowledge and experience to develop an effective risk plan.
- The Evaluator has the capability to manage their Duty of Care responsibilities throughout the life of the contract.

Annex C Timeline of the evaluation



Annex D Description of the participatory ranking exercise

Participatory matrix ranking (PMR)

This exercise is part of the FGDs with farmers who are part of the VFC treatment group.

Questions to be answered through the exercise:

What do you like the most about VFC and why?

What do you like least about the service and why?

Ask about likes and dislikes separately by following the steps below twice – first for likes, then for dislikes.

Requirements

1) A moderator/facilitator and a note taker
2) Paper cards and thick pen (so that writing/drawing is visible)
3) Stones/nuts/locally available material to score

Purpose: the ranking method will be used to determine what features of the VFC service farmers like most, to record their relative preference and what are the reasons for preferring one feature over the other. Through ranking, we can compare features across multiple criteria. The participatory matrix ranking exercise will consist of three steps.

Step 1: Collection of likes/dislikes on cards

Write up the likes/dislikes that the group mentioned on the cards, and place them in front of them in a random order. The facilitator can also draw them, use symbols or use objects that may represent the likes/dislikes. Using pictures or objects is suggested to be a more effective method for participants who have difficulties in reading or writing. If possible encourage the farmers to write/draw the likes/dislikes themselves (this way they are more likely to associate with each card).

Step 2: Ask farmers to score/rank the different likes/dislikes

Give each farmer a fixed number of small objects (e.g. stones, tooth picks) depending on the number of features they have identified (e.g. eight stones if eight features were identified and ranked by the group). Then ask the farmers to distribute the small objects according to what features they personally liked most (i.e. score each feature). They can give all objects to one feature if they prefer this feature, distribute across two or more features, or not distribute any if they don't like any of the features.

Each time a farmer/s places objects on a particular feature ask for their reasons for that score. Ask:

- Why do you give this feature X objects?

The note taker has to record all the discussions continuously.

Example of what matrix could look like in the end:

Feature	Score
Can listen to/read messages in private on my phone	IIIIIIIIIIIII
Access to call centre expert for advice	II
Free of charge calls to other farmers	IIIIIIIII
Etc.	

Step 3: Final discussion

Once the scores have been given, the facilitator should encourage the group to discuss the results, ask if they agree or disagree with the final result and note any agreements or disagreements for these results. Finally, participants should be asked to make suggestions and recommendations to improve the features of the VFC service.

Please take notes throughout the discussion and take photos of the result or record the scoring matrix in your transcripts for the IDS team's analysis.

Annex E Midline topic guides

E.1 Topic guide for in-depth interview with VFC subscribers (who still engage with the service, who used to engage, or who have never engaged)

Purpose

- Likes/dislikes about the Vodafone Farmers' Club bundle (recorded voice messages, SMS weather, SMS market, call centre, free calls)
- Barriers and facilitators to the uptake of VFC services and in particular the recorded voice messages (e.g. technical, individual, household-level perspective)
- Barriers to/facilitators of the translation of the recorded voice messages into practice (e.g. intra/interpersonal; community factors)

Sample: smallholder farmers who are subscribed to VFC (selection will be done by IDS based on quant data)

Location: household

Time for the interview: approximately 60–75 minutes

Instructions

Thank the farmer for taking part in the study and explain that you are part of a research team.

Explain that her/his household has signed up for Vodafone Farmers' Club approximately one year ago. You are here to learn more about what they think about Vodafone Farmers' Club. Say that you are not working for Vodafone but for a research organisation.

Explain that everything they say will be treated as confidential, will not be shared with other people in their village or household and that you will not use their real names. Explain to them that their participation is voluntary, and they can stop anytime and withdraw their data at any time.

Tell them that the discussion will take around 60–75 minutes and that you (and other note taker) would like to take notes and audio-record (so that you do not miss any information). Check that this is okay with them. Ask whether they have any questions.

Name (just first name, so you can use their name during the interview)	**ID number from VFC subscriber list**	**When (approx.) did s/he receive the first VFC recorded voice message (month/year)**	**Does s/he get the recorded voice messages & SMS on her /his own phone/somebody else's phone (specify)?**
Primary source of income of household (get specifics e.g. ground nut farming)	**Date of the interview**	**Village**	

Serial no.	**Questions**	**Prompts**
	1. Perceived value of Vodafone Farmers' Club *Say that you now would like to speak a little about the Vodafone Farmers' Club service.*	
1.	**Why did you/your household agree to sign up for the Vodafone Farmers' Club last year?**	• What did you expect from the service? • Who made the decision to sign up? • Were you influenced by a relative or neighbour or someone else to sign up?
2.	**How did you find the process of activating your Vodafone Farmers' Club subscription?** *Once registered by the quant survey team, Farmers had to activate their SIM Cards by texting to VFC or by checking their balance.*	• Was it easy or hard? • When did you activate your subscription? • Why did you wait before activating the SIM card? • What happened after activation (e.g. when did you receive the first recorded voice message?)
3.	How do you usually get access to the Vodafone Farmers' Club services? (Please describe)	• Is it your own phone/somebody else's phone? • Do you only get access when you use Vodafone Farmers' Club SIM Card (how often do you use the SIM card)? • If the phone belongs to husband/relative and they tell you about the messages, tell us more about how often? Do you have to prompt them?)
4.	**Which services of Vodafone Farmers' Club do you use/have you used?**	• Yes/no • How often have you used this service?

	– Recorded voice messages with agri-tips and food tips – SMS with weather information – SMS with price information – Call centre to ask questions – Free calls to other VFC members	• Are you still using this service?
	If they say in question 4 that they listen to recorded voice messages, go to SECTION A of the topic guide (this includes farmers who listened only in the past and farmers who still listen) ***If they say they have never received/listened to a recorded voice message, go to SECTION B of the topic guide***	

SECTION A: Farmers who listen to/have listened to the recorded voice messages (at one point)		
Say you would now like to ask them a bit more about the recorded voice messages with agriculture and food tips that are part of the Vodafone Farmers' Club.		
5.	**Who in the household usually listens to the voice messages? Why?**	
6.	**What do you see on your screen when you get a voice message?**	
7.	**In your opinion, how useful and relevant are the recorded voice messages?**	• Messages were overall useful/not useful at all. Why? • What messages did you find particularly useful? For example, messages on: – the nutritional value of foods; – how to preserve and store foods; – good hygiene and safety; – home gardening; – crop harvesting, seeding, and weeding; – water management; or – land preparation. • Why? Can you give me an example of specific messages?
8.	**Follow-up question: why did you find the recorded voice messages useful/not useful?**	*Use the following probes to find out reasons for liking messages. You can also do this in reverse to explore why people don't like the messages.*

		• Novelty: You learned something new/you knew most of the information already (examples) • Did the messages remind you of things to do? Why (e.g. reminder)? • Relevant to personal situation: the information was relevant to your personal situation/was not relevant. Why/why not? • Perceived as feasible: you were able to follow the advice given. What barriers did you face when you tried to follow the advice (e.g. time; effort)?
9.	**In general, how well do you think the recorded voice messages address your specific needs related to farming and food practices? Do the messages provide the information you need/want?**	• Do you have any examples where messages were well adapted to farmer's needs (e.g. crop specific)? • Why were the messages well adapted (or not)?
10.	**What do you think about the quality of the information provided in the recorded voice messages? (perceptions about message quality)**	• Level of detail/depth of the information: do you think the messages provide enough detail? Why/why not? Is there too much detail? • Level of ease of understanding: do you always understand what the messages mean? Do they make sense to you? Is the message recorded in a language you are comfortable with?
11.	**Do you trust the information in the recorded voice messages? Why/why not?**	• Perceptions about the author/sender: who do they think is sending the messages (agri-extension services, government) and does this influence whether they believe them or not? • Do you ever think that these messages are like 'spam' (unwanted voice messages)? Why? • Perceptions about recorded voice messages as delivery channel: would you trust a different delivery channel more (e.g. radio; agri-extension worker)? Why?
12.	**What do you do with the Vodafone Farmers' Club recorded voice messages after you listen to them?**	• Keep them/some of them. Why? (e.g. to re-listen to them) • Share the messages with others. Who? Why? (e.g. listening together/forwarding the message to others) • Tell others about the information in the messages. Who? Why? • Do you seek more information from an agri-extension worker?
13.	**Can you tell me more about how you pick up the recorded voice messages?** **What do you see on the screen when you get a voice messages?**	• How many of the voice messages received do you listen to? • How do you decide whether to answer the call or not? • How often do you listen to the whole message? • What makes you listen to the end? • Do you prefer to listen to the call or listen later using the voicemail?
Say you would now like to ask them a bit more about the other Vodafone Farmers' Club services.		

14.	**How useful and relevant do you find the other services that are part of Vodafone Farmers' Club? Why?**	• SMS messages on weather or crop prices • Call centre (have you ever tried to use it? How was it?) • Free calls to other Vodafone Farmers' Club members • Can you tell me more? (Examples for each)
	2. Barriers to/enablers of uptake of Vodafone Farmers' Club	
15.	**Do you/your household often have problems with your phone which might prevent you getting Vodafone Farmers' Club services? Explain**	• Network coverage problems • No battery/charge • Use of different SIM cards and therefore miss messages • Phone is broken/stolen/lost • Phone is not with you at all times
16.	**How does your wife/husband and other family members/friends/work colleagues feel about Vodafone Farmers' Club?**	*Make sure you are distinguishing between responses from different people in the person's life (friends, husband, etc.)* • What was their reaction to you receiving Vodafone Farmers' Club services? How does their response influence you? (e.g. trust more/less) • Do you discuss the content of the voice and SMS messages with them? Why/why not? • Do you keep the messages and share message with them/show messages to them? Why/why not? • Have you ever quarrelled about the messages with them? If so, why?
17.	**Have you ever discussed the information in Vodafone Farmers' Club messages with an agriculture extension worker or any other worker? Why?**	• Do you discuss these messages with them? • What did they say? Do they agree, reinforce or contradict the messages? • How does their response to Vodafone Farmers' Club influence you? (e.g. trust more/less)
3. Experience with/influence on behaviour change ***Say you would now like to ask them whether they have tried anything/have done anything differently because of Vodafone Farmers' Club voice services.*** *Instruction to the interviewer: you do not need to ask about all categories of messages in detail. Encourage the participant to tell you about what she tried to do differently and then ask detailed questions depending on the category of messages she chose.*		

18	**Based on the information that you get from Vodafone Farmers' Club recorded voice messages, the SMS messages, or the call centre, have you tried anything/done anything differently?**
	
	*Refer to earlier answers to make sure you are probing the right topics related to t*he nutritional value of foods; how to preserve and store foods; food hygiene and safety; home gardening; crop harvesting, seeding, and weeding; water management; etc.
		• Why did you decide to try the advice given? What motivated you? Was there anything that prompted you to change? (E.g. heard the information from different sources)?
		• What, if any, problems have you encountered when trying to do something differently?
		  ○ Belief in own abilities: how confident were you about it? How easy or difficult did you find it?
		  ○ Knowledge: did you feel the message provided enough information about the issue? Why not? What did you do? (e.g. ask others; access other information sources)
		  ○ Social influences: how did views/opinions/expectations of your husband/family/friends influence you? To what extent?
		  ○ Access to resources: in what way did your personal circumstances influence you (e.g. access to food or services; demands on your time; poverty)?

19	***Did you receive any support in trying to follow the advice in the messages?***	• What/who helped you to try something different and how long did you try it for? • What consequences of applying these changes have you experienced? Have there been any positive/negative or short-term/long-term consequences? • How long did you do things differently? Why did you carry on or stop? (maintenance of change)
4. Exploration of specific theories related to influence of the mobile phone on behaviour change (These questions aim to test theories and are therefore very leading)		
20	**Do you think the fact that the agri- and food information is sent via a mobile phone has an impact on the likelihood of you changing your behaviour compared to information you get from other sources (such as radio or an agri-extension worker)? Why or why not?**	• Does it influence your farming behaviour and practices in response to the information? (e.g. are you more likely to change your behaviour based on information you get via the mobile phone than via radio? Via agri-extension worker? Why/why not?) • Does it influence the type of food you eat and meals prepared?
21	**Do you feel that the fact that you can listen to the messages in private on your mobile phone has an impact on what you do with the information? Why or why not?**	*Here we are keen to find out whether private, personalised messages have more of an impact than public messages.* • Does it influence how you behave in response to the information? (e.g. are you more likely to change your behaviour based on information you get via the mobile phone than via radio/agri-extension worker, family, or friends? Why/why not?)
5. Current users vs previous users		

22.	**Do you still listen to Vodafone Farmers' Club recorded voice messages?** **If <u>yes</u>, Skip to question 6.**	
23	**If <u>no</u>, ask:** **When and why did you decide to stop listening to recorded voice messages?**	If you never listen to recorded voice messages? Why? • When did you stop (immediately, after some months)? • What are the reasons? (try to find out as much as possible): - content not relevant (when and how did they realise?) - did not expect recorded voice messages - calls at inconvenient times - lack of choice about the kind of information being sent - difficulties listening to Recorded voice messages (e.g. can't hear; don't know how to listen to recorded voice messages on mobile phone) - husband/wife/others did not want me to listen • I don't use the Vodafone Farmers' Club SIM card anymore. Why? • How could the recorded voice messages be improved? Is there anything that could be done to make you listen to the messages again? • Would you like to be able to respond to the recorded voice messages? • Additional/different information
	6. Ideas for improvement of mNutrition	
24.	**How could the Vodafone Farmers' Club service and in particular the recorded voice messages be improved?**	• Would you prefer a different format? Why? Which ones? (e.g. WhatsApp, in- person) • Would you like to be able to respond to the recorded voice messages? • Timing for when voice calls are received? • Additional/different information
25.	**Suppose the current Vodafone Farmers' Club service was available in future for a small fee - would you pay for this? If so, how much are you willing to pay per month for this service?**	
26.	**Has your attitude towards Vodafone changed since you joined VFC?**	Have you bought more Vodafone airtime since using VFC? Have you used other SIMs less since using VFC?

Thank you. Do you have any questions?

SECTION B: Farmers who never listened to a recorded voice message		
Serial No	**Questions**	**Prompts**
27.	**Why did you never listen to a recorded voice messages?**	• Never got one • Not interested
28.	**How useful and relevant do you find the other services that are part of Vodafone Farmers' Club? Why?** • **SMS with weather information** • **SMS with price information** • **Free calls to other farmers** **Call centre**	• Can you tell me more? Please give specific examples
29.	**Do you have any ideas of how services like Vodafone Farmers' Club could be improved and made more useful?**	• Can you tell me more?
2. Experience with/influence on behaviour change ***Say: you would now like to ask them whether they have tried anything/have done anything differently because of Vodafone Farmers' Club services.*** *Instruction to the interviewer: you do not need to ask about all categories of messages in detail. Encourage the participant to tell you about what she tried to do differently and then ask detailed questions depending on the category of messages she chose.*		

29	**Based on the information that you get from Vodafone Farmers' Club SMS messages or the call centre have you tried anything/done anything differently?**
	
	*Refer to earlier answers to make sure you are probing the right topics related to t*he nutritional value of foods; how to preserve and store foods;
	food hygiene and safety; home gardening; crop harvesting, seeding, and weeding; water management; etc.
		• Why did you decide to try the advice given? What motivated you? Was there anything that prompted you to change? (E.g. heard the information from different sources)?
		• What, if any, problems have you encountered when trying to do something differently?
		  ○ Belief in own abilities: how confident were you about it? How easy or difficult did you find it?
		  ○ Knowledge: did you feel the message provided enough information about the issue? Why not? What did you do? (e.g. ask others; access other information sources)
		  ○ Social influences: how did views/opinions/expectations of your husband/family/friends influence you? To what extent?

		○ Access to resources: in what way did your personal circumstances influence you (e.g. access to food or services; demands on your time; poverty)?
30	**Did you receive any support in trying to follow the advice in the messages?**	• What/who helped you to try something different and how long did you try it for? • What consequences of applying these changes have you experienced? Have there been any positive and negative, short-and long-term consequences? • How long did you do things differently? Why did you carry on or stop? (maintenance of change)
3. Exploration of specific theories related to influence of the mobile phone on behaviour change (These questions aim to test theories and are therefore very leading)		
31	**Do you think the fact that the agri- and food information is sent via a mobile phone has an impact on the likelihood of you changing your behaviour compared to information you get from other sources such as radio/agri-extension worker? Why or why not?**	• Does it influence your farming behaviour and practices in response to the information? (e.g. are you more likely to change your behaviour based on information you get via the mobile phone than via radio? Via agri-extension worker? Why/why not?) • Does it influence the type of food you eat and meals prepared?
32	**Do you feel that the fact that you can read the messages in private on your mobile phone has an impact on what you do with the information? Why or why not?**	*Here we are keen to find out whether private, personalised messages have more of an impact than public messages.* • Does it influence how you behave in response to the information? (e.g. are you more likely to change your behaviour based on information you get via the mobile phone than via radio/agri-extension worker, family, or friends? Why/why not?)

Thank you. Do you have any questions?

E.2 Topic guide for in-depth interview with village/community chief

Purpose

- Explore whether they have heard about the Vodafone Farmers' Club and their opinion about the service
- Understand contextual issues relating to agriculture and nutrition

Sample: village chief or another local key figure

Location: village chief's residence or any other place of his/her choice in the community

Time for the interview: approximately 45–60 minutes

Instructions

Say that the aim of the interview is to find out more about agriculture and nutrition in this village and whether s/he has heard about the Vodafone Farmers' Club that some households in this village have been receiving since last year.

Explain that everything they say will be treated as confidential and will not be shared with other people in their community or household, and that you won't use their real names. Explain to them that their participation is voluntary; they can stop anytime and withdraw their data at any time.

Tell them that the discussion will take around 45–60 minutes and that you (and another note taker) would like to take notes and audio-record (so that you do not miss on any information). Check that this is okay with them. Ask whether they have any questions.

Name (just first name, so you can use their name during the interview)	**Occupation**	**Village**	**Date of interview**

No	Questions	Prompts
	Warm-up questions	
	Have you always lived in this community? How long have you been the chief of this community? What are your responsibilities as the chief?	
	Agriculture and nutrition information *I would like to start by asking you about agriculture and nutrition in this area.*	
1	**What is the main livelihood source for people in this area? How do people in this area earn their income? What role does agriculture play?**	• Do both men and women work in agriculture in this area? • Do people consume the crops the cultivate?
2	**How do people in this village get information about agriculture?**	• Who/what sources provide it? Radio? TV? • What information is provided? • What/whose information do they trust most?
3	**How is the nutrition status of people in this village?**	• Ask whether undernutrition is a problem. Why/why not? • Do people eat a good diet? Why/why not?
4	**What are the most important causes for poor nutrition in this village?**	• Is access to nutritious and varied food a problem? Why? (e.g. availability; money to purchase) • Is time for food preparation and purchases a problem? • Is poor hygiene a problem? (e.g. area where children play is dirty; utensils children eat in are dirty; handwashing before eating and meal preparation is a problem)
5	**How do people in this village get information on how to eat well?**	• Health worker • What information is available?
	Awareness about Vodafone Farmers' Club	
6	***Ask: have you heard that some households in this community get voice and text messages about agriculture and food on their mobile phones since last year?*** <u>If they say yes, ask:</u> **What do you think about these messages?**	• Useful or not? Why? • Do people share the messages with her/him? • Are there discussions in the community about the service? What is discussed? • In his opinion, does s/he think people like the service? Why/why not?
7	<u>If they say no, ask:</u> **Would you find messages with agri- and food information for the households useful?**	

Thank you. Do you have any questions?

E.3 Topic guide for interview with agriculture extension worker or local agriculture expert

Purpose

- Explore whether they have heard about Vodafone Farmers' Club and their opinion about the service
- Explore whether there have been any conflicts as a result of the messages
- Understand the context of agriculture in the village

Sample: agriculture extension worker or other local agriculture expert (e.g. NGO; FBO; private sector)

Location: community or at a place chosen by the expert

Time for the interview: approximately 45–60 minutes

Instructions

Thank the respondent for taking part in the study. Say that the aim of the interview is to find out more about the agriculture situation in this village and whether she has heard about Vodafone Farmers' Club, a service that some households in this village have received on their mobile phone for the past year or so.

Explain that everything they say will be treated as confidential and will not be shared with other people in their community or household, and that you won't use their real names. Explain to them that their participation is voluntary, and they can stop anytime and withdraw their data at any time.

Tell them that the discussion will take around 45 minutes and that you (and another note taker) would like to take notes and audio-record (so that you do not miss on any information). Check that this is okay with them. Ask whether they have any questions.

Name (just first name, so you can use their name during the interview)	**Occupation**	**Village**	**Date of interview**

No	Questions	Prompts
	Warm-up questions	
	How long have you been an agriculture extension worker? Have you always worked in this area? Are you a farmer yourself?	
	Information about agriculture	
1	**What are the main challenges that farmers in this area face when growing crops?**	• Are there any challenges related to agricultural productivity (i.e. low yields; water access; soil fertility; plant disease; agricultural inputs)? • What does he/she recommend should be done?
2	**What do farmers usually do when they have a problem with farming?**	• Who do the ask? Whose advice do the trust? • What are the main problems farmers face when trying to address their farming problems?
3	**What kind of agriculture information is available to farmers in this community?**	• Information on how to improve agricultural methods; deal with plant diseases; how to store crops safely to maintain quality and prevent crop loss; information on what crops to grow for sale and/or consumption?
4	**Where do farmers usually go if they have a question and want information related to crop farming?**	• Who do they choose from each of the different sources of information? • Do farmers tend to go around and compare advice from different sources? • How much do farmers trust information from each of these sources? • How do farmers 'test' advice or information they get (FBOs; chats; demonstration visits; phoning friends/family; etc.)? Do they just accept advice from one source?
5	**What are the main challenges you face as an agriculture extension worker in this area?**	• Do you have difficulties in reaching all farmers in this area on a regular basis? • Do farmers usually follow the advice you give? Why/why not?
	Awareness about Vodafone Farmers' Club	
6	***Ask: have you heard that some households in this community get Voice and text messages about agriculture and food on their mobile phones since a year ago?*** If they say yes, ask:	• Useful or not? Why? • Do people share the messages with her/him? • Are there discussions in the community about the service? What is discussed?

	What do you think about these messages?	• In his opinion, does s/he think people like the service? Why/why not? • What do they think about the delivery channel of sending messages via voice? Is this a good format for busy farmers?
	If they say no, ask: **Would you find messages with agri- and food information for the households useful?**	• Why? • Would you promote them? Why? And How?

Thank you. Do you have any questions?

E.4 Topic guide for focus group discussion with VFC subscribers who listen to voice messages

Purpose

- Likes/dislikes about Vodafone Farmers' Club services (participatory ranking exercise)
- Perceptions about quantity and quality of the recorded voice message and other services

Sample: 2–3, with 5–6 VFC subscribers

Location: meeting place in rural community

Time for FGD: approximately 60–75 minutes

Instructions

Thank the focus group participants for taking part in the study and explain that you are part of a research team.

Say that the aim of the focus group discussion is to talk openly about their perceptions of the Vodafone Farmers' Club Service that they have been receiving for the past year or so. Tell them that you will be including a participatory exercise as part of the discussion to help the group to discuss and rank their main likes and dislikes about the service.

Explain that everything they say will be treated as confidential and will not be shared with other people in their village or household (beyond the focus group participants) and that you will not use their real names. Explain to them that their participation is voluntary, and they can stop anytime and withdraw their data at any time.

Tell them that the discussion will take around 60–90 minutes and that you (and another note taker) would like to take notes and audio-record (so that you do not miss on any information). Check that this is okay with them. Ask whether they have any questions.

					Date of FGD:		
	Name	**ID number from VFC subscriber list**	**Gender**	**Name of village**	**Mobile phone ownership (yes; no, but have regular access; no, and does not have access)**	**Main income source**	**Crops grown**
1							
2							
3							
4							
5							
6							
7							

No	**Questions**	**Prompts**
	Perceptions of Vodafone Farmers' Club	
1	***Say: they have signed up to Vodafone Farmers' Club last year, and we would like to find out what they think of the service.*** **(initial exploration; more in-depth in the ranking exercise)**	• Likes/dislikes • Explore the different services (recorded voice messages; SMS; call centre and free calls to other Vodafone Farmers' Club members)
2	**Say: you would like to speak about the regular recorded voice messages on agriculture and food that they received as part of the Vodafone Farmers' Club. You would like to**	• Frequency: What do you think about the frequency? (too much/too few) Why? What would be the right level of frequency for you?

	know what they think about the number of recorded voice messages they receive (frequency) and how good or bad they think the messages are (quality). **How often do you get recorded voice messages with agri- and food information? What do you think about the frequency (perceptions about message quantity)**	• Timing: When do you usually get the recorded voice messages? Morning/afternoon? Is this a good time? Why/why not? • Duplication: do you sometimes get the same messages more than once? How do you feel about it? (e.g. annoyed; like it as it reminds me)
3	**What do you think about the quality of the information provide in the Vodafone Farmers' Club recorded voice messages? (perceptions about message quality)**	• Quality perceived as poor: why? • Relevance of the content: Do the messages tell you things you wanted to know? Can you give me an example? • Level of detail/depth of the information: do you think the messages provide enough detail? Why/why not? • Level of ease of understanding: do you always understand what the messages mean? Does it make sense to you? Is the message recorded in a language you are comfortable with?
4	**How do you feel about getting agriculture and food information as a recorded voice message on your/a family member's mobile phone?**	• Like (e.g. privacy; don't have to go to health worker); dislike (e.g. cannot ask questions) • Do you welcome them or find them a disturbance? • Would you prefer to get the information in a different format (e.g. voice call, recorded SMS) Why? Would you prefer to get the information through or in combination with other information sources (radio, newspaper, personal contact)? Why or why not?
5	**Do you listen to all recorded voice messages with information on agriculture and food that you receive? Why? /Why not?**	• Lack of time • Lack of interest • Has there been a change in the likelihood that you listen all messages over time? (adherence over time) • Household member who owns the phone does not share all messages with you • Do you normally listen to the message in full or just partially? If no, why? Do you think about most messages or just quickly listen and forget? (level of engagement with content)
Participatory ranking exercise ***Instruction for the interviewer:* please see the separate instructions with the instructions on how to facilitate the participatory ranking exercise with the farmers.**		

6	**What do you like best about Farmers 'Club? What do you like least?**	• Ask about different service (recorded services: voice messages; SMS; call centre; free calls) • Ask in particular about the recorded voice messages and what the like/dislike about them
7	**How could the recorded voice messages be improved further? (ask about the content of the information and the delivery via recorded voice messages)**	• Would they prefer different format? Why? Which? (e.g. WhatsApp; in person) • Would they like the opportunity to engage in dialogue with the sender or discuss in another setting?
8	**Would you pay for such service in future? If so, how much are you willing to pay per month for this service?**	

Thank you.

E.5 Topic guide for focus group discussion with community members

Purpose

- Understand current nutrition practices in the community (e.g. child feeding, dietary intake of pregnant women)
- Explore whether they have heard about Vodafone Farmers' Club

Sample: community members (FGDs with mothers with young children; FGDs with elderly women)

Location: meeting place in rural community or place of participants' choice

Time for FGD: approximately 60 minutes

Instructions

Thank the respondent for taking part in the group discussion. Explain that you are a research team that is interested in learning about nutrition of households in this area. Say that you are particularly interested in learning how people in this community get information about nutrition.

Say: the information you give is very important for this study. This is not a test, and there are no right or wrong answers. The most important thing is that you should feel comfortable and contribute as much as you can. You can express opinions and discuss issues freely. All information you provide will be confidential and we will not use you real names. The information you provide will only be used for research purposes and nothing else. Do you have any questions or concerns? The discussion will take around 60–75 minutes and you (and another note taker) would like to take notes and audio-record, if this is OK with them.

Date of the interview:							
				Background information on participant:			
	Name	**Gender**			**Village**	**Occupation**	**Main crop of cultivation**
1							
2							
3							
4							
5							
6							

No	**Questions**	**Prompts**
		Information about nutrition
1	**In your opinion, what makes a healthy diet? Please explain why?**	• Are meat, dairy, legumes (e.g. beans), vegetables, and fruit important for a good diet? • Are the number of meals eaten per day important? • Is the amount of food available per meal important? • What do men/women/pregnant women eat? Are there any differences (e.g. foods men/women/children should eat for good health or should not eat?)
2	**Would you describe the diets of households in this area as healthy? Why/why not? What are typical barriers to a healthy diet in this area?**	• Are there barriers to access to food (e.g. access to markets; availability of (fresh) foods; money to buy food)? • Are there barriers to the preparation of food (e.g. lack of time/resources)?
3	**Where do people in this area usually go to get information about nutrition or how to eat well to stay healthy? What type of information is available?**	• Where do people get information on child feeding; information on food preparation; information about nutrition for pregnant women?
4	**How easy is it for people, in this area, to access information about nutrition? What do you think are possible barriers to access?**	

5	***Say: have you heard that some households in this community get Voice and text messages about agriculture and food on their mobile phones since a few months?*** **<u>If they say yes, ask:</u>** **What do you think about these messages?**	• Useful or not? Why? • Do people share the messages with her/him? • Are there discussions in the community about the service? What is discussed? • In his opinion, does s/he think people like the service? Why/why not?
6	**<u>If they say no, ask:</u>** **Would you find messages with agri- and food information for the households useful?**	• Why?

Thank you. Any questions?

Annex F Coding scheme for the analysis

Codes	Sub-codes	Description
Implementation process		
Registration process	Signing up Message sender number/Spam Problems with delivery or signing up	Process by which people signed up for the programme People not receiving messages
Hardware problems	Broken phone Changes in phone and SIM Credit Lost phone Multiple SIM cards Network Paying to have phone charged Solar	Impact of people changing phones and SIM cards Buying credit People losing phones Multiple SIM cards in one phone Issues with network quality Payments for phone charging at local shops People using solar panels for charging phones
Perceptions about mobile phone as delivery channel	Being able to reply to messages Delivery frequency and regularity Mobile channel negatives Mobile channel positives Literacy Recorded voice messages overall Timing of recorded message delivery Problems with recorded messages Never listen to recorded messages Listening to messages in full Misperception about charging for messages Call centre	Frequency and regularity of message delivery Overall negatives with the mobile channel Overall positives with the mobile channel People being able to read messages or having to have messages read to them if they could not read Reactions to recorded messages Reactions to call centre

Reaction to messages	Following message advice Keeping or deleting messages Message dislikes Message likes Not reading messages Reading in part or full Novelty Realistic Relevant to personal situation Reminder	Following the advice in the messages People keeping messages Overall what people disliked about the messages Overall what people liked about the messages People not reading messages Whether people read the whole message Message content was new information Message content realistic Message content relevant to personal situation Message was a reminder of knowledge they had been exposed to elsewhere
Message sharing	Sharing Thinking about messages later	Sharing messages Whether people thought about messages later on
Perceptions of the usefulness of the messages	Relevant to personal situation Reminder Reasons for why not useful Useful because through mobile phone Not useful as too many too remember Not useful no time to engage as occupied	Users perceptions of the usefulness and why
Ease of comprehending messages	Couple discuss message Message comprehension difficult Messages easy to understand and self-explanatory Misunderstanding content and no way to clarify it	Users perceptions of the ease of use
Factors that affect the trust in messages	Threats to trust Distrust because believe message comes from MNO Distrust as believe it is spam Trust because from health sector Trust because the heard the same from health worker Trust because written word Trust because they read text messages themselves and no translation error	Factors that affect users trust in the content of the messages

	Trust because timed well and provide guidance Suspicion as knowledge of stage of pregnancy Danger to trust and credibility not well timed Trust content personal contact	
Enablers/barriers to behaviour change		
Enabler of behaviour change	Community reaction if change Enabler to change positive Other supportive agriculture projects from various organisations	Various enablers of a change in behaviour in response to the messages
Pathways of behaviour change	Mechanism behaviour change barrier to sharing Mechanisms of change share with others Pathway to change – couple discuss	Detailed description of specific pathways of behaviour change