

Business Development Model for AgroTech
Grameen Foundation (GFUSA) and Farm Radio International (FRI)

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Executive Summary

Context

Ghana has low agriculture productivity and one of the reasons for it is the lack of required level of extension services for the farmers. In response to this need, GFUSA and FRI have developed different models for extension services. While GFUSA has developed a software application called 'SmartEx' for managing extension services delivered through on-the-field Agents, FRI has developed innovative methods of airing agriculture programs over radio and to make them interactive using mobile phones.

The two institutions - GFUSA and FRI, are now looking to develop a Business case for an innovative integrated extension services model that can complement the Field Agent intermediation with the power of direct-to-home radio programming of FRI. This report presents the Business model for this integrated 'AgroTech extension services' model. The report is based on the study commissioned by GFUSA and conducted by M2i Consulting, a management consulting based in India. This report also refers to an earlier study commissioned by Farm Radio International and done by Urika Research, Ghana in September 2016, called 'Agriculture Radio Programming for Northern Ghana: Planning viability for a market oriented approach'.

Methodology for the study

The methodology used by the consultant for the study, involved secondary research followed by a primary research in Ghana. The primary research included FGDs and questionnaire-based survey with over 100 farmers in two regions - Volta and Brong Ahafo. In addition to the farmers, the consultant interviewed 10 Outgrower Business Owners (OBs), 7 financial institutions of different legal forms, farmer federations, market associations, agri-input dealers, a processing unit and 2 potential business entities that can take up AgroTech as a business vertical in the future.

Findings

Need for services

The field research carried out under the study showed high need for extension services.

- Farmers reported that current level of access to information on farming is not adequate. The main source of technical support for farmers are MoFA TOs and radio programs. MoFA TOs are grossly understaffed.
- Farmers reported of lack of knowledge on modern farming techniques and prevalence of outdated farming methods.
- Farmers reported lack of information on land preparation, on seeds, fertilizers, harvesting storing etc.
- Farmers reported of very low farm productivity and high level of dissatisfaction with current level of yields and quality of produce.
- Farmers lacked support mechanism or lack of access to advice during any exigency.

- Farmers reported lack of information on weather and markets and high dependence on a few sources, making them vulnerable to exploitation.

In addition to extension services, farmers also mentioned need of other support services such as:

- Access to finance
- Access to market information
- Knowledge on simple account-keeping to ascertain costs, revenues and profits
- Farmers need agriculture implements, machines and transportation facilities

Thus, need for extension services and more importantly overall support services was clearly evident from the study. This makes the case for an agriculture advisory and support services.

Willingness to pay

While there is a demand for agriculture advisory and support services, it is alone is not a sufficient condition for a business case unless there is a sustainable revenue model. Thus, the study explored willingness of farmers to pay for such services.

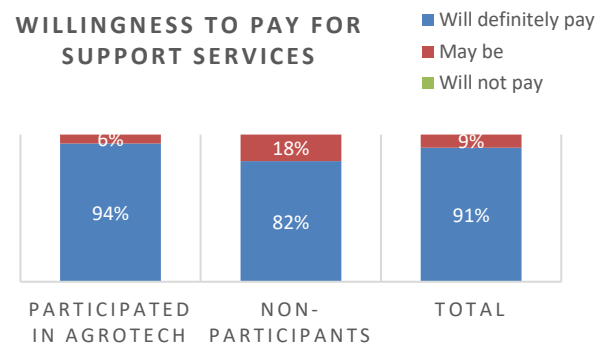
The farmers overwhelmingly showed willingness to pay for high quality support services. Farmers mentioned of needing not just technical advice but a range of support services.

In the research, 91% of the farmers showed definite willingness to pay for such services. These findings are consistent with the ARP viability research of FRI, where almost 62% farmers showed willingness to pay even for agriculture radio programs.

Capacity to pay

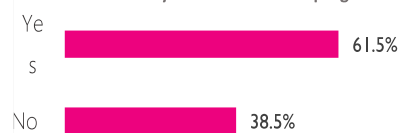
The capacity to pay was estimated by understanding the current cost of production of some common crops and how much additional cost farmers could pay, if advisory resulted in greater productivity. This was also then seen with the overall income levels and landholdings of the farmers. The findings showed that for main crops like maize and rice, the margins that farmers had could sustain the fee for AgroTech services that farmers were willing to pay.

WILLINGNESS TO PAY FOR SUPPORT SERVICES



No respondent completely refused to pay; 'Will not pay' is 0%.

Farmers' willingness to pay a small fee deducted from their phone credit to support radio program each time they call into the radio program



Source: ARP Viability study

Business model

While designing the business model, the following key considerations were taken in to account:

- Farmers need a larger package of services than just extension services
- Farmers willingness and capacity to pay
- Mechanism for ensuring quality standards
- Mechanism for ensuring development and upgradation of technical extension material
- Mechanism for upgrading SmartEx with changing market needs
- Cost for delivering services
- Creating conditions so that business model is acceptable to farmers and the likelihood of actual payment for services enhanced

Based on these key considerations, a two-tier model is proposed. Under this model, there will be a top-level umbrella body called ‘AgroTech Farm Advisory Services’ (AFAS) to be jointly managed by GFUSA and FRI. Under AFAS will be the independent service delivery channels. AFAS will be responsible for managing and expanding AgroTech, updating SmartEx and advertising through Farm Radio. Later, if the AgroTech model scales up, GFUSA and FRI may consider to separate it into an independent entity.

Three distinct types of service delivery channels have been proposed: a.) Freelance Individual agents (called CAS) b.) Out grower Businesses, engaging CAS as their staff and c.) Institutions, who will also engage CAS as staff and have organized structure. AFAS, will not be the entity delivering services or doing actual business but only a support institution or an association.

The key functions of these institutions will be as below.

Tier 1 – Umbrella body: AFAS

Purpose

To create favorable environment for efficient delivery of high quality farm advisory and support services through a financially viable model (*not just extension services*)

Legal form: Not-for-profit

Key activities

- Promoting AgroTech brand and support expansion of the AgroTech services
- Register and train service delivery channels
- Create standards and fair practice codes for channels
- Support delivery channels (call-centre support, WhatsApp group etc.)
- Provide advertising and information dissemination platform of Farm Radio.
- Collect feedback, improve services and upgrade AgroTech SmartEx app
- Develop creative programs and interactive advisory models through Farm Radio
- Providing advertisement services on Farm Radio for AgroTech clients as part of advisory package
- Liaise with Govt., experts and other stakeholders
- Create new technical material on Agronomics
- Conduct training of trainers (existing channels can act as trainers)
- Promote best practices, learning sharing, publications; giving awards to channel partners
- Data management services – aggregate data from channels, provide aggregated data to industry on fee basis, data to be provided within the defined client protection and data security standards and under proper agreements; data use for research and also for government purposes
- Advertisement services on fee basis for various stakeholders – FBOs, Outgrowers, agri-input companies, agriculture service provider businesses

Revenue sources

- Fee charged to partner channels on per farmer basis or on membership basis
- Fee from data services – to be paid by agri-input companies, consultants, government or research agencies
- Fee from radio adverts and campaigns
- Sponsorships for events

Tier 2 – Delivery channels: Individual CAS, OBs and Institutions

Purpose

To provide extension and other farmer support services

Legal form: Individual, registered entities or for-profit-companies

Key activities

- Register and provide extension services to farmers using SmartEx app.
 - Understand and respond to local farmer issues and provide range of support services to farmers
 - Leverage various information sources (MoFA TOs, Farm Radio, local fertilizer distributors, AFAS, other farm mobile applications) and support farmers
 - Facilitate cross-learning among registered farmers
 - On behalf of registered farmers, respond to emergencies like pests or any break-out of disease; raise issue with AFAS, Farm Radio, WhatsApp group, MoFA TOs, fertilizers distributors etc.
 - Try and discover resources such as tractor service providers, tool and implement
-

providers. Invite them to meet registered farmers

- Arrange financial services
 - Provide data services, market intelligence, financial education and other agent services to financial institutions, agri-input dealers, distributors, companies etc.
-

Revenue sources

- Fee charged to farmers
 - Fee charged to other clients for data and other services– financial institutions, agri-input dealers
-

Some key recommendation for enhancing likelihood of success of the business model are:

- Engage local youth as CAS; involve farmers in selection of CAS and determining fee keeping in mind the viability
- Train CAS intensively on range of aspects (technical, soft-skills, networking etc.) and provide reference material
- Create standards for quality control and monitor performance (eligibility criteria for becoming service delivery channel, minimum service delivery quality standards and code of conduct in dealing with farmers)
- Provide services through existing community groups, farmer federations groups or organize people into new groups (where there are none) while delivering services. This is to create cost-effectiveness and peer pressure to avoid defaults on payments
- Partner with other institutions such as MoFA, Farm Radio, Advance project, other ICT platforms etc. and create synergies

Financial viability

Financial modeling was done for each of the delivery channels with conservative assumptions. The models suggest that with a fee charged in the range of GHC15-20 per acre to a farmer for a season, the business has the potential to turn viable. The fee assumptions in the projections have been assumed maximum at GHC20 per acre per season, which is well below the willingness to pay expressed by farmers. Further, average landholding has been assumed at 3 acres, which is again conservative. But financial modeling shows that managing cash flows will be critical in this business, as payments will only come at the end of the crop cycles, while expenses will be spread across the year.

Financial viability pilot

This report recommends that GFUSA and FRI must undertake a financial viability pilot. The key aspects to be tested in this pilot would be:

- Financial viability and generation of revenue through payment by farmers
- Roles of FRI and GFUSA under the integrated model
- Revenue sharing mechanism between FRI and GFUSA for services provided
- Upgrading SmartEx for service and data needs of other stakeholders – banks, agri-input companies, agri-service providers etc.
- Upgrading SmartEx for integrating Farm Radio services and programs on the application

- Pitching AgroTech to other actors in the value chain (financial institutions, agri-businesses etc.) and their willingness to pay for services
- Engagement of new delivery channels (in addition to CAS and OBs) in delivering AgroTech services such as business institutions
- Testing of synergy created through working in partnership with other institutions such MoFA, Advance project (ACDI-VOCA) and other ICT platforms

The report presents the key steps and activities that should be undertaken in this proposed financial viability pilot.

Abbreviations

AIS	'Achieving Impact at Scale through ICT-Enabled Extension Services': <i>Project funded by CIFSRF</i>
CAS	Community AgroTech Specialist: <i>This is the proposed term to be used for 'Agents' under the business model recommended in the report. CAS will provide advisory services to farmers for fee.</i>
FBOs	Farmer Based Organization
FRI	Farm Radio International
FGD	Focus Group Discussion
GFC	Cedis (Ghanian currency): 1 US\$ = 4.5 Cedis
GFUSA	Grameen Foundation, USA
ICT	Information and communications technology
M2i	M2i Consulting: <i>Consultant for the assignment</i>
MoFA	Ministry of Food and Agriculture
OB	Outgrower Business Owners: <i>They provide agriculture inputs on credit to farmers during sowing season and generally buy the final produce from farmers</i>
SHF	Small-Holder farmers
TO	Technical Officer (of MoFA): <i>These are extension officers of MoFA that work with the community</i>
WTP	Willingness to pay

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1 AgroTech Model

Low agricultural productivity in Ghana is cited as one of the key reasons for the decline in agriculture in Ghana. One of the many reasons for low agriculture productivity is the lack of required level of extension services to the farmers. Agriculture extension services in Ghana are primarily led by the Ministry of Food and Agriculture (MoFA). Several constraints have been identified in the current extension services.

In response to this challenge, GFUSA and Farm Radio International (FRI), have been attempting to provide extension services through two different, yet innovative methods. GFUSA uses an '**Intermediated method**' wherein trained 'Field Agents' supported by an ICT platform work directly with farmers to provide them extension and support services. On the other hand, FRI uses '**Direct to Farmer**' method using interactive radio programming to provide extension services.

GFUSA and FRI have realized that these two different methods have elements of complementarity, creating synergy and thus reinforcing learning among the farmers resulting in behavior change. The two methods integrated into one have the potential in not just improving the technical knowledge of farmers but also in helping them with the much-needed farm inputs.

While technical knowledge is a necessary condition for improving farm productivity, it is alone not a sufficient condition for successful farming. Farmers also require various farm inputs and services such as seeds, fertilizers, tools, implements, market information, weather information, finance etc. The GFUSA and FRI integrated approach has the potential to mobilize these inputs and services and make them available for farmers, thus significantly improving the chances of enhancing farm yields and in turn increasing farmer incomes.

In this backdrop, The Canadian International Food Security Research Fund (CIFSRF) has provided funding to Grameen Foundation and Farm Radio International to reach 300,000 farmers with extension information and to support 60,000 of them to adopt the use of improved inputs and agronomic practices through the "**Achieving Impact at Scale Through ICT-enabled Extension Services in Ghana (AIS)**" project. The project implementation period is twenty-four months starting November 2015.

A critical step forward for this integrated approach is to build a Business Model for it to make the initiative financially sustainable and to be able to scale up. This can be achieved if the business model is commercially viable, stakeholders have willingness to pay for services and if AgroTech can engage other private sector players. Towards this end, this report explores the Business Model for this integrated approach called '**AgroTech**' extension services.

Before we delve further into the integrated business model, we first separately understand the extension services' model of Grameen Foundation and FRI.

1.1 ICT based farmer extension services model of GFUSA

GFUSA has created an ICT-based agricultural extension service platform called 'SmartEx'. This is an application that is used by field agents who provide customized extension service to farmers. Since there is an intermediation by field Agents here, who interact with farmers, this is also called the 'Intermediate model'. These Agents can be staff of an Outgrower Business, Nucleus Farmer or any other business entity who may have engaged them.

The services delivered through AgroTech SmartEx include:

- Managing smallholder outgrowers/producers to produce efficiently on behalf of nucleus farmers, large buyers and processors by providing customized technical and operation information, mentoring and coaching
- Managing smallholder credit on behalf of agribusiness service providers (nucleus farmers, aggregators, buyers, processors, input dealers, tractor ploughing, post-harvest threshing and warehousing) and financial service provider through coaching, effective monitoring and credit recovery.
- Sale outlet/franchise for tailored financial and risk-mitigating products such as savings and insurance

The key features of the software application, AgroTech SmartEx are:

- **Farmer discovery and enrolment:** This enables the Agent to register a farmer, and document previous farm practices and credit activities prior to farmer joining the AgroTech SmartEx Coaching Scheme.
- **Farmer Management:** provides a protocol of programed visits or Agent routine tied to key crop growth stages or farm operations, to deliver appropriately timed support (advice and/or demonstration) to the farmer. Agent records input and output information of all activities and aggregates are provided to relevant value chain actors through a dashboard.
- **Value Chain Linkages:** This feature provides the agent access to a range of agribusiness service providers value chain service providers (nucleus farmers, aggregators, buyers, processors, input dealers, tractor ploughing, post-harvest threshing and warehousing) and financial service providers).
- **Access to information and Knowledge Content depository:** This is a collection of information and knowledge on crop production, processing and marketing. Currently five (5) food crops are covered, namely Maize, rice, soya bean, cassava and yam. Content of other food crops such as groundnut and cowpea, as well as tree crops and vegetables will be deployed soon.
- **Monitoring, Evaluation and Learning:** Data collected by the mobile application through agent interactions are stored and analyzed by remote servers. The analyzed

data, accessed by the mobile application, helps the agent to understand the background of the farmer, his/her learning needs and requirements and track performance. The activities of the agent are also tracked and the data is available to supervisors via a dashboard.

The Field Agent is the representative of the Farm Business (Nucleus farm, Outgrower Business, Processor, Aggregator etc.) in the communities. Some of the key things that Field Agent have to ensure are:

- Farmers receive and understand information on the operations and relationship between the farmers and the organization
- Distribute any inputs and farm resources meant for farmers in a timely manner
- Provide information required for efficient utilization of the input resources provided
- Support farmers to manage their natural resource base in a sustainable manner
- Support the farmers to apply diligence and rigor to their farm operations that will ensure achievement of the expected results
- Retrieve all credit and other resources owed by farmers in a timely manner
- Support farmers and their household to efficiently manage their finances in order to improve standard of living.

Field Agent has to also conduct coaching sessions in Group Meetings as well as through Individual Visits. Individual Visits are for sessions that involve discussion of personal information and issues (such as registration, profiling etc.) that the farmer may not want others to know about.

Group Meetings are suitable for Coaching Sessions during which other farmers' experiences and queries of general nature can be shared and are useful for the entire group.

The coaching sessions make use of multi-media, voice messages, videos on tablets, videos projected using Pico projectors. The sessions are designed for pre-sowing season, in-season and post-harvest season.

Value proposition

The key value proposition of this model are:

- Farmers get customized advisory and not just generic knowledge
- The model provides for the opportunities to farmers to have direct interaction and personalized discussions around their farm issues with the Field Agent
- Meetings of farmers in a group help in sharing experiences and building common interest groups. These groups further get engaged in aggregating benefits such as joint procurement, sharing agriculture services, bulk selling etc.
- Field Agents not just impart technical knowledge but also help in linking them to agriculture input service providers, suppliers, markets etc.
- The SmartEx application helps in tracking farm performance objectively and to compare pre and post support farm performance. This helps in tracking

productivity, price realizations, effectiveness of advisory and change in economic status of farmers.

- The digitization of all the farm related information of farmers provides opportunity for leveraging this data. This can help in attracting buyers, in getting access to credit from suppliers, getting access to finance from banks etc.
- In a scaled-up form, the ICT platform will have large database on farming practices, yields, yield trends, sales figures, fertilizer usage, seed usage, chemical usage etc. This data can be aggregated for Farmer Groups, Villages and regions. The data can also be disaggregated up to individual farmer level thus making it extremely useful for agriculture input companies, government, banks, researchers etc. This provides the opportunity for model to be established and scaled on commercial lines with several potential sources of revenues that may interested.
- The model provides opportunities for local youth to act as Agents and thus creating livelihood.

1.2 Direct to farmer model of Farm Radio International

Farm Radio International (FRI) uses another successful model of leveraging the reach of radio for extension services. Radio is accessible to an estimated 87% of males and 75% of females in Ghana to provide interactive programming to small-holder farmers (SHFs). The messaging teaches SHFs how to increase and diversify food production, improve land-use management, and reduce post-harvest losses. FRI leverages the existing agricultural ecosystem in Ghana, for example by hosting MOFA agents as guests on its radio programs so they can extend their messaging significantly beyond individual or group interactions.

FRI also complements existing agricultural extension networks with timely educational campaigns that improve livelihoods and household wellbeing for hundreds of thousands of Ghanaians, such as quality standards required for selling crop surpluses to the World Food Program, essential climate change adaptation information for SHFs in the country's arid north, and reducing vitamin A deficiency by promoting the production and consumption of orange-fleshed sweet potatoes to pregnant women and new mothers. While the channel can reach vast audiences at extremely low cost, it is most valuable for reaching older farmers that are less likely to use phones to send or receive information, as well as women who are less likely to own or have access to a phone.

Radio – FRI's radio programming broadcasts expand access to extension content into the homes of listeners and into communities via the creation of listening groups, which have the added benefit of bringing radio to farmers who do not have radio access in their homes. Broadcasts are reach SHFs with entertaining, educational radio programs. Embedded in that context, radio hosts raise awareness of the benefits of technologies for the targeted value chains and provide information on their use. Radio hosts are joined by agronomists from MOFA or research institutions, to complement educational content with live Q&A call-in segments, where experts emphasize the value and ease of technology adoption or provide troubleshooting. This interactive, farmer-centered programming reinforce intermediated extension services and the short, technical messages delivered via SMS/IVR

campaigns to service rural, hard-to-reach farmers unable to access information through other channels. Content increase listeners' knowledge, change their attitudes, and encourage educated decision-making on adoption of improved farming practices.

Interactive radio campaigns – this leverages existing radio assets within target communities and agricultural eco-systems in Ghana to develop and deliver entertaining and educational radio programs. Campaigns aim to raise awareness about, increase knowledge and promote adoption of SSTP technologies among smallholder farmers by allowing farmers to share practices, results, and feedback directly with other farmers. Campaigns use one or more of the following formats to inform, engage, collect feedback and respond to farmers' questions about new technologies: General and Crop focused Participatory Radio Campaigns; Radio dramas; Radio market place.

Direct-to-farmer channels include radio and SMS/IVR and are used to deliver content to a much wider audience than human networks could ever cost-effectively reach. Marketing campaigns direct listeners to local, trusted input distribution centers or advertise opportunities to engage with intermediated service events in the area. Radio also enables multi-format educational programming and, when combined with other channels, it creates extremely interactive experiences by inviting listeners to engage with tools like beep-to-vote, call-in segments, and the formation of listening groups that include demos, video screenings, or farmer knowledge exchange.

Value proposition

The key value proposition of this model are:

- High outreach
- Low cost
- Ability to make programmes interactive and entertaining
- Can reach out to otherwise more difficult to reach farmers – old farmers, remote locations etc.
- Can be leveraged by multiple stakeholders – companies for advertising, issue advisories by government etc.
- Run campaigns
- Provide multitude of information – suppliers, buyers, weather, advisories, pest related etc.

1.3 AgroTech: Integrated model

GFUSA and FRI aim to combine the two models discussed above into an integrated **AgroTech extension services model**. The integrated model can improve the efficacy of extension services and promote lasting behavior change among Ghanaian SHFs to increase yields and improve food security.

This report presents the business model for the **AgroTech** extension services. This business model has been developed after a research conducted by M2i Consulting, a management consulting company based in India. This report also refers to a separate

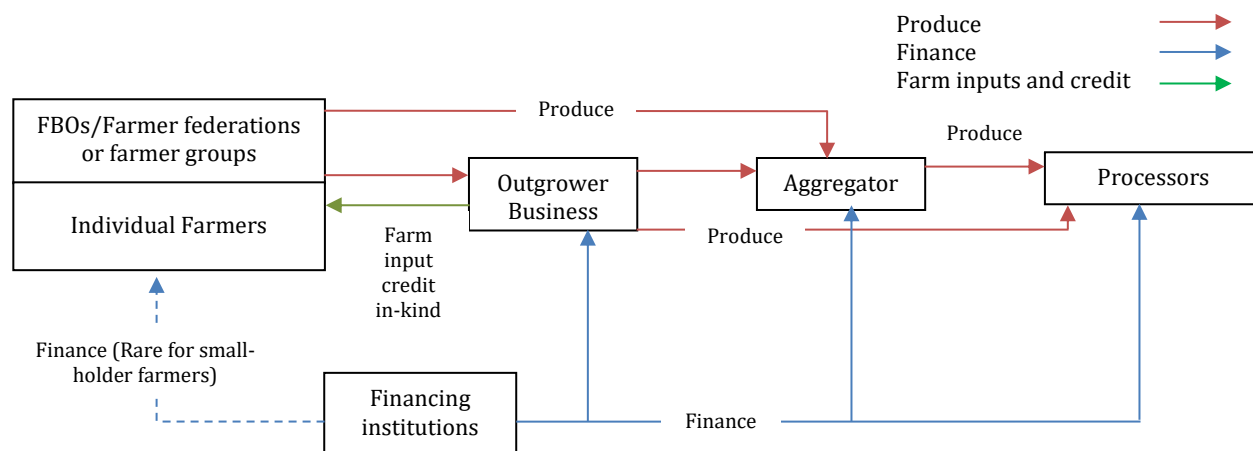
research initiated by FRI regarding viability of Agricultural Radio Programming (ARP). The research was done in September 2016 by research agency, Urika Research and was regarding viability of Agriculture Radio Programming of FRI. That report has been referred to in this document as '**ARP viability research**'.

2 Establishing demand for extension services

This section tries to identify if the real demand for extension and/or farm support services even exist. Without need or real demand for any service, it will be difficult to have a business model or/and willingness of people to pay.

Agriculture Value chain

We start here by first understanding the typical agriculture value chain in Ghana. The chart below shows this value chain with different stakeholders and movement of produce and finance.



The chart above shows the following:

- Farmers are the producers. Farmers may exist as individuals or could be part of Farmer federations or other smaller groups. Farmer federations or FBOs are associations of farmers to improve their bargaining power and to leverage strength as a collective.
- Outgrower Business Owners are intermediaries between the market and the farmers. They may themselves be farmers or may just be operating as intermediaries. The biggest value addition that OBs bring is of providing farmers with agriculture inputs on credit. Thus, most OBs are those who have the capacity to mobilize finance or have their own money to provide to farmers during farming season. OBs provide farm inputs on credit to individual farmers and then at the end of the season they generally procure the produce and take their share of interest on credit provided. Generally, the principal as well as interest is all collected in the form of produce. Mostly, the terms of credit are not clearly defined.

Existence of OBs and the nature of transaction between farmers and OBs, in a way reflect failure of sound formal mechanisms for the services that OBs otherwise provide, namely – farm credit, market linkages and information availability. But for

now, OBs are an integral part of value chain and are well entrenched in the value chain.

- OBs sell the produce that they procure from farmers to Aggregators. Some Aggregators may also procure produce directly from farmers. Aggregators generally are large scale-buyers operating in market. They may procure and then sell it to distributors, wholesalers of produce, to processing units etc.
- Processing units may be factories or smaller units which procure produce from Aggregators or in some cases from OBs.
- Financial institutions provide finance. In most cases, financial institutions refrain from lending to small-holder farmers. Most financial institutions lend to large farmers, processing units, OBs and Aggregators. Finance is a problem throughout the value chain, especially for small scale operators; be it farmers, OB or Aggregators.

Need for extension services

The primary survey conducted with the farmers and the findings of the FGDs showed significant need for extension services as well as other support services among farmers. The research had following findings.

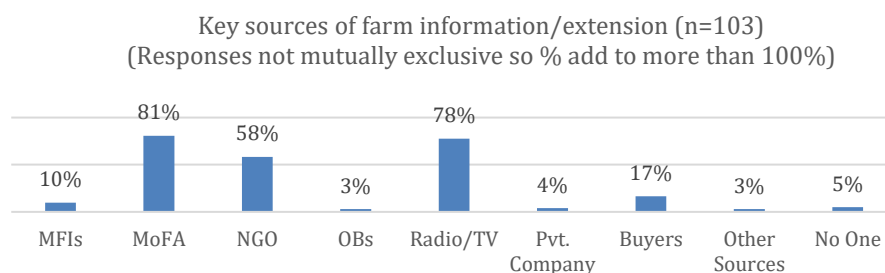
- Current level of access to information on farming is not adequate

Farmers informed that they currently did not have adequate access to information related to farming. Most farmers mentioned that their main source for technical advice was MoFA Technical Officer. But support provided by MoFA TOs was not adequate. Farmers informed that TOs had large geographies under their jurisdiction and were not easily accessible.

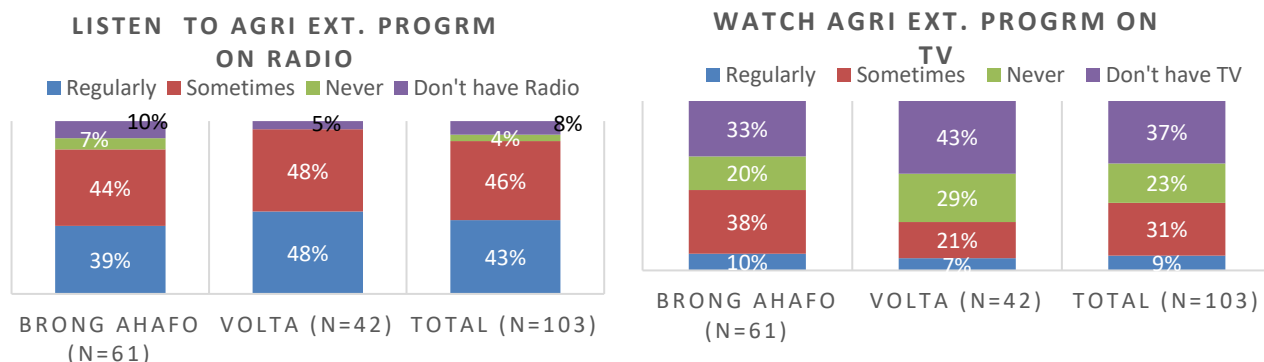
What are the biggest challenges for you in agriculture?	Brong Ahafo (n=61)	Volta (n=43)	Total (n=103)
Agri-input availability	59%	45%	53%
Input cost	20%	38%	27%
Farming technique	48%	36%	43%
Market and price uncertainty	79%	74%	77%
Rainfall/Irrigation	84%	55%	72%
Soil quality	11%	7%	10%
Others	3%	26%	13%

Source: Primary research

The chart below shows the information sources used by farmers.



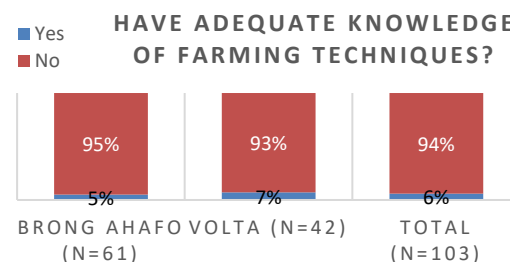
The chart shows MoFA as the most common source of information followed by TV and Radio. The charts below show the details of frequency of usage of TV and Radio.



However, the constraint that farmers expressed with TV and radio was that it was one-way communication and provided generic information. It did not cater to specific queries and local issues.

- Lack knowledge of modern farming techniques**

Most of the farmers had learned farming from their ancestors. They felt that the knowledge handed-over to them was outdated. An overwhelming - 94% respondents thought that they did not know modern farming techniques and needed to upgrade their knowledge.

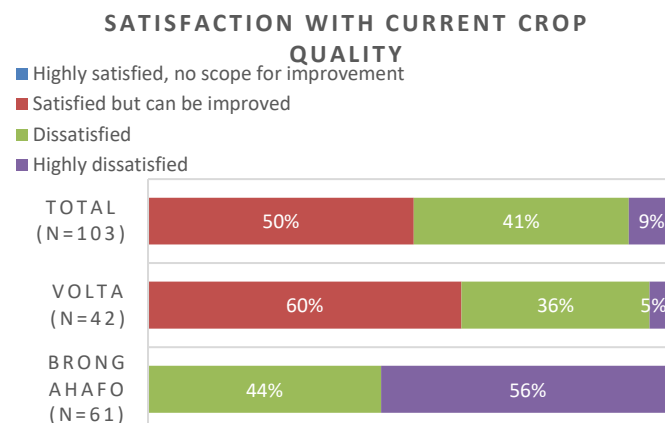
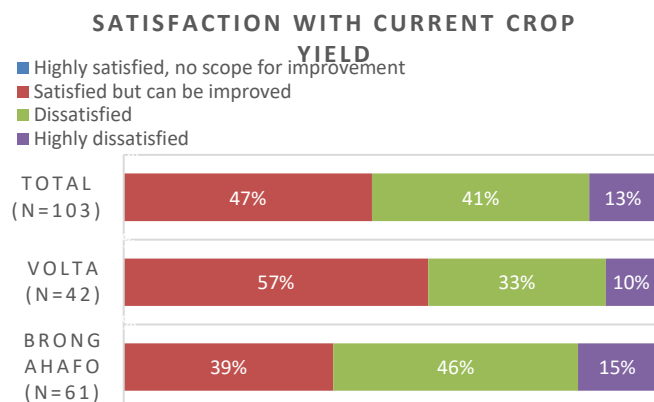
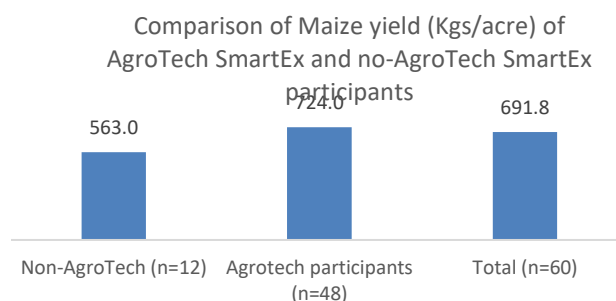
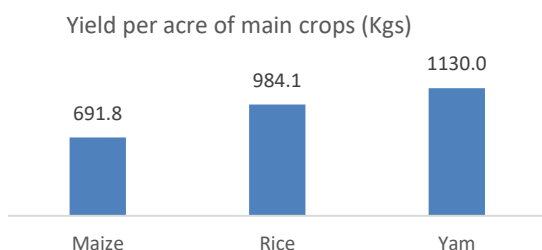


Farmers mentioned that they lacked information on quality of seeds, techniques of sowing, applying fertilizers etc. Incorrect ways of farming had significant impact on overall productivity.

- Farm productivity is low**

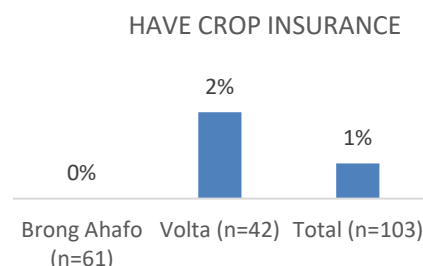
Farmers were highly dissatisfied with their current level of farm productivity. They mentioned that the yield for most of the crops was quite low and had the potential to be increased many folds. Farmers who got access to good extension service under AgroTech project or under ADVANCE project, reported of increase in yields by 100 – 300%.

Comparing, the farm productivity data for farmers who had participated in AgroTech, pilot, it was found that the average productivity reported by them was higher than those who had not participated.



- Lack of technical support during any exigency

Farmers mentioned that the crops were frequently attacked by pests, diseases, insects and birds. The pattern of attacks and the type of diseases also changed from year to year. Further, crops also fail because of erratic rains. Under such exigencies farmers had no source from which they could seek some quick advice. Farmers mentioned that they were not even aware of crop insurance or how it could be availed in such emergencies.



- Lack information related to weather and markets

Farmers lacked weather information and often carried out sowing, fertilizer application and harvesting in isolation of weather or market information. This resulted in low productivity, low quality of produce and low realization of prices.

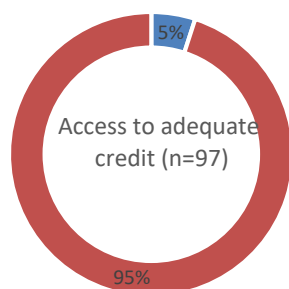
Need for other support services

While, the farmers mentioned that they need extension services they also made it clear that extension services alone would not help. Farmers expressed need for various support services discussed below.

- Access to finance

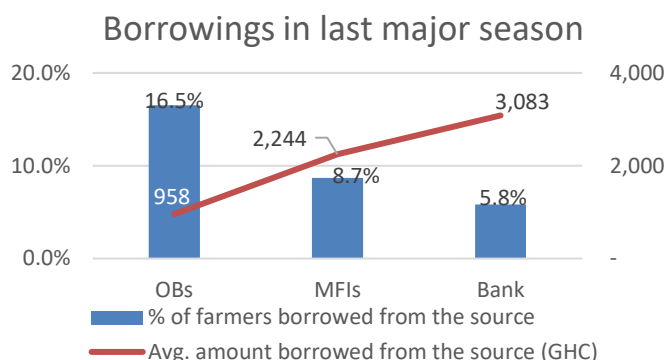
Without timely finance farmers could not procure inputs on time. The survey showed a very high proportion of farmers not having access to credit and even higher proportion of them not having access to adequate credit. Further, most farmers accessed credit from informal sources.

- Get adequate credit
- Do not get adequate credit



	Formal source (Banks/MFIs)	Informal source (OBs /friends)	Total
No. of farmers availed credit in last season	16 (15.5%)	21 (20.4%)	35 (34%)
Avg. amount availed, GHC	2,488.8	1,077.5	1,784.2

Average credit needed
(as estimated by farmers for a season)
GHC 3,549



How much credit do you need in a year? (GHC)	Brong Ahafo	Volta	Total
Do not need	14%	7%	11%
Up to 5,000	70%	83%	75%
5,000 to 10,000	14%	5%	10%
10,000 to 15,000	0%	0%	0%
15,000 to 20,000	2%	2%	2%
More than 20,000	0%	2%	1%

- Weather information – Farmers lacked information on weather.
- Market information – Farmers mentioned that they did not have enough information about markets and pricing. They lacked access to buyers and processors. They had to rely on a few buyers that they knew and had to accept whatever prices they offered.
- Record-keeping – Farmers lacked capacity to keep accounts of their farm expenses and revenues realized. Farmers often could not ascertain profit or loss made in a season. They were also not aware of the interest rate, that it works out to, when they avail agri-input credit from OBs.
- Input services – Farmers mentioned need for services such as tractors, thrashers etc. Farmers lacked information about and access to such vendors. Further, as individual small-holder farmers had small land sizes, such service providers were generally not interested in them.

Thus, we see that Radio has very high outreach and most farmers use radios for availing various agriculture related information. However, people find mostly one-way communication of radios a constraint. Further, people also mentioned need for various other support services.

3 Business case for Integrated AgroTech model

3.1 Positioning of AgroTech

In the last 5 years or so, several ICT-enabled platforms have emerged that provide various solutions to address different challenges that farmers in Ghana face.

If AgroTech extension service model is pitched just as another technology or radio solution then some of these organizations have competing products. Particularly, mFarm offers a comprehensive ICT enabled application which is also very versatile. To compete effectively and to create differentiation, 'AgroTech extension model' must be more than just a technology solution or a radio broadcaster of information.

Hence, one of the key aspects to be appreciated is that – instead of technology, the focus has to be on the services that can benefit farmers; technology should only be an enabler.

Business Model proposed in this report, as discussed later, does not pitch AgroTech as a company offering a technology product. Instead, AgroTech should be an advisory platform that provides various services to farmers and other stakeholders, using ICT and interactive radio platform.

This distinction is important as this will separate AgroTech from other ICT companies/organizations that are currently operating. Furthermore, because the focus here is on providing support services to farmers, the proposed business model involves personalized mentoring, interactive radio broadcasting and hand-holding services to farmers through on-the-field Agents. The radio broadcasting will reinforce the on-field extension and support services provided by the Field Agents.

Currently, there are no companies operating at scale that are providing extension services or farmer support services on commercial basis.

Outgrower Business Owners (OBs) or large agri-distributors also provide some farm support services. These are mainly related to agri-input credit or extension related to use of fertilizers, seeds etc. However, the services offered are ad hoc rather than systematic or organised. Often OBs do not have clear engagement terms with farmers for these services resulting in opaque barter transactions between OBs and farmers.

There are enough opportunities for GFUSA-FRI integrated AgroTech model to also collaborate with other platforms. There are various service providers that offer weather information (Ignitia), credit facilities (FASIBA of Esoko) etc. AgroTech can leverage such existing platforms for those services rather than creating competing functionalities within its ICT platform.

3.2 Willingness to pay and capacity to pay for farm services

The previous section established the need for farm advisory and support services, but a business idea cannot be sustained unless there is a clearly defined revenue source and willingness of beneficiaries to pay for the services. Thus, the study explored the extent of demand for such services and the willingness of farmers to pay for such services in case they were available.

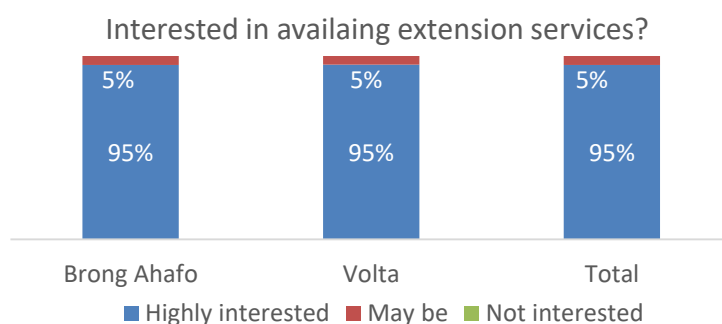
Challenges faced by farmers in agriculture

Farmers mentioned of significant challenges they had to face in farming. The survey showed following responses from farmers on major challenges:

What are the biggest challenges for you in agriculture?	Brong Ahafo (n=61)	Volta (n=43)	Total (n=103)
Agri-input availability	59%	45%	53%
Input cost	20%	38%	27%
Farming technique	48%	36%	43%
Market and price uncertainty	79%	74%	77%
Rainfall/Irrigation	84%	55%	72%
Soil quality	11%	7%	10%
Others	3%	26%	13%

As farmers faced all these challenges, they expressed need for extension and other support services. They also mentioned that they would prefer some local resource who could help them.

The chart presents the research findings showing very high level of interest in availing extension services. 95% of the farmers mentioned they were 'highly interested' in support services, while another 5% were not very sure.



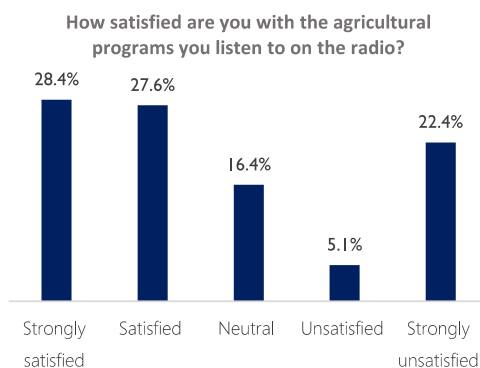
Farmers mentioned that they needed a package of services over extension services alone.

In which areas do you feel the need for information or advice?	Brong Ahafo (n=61)	Volta (n=43)	Total (n=103)
Agricultural credit	41%	64%	50%
Pest Control	57%	55%	56%
Fertilizer related issues	46%	71%	56%
Inter cropping	7%	2%	5%

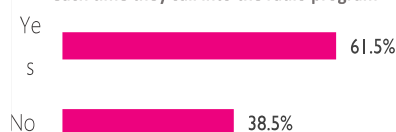
Land Preparation	10%	10%	10%
Land Management	49%	43%	47%
Seed related issues	41%	19%	32%
Sowing related	26%	26%	26%
Irrigation	33%	26%	30%
Marketing	51%	52%	51%
Weather related issues	51%	57%	53%
Harvesting	2%	14%	7%
Others	0%	7%	3%

Radio programmes have been helping farmers with their information and support services' needs. The ARP viability research report observes that *"farmers are clearly committed to agricultural radio: Nine-four percent of farmers surveyed (based on contact made through radio stations in Northern Ghana) report Always (53%) or Sometimes (41%) listening to their local programs. Ninety-two percent indicated that agricultural radio helps increase their incomes."*

Further, ARP viability research showed that almost 83% farmers mentioned that Radio programs help



Farmers' willingness to pay a small fee deducted from their phone credit to support radio program each time they call into the radio program



pay for field-agent kind of model. Most, farmers even mentioned that they would prefer to pay quarterly or annually rather than monthly.

Do the agricultural radio programs you listen to help you to connect to market actors, e.g. input suppliers or buyers?



Do the agricultural radio programs you listen to help you to increase or improve your crop yields?



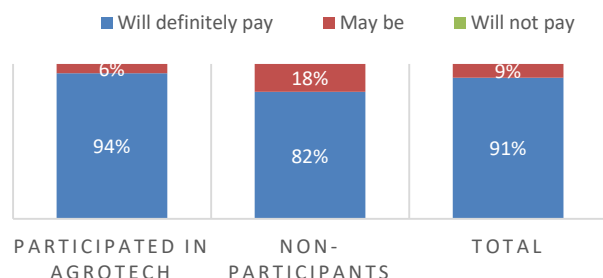
them connect to market and as high 96% mentioned that these programs help in increasing yield. Further, 56% respondents in the same research were satisfied with the radio services.

However, it is highly likely that if radio programming is complemented with on-the field support it can be very effective and people would be willing to pay for these services.

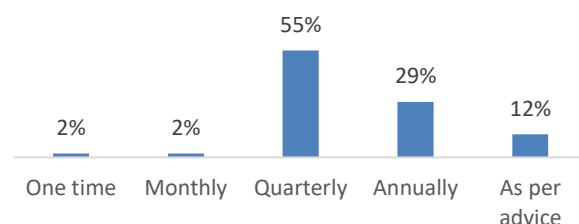
In ARP viability research, 62% of farmers surveyed were willing to contribute small fees, paid through phone credit, to support the radio program.

These findings of ARP viability research are consistent with the willingness-to-pay shown by farmers even under the research conducted by M2i. In this research, over 90% farmers expressed definite willingness to

WILLINGNESS TO PAY FOR SUPPORT SERVICES



Preferred frequency of payment for services



Capacity to pay

The capacity to pay was estimated by understanding the current cost of production for common crops and if the advisory cost can be loaded to it. This cost was also seen in context of current income levels and landholdings.

During FGDs, detailed discussions were held with farmers on how much would be a reasonable fee for such services. The cost of production of different crops as worked out by farmers is presented below:

Cost per acre - Rice

Costs	GHC
Land rent	100
Land preparation-chemical spray	30
Power tiller	130
Seed sowing	30
Selective weeding	60
Fertilizers - First round	200
Fertilizers - Second round	100
Labour	50
Harvest	170
Thrashing	70
Winnowing	60
Transport	60
Total cost per acre	1,060
<i>Produce per acre (Kgs)</i>	<i>950</i>
Selling price of produce in acre	1,500
	400
Profit per acre	to 450

Cost per acre - Maize

Costs	GHC
Land rent	100
Ploughing	80
Sowing	50
Fertilizers	100
Herbicide	20
Another herbicide	25
Weedicide	15
Harvest	60
De-husking	20
Shelling	20
Transport	60
Total cost per acre	550
<i>Produce per acre (Kgs)</i>	<i>750</i>
Selling price of produce in acre	900
	300 to
Profit per acre	350

The above tables show a broad estimation of the cost and sale realizations for the crops from an acre of land. It must be understood that although there are variations across cost

and sale price from season to season and region to region, a ballpark figure for profits can be assumed to be in the range of 40% to 50% of cost in a normal scenario.

With the current costing and current level of profits per acre, farmers estimated that they could pay in the range GHC30-50 per acre per season for AgroTech services.

Capacity and willingness to pay	Amount
Capacity and willingness to pay per acre	GHC30-50
Capacity and willingness to pay for a season assuming landholding of 3 acres	GHC90-150
Capacity and willingness to pay for a year considering two seasons and landholding of 3 acres	GHC180-300

Landholding

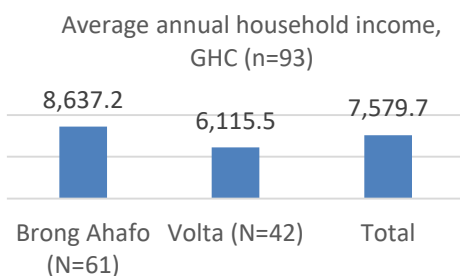
In the above table, we calculated the cost per farmer per year with 3 acres of land, which comes to around GHC180-300. However, in the survey the actual landholding per farmer was as below.

Land holding	Brong Ahafo	Volta	Total
Up to 3 acres	5%	40%	20%
>3 to 5 acres	56%	17%	40%
>5 to 10 acres	17%	31%	23%
>10 to 15 acres	5%	5%	5%
>15 to 20 acres	7%	7%	7%
More than 20 acres	10%	0%	6%
Average landholding, acre	10.4	5.8	8.5

Income

The average annual household income as mentioned by farmers was GHC 7,580; this is comparable to GDP per capita for the country.

If we assume that the support services provided result in an increase of even 15% in average total income, the average annual income would reach around GHC 8,717. With this income farmers should be able to pay a fee of GHC 180-300 in a year.



Income	Brong Ahafo	Volta	Total
0-5,000	44%	69%	55%
>5,000-10,000	28%	18%	24%
>10,000-20,000	22%	3%	14%
>20,000	6%	10%	8%

4 Proposed Operation Model for AgroTech

The business model proposed here is based on the following key findings in the study:

- Farmers need not just extension services but larger package of support services
- Other players – namely financial institutions and agri-input dealers also need a range of services
- Farmers need an easily accessible and a trust-worthy service provider preferably local
- Radios have very high outreach and in absence of customized advisory services, farmers depend on radio programs for information needs.
- Through radio programs farmers have been able to derive tangible benefits such as technical inputs and linkage to market
- Farmers, financial institutions as well as agri-input dealers are willing to pay for the services
- There is a potential for multiple channels to provide AgroTech services, as already piloted by GFUSA and FRI separately for the two types of extension models
- There are farmer groups and federations in the community which have need for AgroTech services
- For maintaining quality and to ensure sustainability, it will be important to create mechanisms for the following:
 - To have standards for eligible delivery channels (OBs and Agents) to ensure quality
 - To develop and update technical material on Agronomics of various crops
 - To have updates for software to adapt to changing market demands or to improve on existing functionalities
 - To train delivery channels and Agents
- There are other agencies such as MoFA, other ICT platforms, projects like Advance which can help in creating synergy and can potentially enhance the service offerings of AgroTech
- Fee for AgroTech service should be charged to farmers for services provided. Building a model with revenues attached to increase in farmers' productivity or profits would be risky and may not be sustainable. This is because farm productivity varies for various reasons. Estimating increase in productivity and contribution of AgroTech advisory services to it would be difficult and can lead to conflicts.
- AgroTech being a joint venture of GFUSA and FRI, should not charge separate fee from clients but, a single fee should be charged. Revenues can be split by GFUSA and FRI based on services rendered by each or by some other mutually agreed method.

With the above considerations, a business model jointly owned and managed by GFUSA and FRI, having a two-tier structure is proposed. It is also proposed that AgroTech model is not viewed narrowly as just an extension service provider but rather a farmer advisory services' platform. Under the two-tier structure, there will be a top-level umbrella organization and then at the second level, will be the service delivery channels. These delivery channels would be providing services on commercial basis. The chart below and the table following it, explain the proposed structure and the revenue model.

Proposed Business Model

Umbrella Body (AFAS)

AFAS to be a network or an association to provide support to members (Service delivery channels); it will create enabling environment for delivery of services for partner channels. It will help in binding and holding the whole model together. It will not be doing the service delivery itself and will also not restrict from governing the market pricing for the channels. AFAS will charge fee to members, have event sponsorships and gain revenue by data management services and advertising on Farm Radio.

\$ - Membership/License fee

\$ - Data services' fee;
-Radio advert. fee

Service delivery channels (3 broad types)

Service delivery channels will deliver the AgroTech extension and other support services. They can decide their own business model; package of service offerings and fee mechanisms acceptable to farmers (Amount, method of payment etc.). They will receive fee from farmers, financial institutions, agri-input dealers and other companies who may benefit from them.

\$ - Fee for service

Clients

Clients will be the ones receiving services. They will be farmers, FBOs, agri-value chain companies, financial institution and other companies needing different services and data.

AgroTech Farm Advisory Services- (Umbrella Body) *to be jointly managed by GFUSA-FRI*

Individuals
Community AgroTech
Specialists (CAS)
(Youth from
communities)

**OBs/
Aggregators**

Individual
CAS

Institutions
(Pvt. Companies/NGOs)

More organized
hierarchical structure

Head Office and
branch set-up

CAS Managers

CAS

Farmers

FBOs

Agri-input
distributors
and dealers

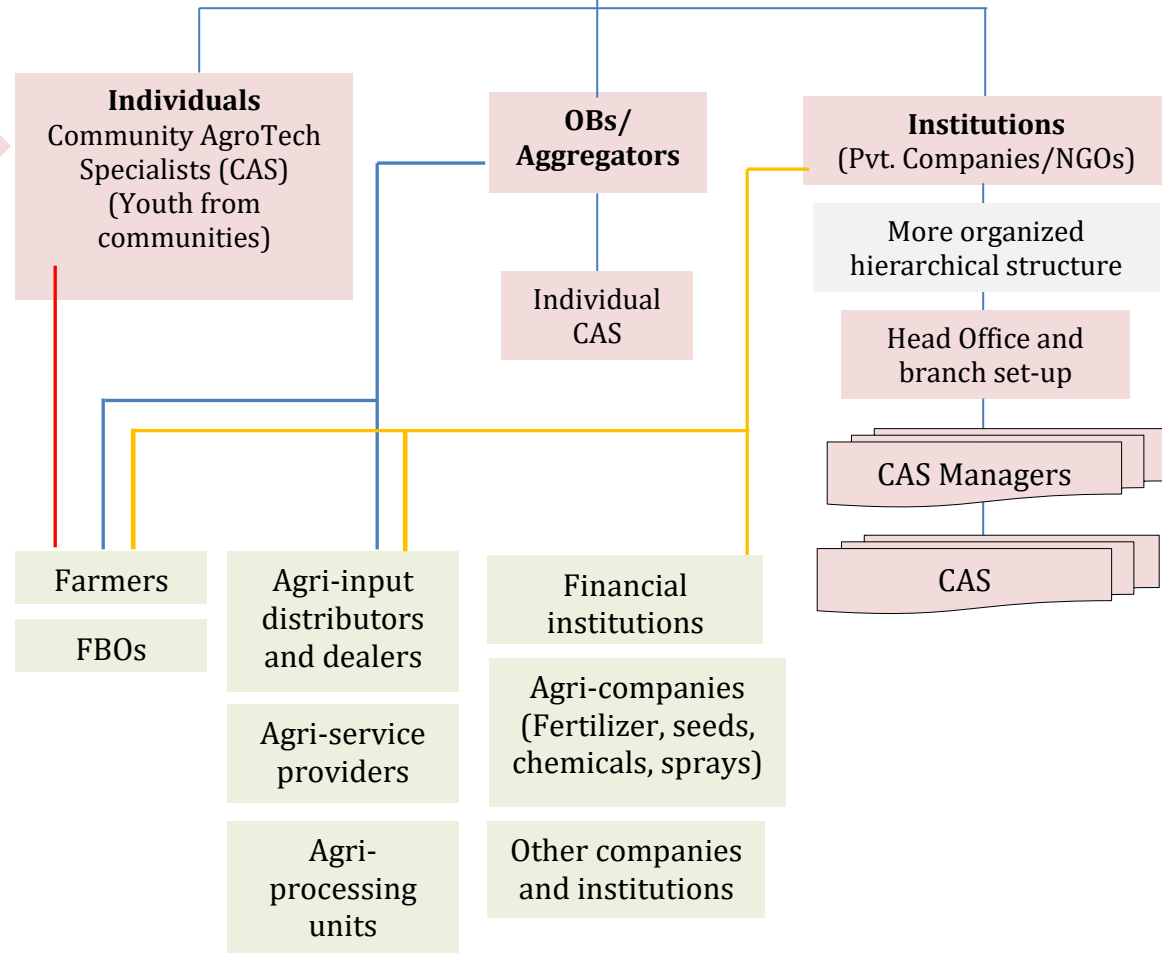
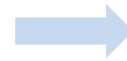
Agri-service
providers

Agri-
processing
units

Financial
institutions

Agri-companies
(Fertilizer, seeds,
chemicals, sprays)

Other companies
and institutions



Top-level Umbrella body – AgroTech Farm Advisory Services (AFAS)				
Entities in the scale-up model	Legal status	Purpose	Service Offerings	Revenue Sources
<p>AFAS</p> <p>To be jointly managed by GFUSA-FRI to promote AgroTech. If the model grows GFUSA-FRI may decide later to separate it into an independent entity.</p>	Not-for profit	To create a favorable environment for efficient delivery of high quality farm advisory and support services through a financially viable model <i>(not just extension services)</i>	<ul style="list-style-type: none"> Promoting AgroTech Brand and support in its expansion Registering and training of partner service channels (Community AgroTech Specialists (CAS); OBs and institutions) To create standards for channels and fair practice codes To collect periodic feedback from partner channels and improve services and software; manage and upgrade SmartEx application To develop Radio programming content and Broadcast radio programmes in innovative manner To create complementary content between SmartEx and radio programming To provide radio advertising services To create interactive radio programming and other information system that can be overlayed on SmartEx platform To provide support services to partner service channels - CAS, OBs and institutions and respond to their needs (call-centre support, linking to other stakeholders, WhatsApp groups) To liaise with Govt., experts and other stakeholders to enhance service offering packages through channels To create new technical material on Agronomics To conduct training of trainers (existing channels can act as trainers for new channels) 	<ul style="list-style-type: none"> Fee charged to partner delivery channels on per farmer basis or on membership basis (Single fee will be charged and not separately by FRI and GFUSA) Fee from data services – to be paid by agri-input companies, consultants, government or research agencies Advertising on radio by private companies, farmer groups etc. Sponsorships for events <p><i>FRI and GFUSA to split revenue in proportion of services provided</i></p>

			<ul style="list-style-type: none"> • To promote best practices, learning sharing, publications; recognizing and awarding good practices and achievements of channel partners • Data management services – aggregate data from channels, provide data to industry on fee basis; data can be used for research and for government purposes 	
Service delivery channels				
Delivery Channels	Legal status	Purpose	Service Offerings	Revenue Sources
CAS	Individuals Local educated youth from community	To provide extension and other farmer support services locally	<ul style="list-style-type: none"> • To register and provide extension services with intensive farmer engagement using AgroTech • To understand and respond to local farmer issues • To help farmers in record-keeping • To provide weather information • To run advertising campaigns for clients on Farm Radio • To help farmers identify buyers, sellers or input service providers through Farm Radio • To liaise with MoFA TOs to gain knowledge and to pass on knowledge to farmers • To liaise with local agri-distributors and try and negotiate credit for the registered farmers; support in farm inputs • To liaise with agri-distributors to understand latest fertilizers and pass knowledge to farmers • To facilitate cross-learning among registered farmers • On behalf of registered farmers, to respond to emergencies like pests or any break-out of disease by gaining knowledge from AFAS, Farm Radio, WhatsApp group, MoFA TOs, fertilizers distributors 	<ul style="list-style-type: none"> • Fees from farmers either on per acre basis, fixed basis or any other basis as agreed between farmers and CAS <ul style="list-style-type: none"> ○ AFAS not to prescribe fee, frequency, timing or mode of payment. CAS and farmers to mutually decide all these modalities. • Ideally, fee should be charged to farmers for services provided by CAS. The fee should not be pegged on the improvement in productivity, profits or other such outputs.

			<p>etc.</p> <ul style="list-style-type: none"> To try and discover resources such as tractor service providers, tool and implement providers. Invite them to meet registered farmers. 	
OBs	Registered or un-registered Buyers/Aggregators	To provide extension and other farmer support services locally	<ul style="list-style-type: none"> To have a team of CAS (preferably locally placed CAS within community) to deliver extension and farmer support services To provide all services as listed above. <p>Additional services that OBs can offer</p> <ul style="list-style-type: none"> To provide agri-inputs as per FMP of farmers To network with agri-service providers – tractors, transporters, thrasher etc. and make them available to the registered farmers To buy produce from farmers To offer fair weights and fair prices to farmers To engage with financial service providers and help in credit flow to registered farmers To network with external stakeholders and try and get support for registered farmers To engage CAS to act as agents for financial institutions, to help them in saving mobilization, identifying potential borrowers etc. To engage with agri-distributors and support them in their extension and other services To advertise on Farm Radio 	<ul style="list-style-type: none"> Fees from farmers either on per acre basis, fixed basis or any other basis as agreed between farmers and CAS <ul style="list-style-type: none"> AFAS not to prescribe fee, frequency, timing or mode of payment. CAS and farmers to mutually decide all these modalities. Ideally, fee should be charged to farmers for services and not pegged to agriculture outputs or income of farmers. Fee to financial institutions if CAS does some activities on their behalf Fee for providing any data about farmers Fee from distributors or agri-input dealers for any support provided to them using network of CAS
Institutions	Private companies	To provide a range of	<ul style="list-style-type: none"> To have a network of CAS to offer AgroTech extension services and other services 	<ul style="list-style-type: none"> Fee to farmers for services Fee to financial institutions

	or NGOs	support services to farmers including extension services	<ul style="list-style-type: none"> • To offer all services as listed for CAS and OBs Additional services that Institutions can offer <ul style="list-style-type: none"> • To engage intensively with financial institutions to offer farmer data and to ease financing • To engage intensively with large buyers, processing units to ensure market for produce of registered farmers, ensuring quality as demanded by companies • To engage with agri-service providers to ensure required services to farmers • To identify various stakeholders (fertilizer companies, seed companies, consumer durable or non-durable companies) that may be interested in farmer data. Provide data services to them. • To run advertising campaigns on Farm radio 	<p>for data as well as other financial services delivered through CAS</p> <ul style="list-style-type: none"> • Fee to all agri-companies needing data or other services delivered through CAS • Fee to other consumer companies needing farmer data or any other service
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Proposed roles of GFUSA and FRI under the integrated model

GFUSA	FRI
<ul style="list-style-type: none"> • Create FRI radio button on SmartEx app, so that if one clicks on it one can have two further options: <ul style="list-style-type: none"> ○ Hear the live program of Farm Radio being currently aired – should be able to record the programs for future reference ○ Hear from a directory of pre-recorded programs, these can be some programs on common topics such as: <ul style="list-style-type: none"> ▪ technical aspects in sowing of certain crops ▪ application of fertilizers ▪ common mistakes in harvesting ▪ immediate action in case of common diseases etc. ○ There should be an option to download these programs, some for free and some for a small charge (<i>just like songs can be downloaded for a fee</i>) • Create mechanism to accept feedback from clients and service delivery channels on SmartEx 	<ul style="list-style-type: none"> • Run radio campaigns for AgroTech • Develop innovative and customized radio programs • Create content that can be overlayed on SmartEx • Help in identification of Community Agriculture Specialists (CAS) (which are currently called 'Agents'), OBs and other potential business partners for delivery of AgroTech through radio campaigns • Adapt programs as per the client feedback received through SmartEx platform • Air programs that are directed specifically for CAS – training techniques and soft skills can be imparted over radio programs • Run some fixed number of radio advertising, as part of AgroTech service package, for farmers or FBO clients of AgroTech who might be looking for buyers for other produce or may be looking for farm inputs or other services • Run radio advertising for AgroTech clients on fee basis for advertising beyond the fixed number of adverts in the AgroTech package

Key recommendations for improving likelihood of success of the business model; GFUSA and FRI need to jointly work on them

- Market AgroTech – Merchandise, AgroTech field camps etc.
- Replace term 'Agent' with 'Community AgroTech Specialist (CAS)', 'AgroTech Extension Officer', 'AgroTech Farm Doctor' etc.
- Promote CAS as a specialist local farm doctor; charging for advisory (not for yield increase)
- Provide a package of services to farmers – technical knowledge, support services, marketing, finance etc.
- As part of service package, leverage Farm Radio for advertising for individual farmers, FBOs other clients. Help them identify buyers, service providers etc. through radio campaigns. This can be part of overall AgroTech service package with no additional fee.
- Engage local educated youth from community rather from outside; one community can have more than 1 CAS; engaging local youth is highly recommended to make the model cost effective and for faster acceptance of model by the community, particularly under fee model
- Focus on quality rather than cutting cost
- Create standards and eligibility criteria for OBs, other business entities, CAS
- Create Training modules and manuals for all crops

- Train CAS more intensively; provide reference material
- Create pool of trainers and certifiers to work on fee basis
- Add services for CAS beyond technical advisory for crops – transportation, agri-inputs, credit/savings
- Create Fair practice code for CAS, OBs and other entities
- Track performance across delivery channels
- Work towards leveraging 'Uliza' platform of FRI by promoting it through CAS network. Catalyze farmers to ask queries and help popularizing the platform and make it more vibrant.
- Leverage platform to serve other stakeholders on commercial basis, charge fee
 - FIs, Agro-dealers/Distributors, Fertilizer, Agro-chemical and seed companies
- Involve Financial Institutions, encourage them to develop products, providing them data and eligible clients to reduce credit risk
- Deliver services to farmers by working with existing farmer groups and farmer federations. This can help in managing costs as well in creating peer pressure group for payment of services.
- Engage with other agencies such as MoFA, ADVANCE and ICT platforms to enhance service offerings.

Potential of engaging with partners

In the business model, it is recommended that AgroTech provides a comprehensive range of advisory and support services rather than just extension services. Thus, it is necessary that AgroTech partners with different stakeholders and other such service providers.

Potential areas to work with ADVANCE

- In development of technical material on Agronomics of crops
- In development of training manuals and reference materials
- As one of the support agencies which can help in technical advice to CAS, OBs and Institutions
- In information documentation and dissemination

Potential areas to work with other ICT platforms

As farmers would have different support service needs, there are other ICT platforms that may provide solutions for those service needs. Thus, AgroTech agents would be able to render a larger range of services and with greater effectiveness if they are able to leverage these other existing ICT platforms. Leveraging these platforms can enhance value proposition offered by the AgroTech agents. Some of these platforms and services that they can be used for are:

- **Esoko:** financial services, market linkages
- **mFarm:** Record-keeping, tracking of transactions
- **Farmline:** web-based messaging services, voice messages
- **Ignitia:** weather information
- **Prep-eez:** voice messaging services

Potential areas to work with MoFA

The field agents (CAS) can work with MoFA TOs. They can take any technical issues or problems faced by farmers to TOs and seek solutions. The agents can then disseminate the information quickly to farmers. MoFA TOs can utilize the network of CAS to quickly disseminate any agriculture related information or to mobilize farmers for any event or action. Thus, CAS can act as force multipliers and facilitators for MoFA.

5 Next step: Financial viability

The business model described in previous section, proposes a two-tier structure involving an ‘umbrella body’ and ‘delivery channels’. However, for conducting a financial viability pilot at this stage, there would not be a need to create a separate AFAS (umbrella body). The pilot can start with a simpler model, where GFUSA-FRI conduct some of the activities in the pilot that are envisioned for AFAS in the long-run. Once the pilot is over and is successful, AFAS may organically evolve.

This section discusses the details of the financial viability pilot that GFUSA-FRI may undertake.

5.1 Proposed financial viability pilot

Recommendations for pilot	
Step 1: Engage with institutions	<ul style="list-style-type: none"> Conduct a few workshops and meetings with financial institutions, Agri-input dealers and with potential business institutions (that can scale up the model later). Following should be the agenda of these meetings and workshops: <ul style="list-style-type: none"> To present to them the AgroTech model The business idea and the services that AgroTech can provide Identify specifically the kind of services, data and reports that financial institutions and agri-input dealers will need Inform about the idea of pilot and their willingness to participate Present the business model and the revenue potential being envisioned Discuss what could be the role of financial institutions and agri-input dealers in the pilot Willingness of financial institutions and agri-input dealers to pay in case AgroTech model can provide certain services as identified by agri-input dealers and financial institutions
Step 2: Upgrade AgroTech SmartEx application	<ul style="list-style-type: none"> Upgrade SmartEx by designing new capabilities as identified in the workshop; some new functionalities that can be built in SmartEx could be: <ul style="list-style-type: none"> Data capture and dashboards for FIs Data capture and dashboards for Agro companies and distributors Ability to capture agri-input usage so far Various product brands being used Credit history A button for listening to Farm Radio – current programs as well as recorded programs Ability to download or record programs of Farm Radio

	<ul style="list-style-type: none">○ Not allow un-authorized copying○ Remotely disable application○ Remotely monitor trainers								
Step 3: Create basic standards for AgroTech SmartEx services	<ul style="list-style-type: none">• Create eligibility criteria for selection of delivery channels of AgroTech (CAS, OBs and Institutions)• Create standard SOP for delivery of services – Minimum meetings with farmers, service offerings, quality and process of dealing with the farmers while providing advisory• Set appropriate Farmer to Agent ratio• Create reference material on Agronomics for various crops• Create a technical helpline that CAS, OBS, Institutions can call for technical support								
Step 4: Plan pilot	<ul style="list-style-type: none">• Decide roles of GFUSA and FRI for the pilot and revenue sharing mechanism• Finalize entities that will participate in pilot, these may include:<ul style="list-style-type: none">○ Delivery channels – OBs, Institutions and Individual CAS○ Farmer federations○ Financial Institutions and Agri Dealers and distributors○ Other institution like ADVANCE• Set goals, objectives and activities under pilot• For Institutions and OBs some operational cost might need to be absorbed by GFUSA-FRI, thus decide on how costs and revenues will be shared• Ideally during pilot, it is recommended that GFUSA-FRI does not charge any licensing or membership fee (as originally described in the model). However, the pilot will show whether institutions will be able to pay such a fee in the future.• Define roles for each stakeholder and decide timelines; ideally pilot should not be less than 1 year <p>Some of the institutions that can be interested in pilot based on M2i’s survey are:</p> <table><tr><th>Agri-input dealers</th><th>Potential institutions</th><th>Farmer federations</th><th>Financial institutions</th></tr><tr><td><ul style="list-style-type: none">• Green Shield• Worawora rice mill (GN Foods)</td><td><ul style="list-style-type: none">• AgriImpact• AgriConsult</td><td><ul style="list-style-type: none">• Wenchi Farmer Federation• Tapaman Farmer Association• Cocoa Abrabopa</td><td><ul style="list-style-type: none">• Express Savings and Loan• Opportunity Savings and Loan</td></tr></table>	Agri-input dealers	Potential institutions	Farmer federations	Financial institutions	<ul style="list-style-type: none">• Green Shield• Worawora rice mill (GN Foods)	<ul style="list-style-type: none">• AgriImpact• AgriConsult	<ul style="list-style-type: none">• Wenchi Farmer Federation• Tapaman Farmer Association• Cocoa Abrabopa	<ul style="list-style-type: none">• Express Savings and Loan• Opportunity Savings and Loan
Agri-input dealers	Potential institutions	Farmer federations	Financial institutions						
<ul style="list-style-type: none">• Green Shield• Worawora rice mill (GN Foods)	<ul style="list-style-type: none">• AgriImpact• AgriConsult	<ul style="list-style-type: none">• Wenchi Farmer Federation• Tapaman Farmer Association• Cocoa Abrabopa	<ul style="list-style-type: none">• Express Savings and Loan• Opportunity Savings and Loan						

Step 5: Identify location and communities for pilot	<ul style="list-style-type: none">• Pilot should be conducted in at least 2 regions.• In each region, the pilot should be conducted in at least 7-8 communities.• Pilot should include at least 3-4 FBOs, who will receive the services.						
Step 6: Service delivery channels for pilot	<p>Identify three service delivery channels, as described in the model, to participate in the pilot, their numbers can be as below:</p> <table><tr><th>Individual CAS</th><th>OBs</th><th>Institutions</th></tr><tr><td>20-25</td><td>5-7</td><td>1-2</td></tr></table>	Individual CAS	OBs	Institutions	20-25	5-7	1-2
Individual CAS	OBs	Institutions					
20-25	5-7	1-2					
Step 7a: Pilot activities under individual CAS channel	<p>Key activities under pilot:</p> <ul style="list-style-type: none">• Once the communities for pilot under Individual CAS delivery channel are identified, the idea of support services on fee basis should be discussed in these communities.• Communities should be involved in identifying the local youth who are educated, sincere and whom community can trust. It is also important that the identified youth are good in communication, can travel and can network with people.• 20-25 youth can be piloted with. There can be more than one youth within a community. Hence, pilot can be done with 10-12 communities or as identified by GFUSA-FRI.• Once the potential CAS are identified; services to be offered by CAS, fee per acre and payment modalities should be agreed between CAS and farmers with active support from GFUSA-FRI.• Form a batch of identified CAS under the pilot and train them on SmartEx, technical aspects of farming, agronomics of crops, soft skills – communication, marketing, presentation and leadership.• Training should be provided with the idea that CAS will be providing not just the extension services but other support services and issues faced by farmers.• Equip CAS with contact details of agri-input providers, service providers and technical reference material on crop agronomics.• Provide helpline numbers at GFUSA-FRI for support, contacts of local MoFA TO, contacts of Farm Radio and other support agencies.• Guide CAS that his/her revenues will depend on the range and quality of service it provides.• Provide tablet and Pico projector with agreement that they would repay the loan with some moratorium (6-9 months).• Support them by running AgroTech campaign on Farm Radio• Form AgroTech branding T-shirts and encourage CAS to sport it.						

Step 7b:
Pilot activities
with OBs

Key activities under pilot:

- Identify 5-7 OBs interested in delivery of services under fee model.
- Discuss the idea in detail and discuss the revenue model and revenue potential as illustrated under financial viability section of this report.
- OBs should be suggested to engage local educated youth who can work within community on commission or salary basis and report to OB. The profile of youth would be same as suggested under individual CAS delivery channel.
- Hiring local youth from community can significantly reduce operating cost and help in achieving break-even. Further, local youth will have more acceptability among community.
- OB will be responsible for quality control and effective delivery of services.
- Decide a package of services that OBs can offer. This package can include larger range of services.
- Once OBs are convinced and selected they should identify and engage youth in different communities and start marketing AgroTech and services they would offer. They should also inform the community of the fee to be charged.
- Support them by running AgroTech campaign on Farm Radio
- During pilot, it would be advisable that each OB engages not more than 4 CAS to keep it simple.
- Services offered, fees and payment modalities should be agreed between farmers and the OBs.
- Form a batch of CAS identified by OBs and train them on all the aspects as discussed earlier under Individual CAS.
- Equip OBs with contacts of service providers and support services for AgroTech as discussed under Individual CAS.
- Provide tablet and Pico projector on credit with certain moratorium period.
- Form AgroTech branding T-shirts and encourage CAS and OBs to sport it.

Step 7c: Pilot activities with institutions	Key activities under pilot: <ul style="list-style-type: none">• Identify 1-2 institutions that may be interested in the model.• Have rounds of discussions with them to present the AgroTech and present the business model, break-even projections and the revenue model.• During the study M2i consultant met a few institutions. The interaction with these institutions were quite positive as they showed interest in participating in the pilot and subsequently to scale it on commercial basis. These institutions included: AgriImpact and AgriConsult. Particularly, AgriImpact was found to be well-suited and it was also keen on partnering in such an initiative.• GFUSA and FRI should engage with more such institutions and see if they are interested.• Engage with these institutions to decide on the package of services and value that they can bring to farmers. Institutions should ideally be able to mobilize a greater package of services for farmers including finance, market linkages etc.• Decide revenue model and start pilot with other activities as already discussed above.• Support them by running AgroTech campaign on Farm Radio
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5.2 Financial viability modeling under different channels

In this section, we evaluate the financial viability of the proposed three channels. This is done by simulating the revenue and cost assumptions as identified during this study. Some common assumptions used across different delivery channels are:

- AFAS charges a fee of GHC10 per farmer per year, this may go down as the size of operation for institution increases.
- On revenue side, willingness of farmers to pay for services was found to be in the range of GHC 30 to 50, as discussed in the earlier chapter. The revenue assumptions are thus guided by these figures.
- The average landholding per farmer has been assumed to be in the range of 3-5 acres which is based on the primary survey findings. The survey findings showed the average landholdings to be as below:

Land holding	Brong Ahafo	Volta	Total (n=101)
Up to 3 acres	5%	40%	20%
>3 to 5 acres	56%	17%	40%
>5 to 10 acres	17%	31%	23%
>10 to 15 acres	5%	5%	5%
>15 to 20 acres	7%	7%	7%
More than 20 acres	10%	0%	6%
Average landholding, acre	10.4	5.8	8.5

Source: Primary survey

1 Financial viability under Individual CAS channel

Key assumptions

- The AgroTech services under this channel will be provided by educated young individuals within the community on freelance basis.
- The individual CAS will be a youth willing to provide sufficient time to these services and wants to take it up as a primary livelihood activity.
- Individual CAS will be someone who is perceived to be responsible, smart, honest and active individual within the community.
- Individual CAS will have to procure a small Pico projector and a tablet initially on credit.
- The Individual CAS invests around GHC2,000 on a hand-held projector and tablet. The amount depreciated in 3 years.
- The devices are bought on loan with interest of around 36% per annum.
- The CAS has to pay a licensing fee to AFAS at GHC10/farmer.
- Being an individual local youth the package of services offered may not be very large and CAS may not be able to offer linkages with external institutions – financial institutions, agri-input dealers etc. Hence, revenues will primarily be from farmers.

- CAS will provide services to a set of farmers, these farmers may not remain same every year but will change. Farmers who do not feel need for further services may discontinue, while new ones may join.

Costs

The cost assumptions are based on discussions with various Agents and OBs from their experiences in the previous pilot of AgroTech.

Initial investment

Assets	GHC
Tablet	800
Projector	1,200
Total	2,000
Purchased on credit with interest of 36% per annum, to be repaid in 3 years	

Regular expenses

Fixed expenses	Monthly (GHC)	Annual (GHC)
Data/month	20	240
Travel	30	360
Miscellaneous	20	240
Depreciation (3 years period)		667
Interest on loan for devices		500
Total		2,007

Variable expense

Licensing fee per farmer per year paid to AFAS	GHC 10
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Revenues

- The fee to be charged to farmers has been assumed to be in the range of GHC10-20 which is well within the WTP range of GHC30-50 that came out from the discussions with the farmers.

Estimated revenue per farmer

Fee per season per acre for a single farmer (GHC)	15
No. of seasons	2
Avg. acre	3
Revenue per farmer per year (GHC)	90

Contribution margin (GHC)

Revenue per year	90
Variable cost per year	10

Contribution margin	80
Contribution margin per farmer	80
Fixed cost	2,007
Break-even in terms of number of farmer clients with above assumptions	25

Break-even Matrix: Number of clients needed for break-even

Average landholding of clients		Fee charged per acre per season		
		10	15	20
	3	40	25	18
	5	22	14	11
	7	15	10	7
	10	11	7	5

Profit Matrix: Potential annual profits for CAS under different scenarios (GHC)

Fee charged per acre per seasons; Average landholding of clients		Number of farmer clients				
		40	50	75	100	125
	10; 3	-	493	1,743	2,993	4,243
	10; 5	1,593	2,493	4,743	6,993	9,243
	15; 3	1,193	1,993	3,993	5,993	7,993
	15; 5	3,593	4,993	8,493	11,993	15,493
	20; 3	2,393	3,493	6,243	8,993	11,743
	20; 5	5,593	7,493	12,243	16,993	21,743

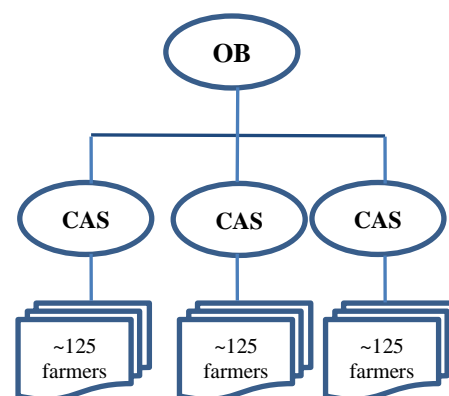
Conclusion

- The financial model shows that the Individual CAS model is likely to be viable under the given assumptions, even at low client base. This is because Individual CAS does not have its own cost (salary). All revenues beyond break-even are income of CAS.
- The model also predicts decent level of incomes for the CAS and hence can be taken up as a full-time livelihood activity.

2 Financial viability under OB channel

Key assumptions

- Under this model, OBs will be engaging local youth to act as CAS.
- The CAS engaged by OB will be from the community and will not need to extensively travel outside the community.
- The CAS will be paid a salary or commission by OBs
- OBs will have to procure projector and tablet for CAS



with investment of GHC 2,000. The amount is depreciated in 3 years.

- The devices are bought on loan with interest of around 36% per annum.
- The OBs pay a licensing fee to AFAS at GHC10/farmer.
- OBs being better networked will be able to mobilize larger package of services and will be able to generate some revenues from – agri-input dealers and agri-service providers. Hence, some revenues will come from these sources in addition to farmers. As these revenues are difficult to estimate at this stage, they have been assumed as a percentage of revenues from farmers.
- CAS will provide services to a set of farmers, these farmers may not remain same every year but will change. Farmers who do not feel need for further services may discontinue, while new ones may join.

Costs

The cost for one CAS will be as below, assumptions are similar to Individual CAS model

Initial investment

Assets	GHC
Tablet	800
Projector	1,200
Total	2,000
Purchased on credit with interest of 36% per annum, to be repaid in 3 years	

Regular expenses

Fixed expenses	Monthly (GHC)	Annual (GHC)
Data/month	20	240
Travel	30	360
Depreciation (3 years period)	-	667
Interest on loan for devices	-	500
Salary/commission to CAS	400	4,800
OBs monitoring and other costs allocated to each CAS	100	1,200
Total		7,767

Variable expense

Licensing fee per farmer per year paid to AFAS	GHC 10
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Revenues

- The fee to be charged to farmers has been assumed to be in the range of GHC10-20 which is well within the WTP range of GHC30-50 that came out from the discussions with the farmers.

- OBs may be able to realize revenues from other sources – agri-input dealers, agriculture service providers, distributors etc. These revenues have been assumed as 10-15% of total revenues from farmers.

Estimated revenue per farmer	
Fee per season per acre for a single farmer (GHC)	15
No. of seasons	2
Avg. acre	3
Revenue per farmer per year (GHC)	90

Contribution margin (GHC)	
Revenue per year	90
Variable cost per year	10
Contribution margin	80

Contribution margin per farmer	80
Fixed cost	7,767
Break-even in terms of number of farmer clients with above assumptions	97

Break-even Matrix: Number of clients needed for break-even

		Fee charged per acre per season		
		10	15	20
Average landholding of clients	3	155	97	71
	5	86	55	41
	7	60	39	29
	10	41	27	20

Profit Matrix: Potential annual profits per CAS under different scenarios (GHC)

		Number of farmer clients		
		100	125	150
Fee charged per acre per seasons; Average landholding of clients	10; 3	(2,767)	(1,517)	(267)
	10; 5	1,233	3,483	5,733
	15; 3	233	2,233	4,233
	15; 5	6,233	9,733	13,233
	20; 3	3,233	5,983	8,733
	20; 5	11,233	15,983	20,733

Annual profits for OB from farmer revenues

		No. of CAS	
		5	10
Revenue per CAS from likely scenarios above	2,233	11,165	22,330
	9,733	48,665	97,330

Annual profits for OBs from farmer revenues + revenues from other sources

		Additional revenue (Proportion of revenue from farmers)			
		5 CAS		10 CAS	
		10%	15%	10%	15%
Revenue from above table	2,233	12,282	12,840	24,563	25,680
	9,733	53,532	55,965	107,063	111,930

Conclusion

- The financial model shows that the OB-based delivery model can be financially sustainable for farmer fees of at least GHC15 per acre per season. Further, model shows the minimum efficiency of 100 farmers per CAS for sustainability. Below these levels, it may be difficult to break-even. For the model to be financially attractive for OBs, efficiency as high as 125 farmers per CAS would be needed. The actual farmer clients may keep changing as old farmers may drop-out while new ones join.
- Every OB can choose to engage as many CAS as the OB thinks she/he can manage
- Working with farmers with slightly larger average landholding (5 acres or above), the model can break-even faster and with lower number of farmers.
- With additional revenues from other sources it may be possible for OB to pass on the benefit to farmer by charging lower costs.

3 Financial viability under business institution channel

Under this model an institution will be running it as a separate business or a business vertical. Two scenarios are presented:

- Normal scenario:** Higher growth, higher fee and lower cost of fund
- Conservative scenario:** lower growth; lower fee from farmers and high cost of borrowing

3.1 Normal Scenario

The following assumptions have been made to make financial projections for 5 years under 'Normal Scenario'.

Key assumptions

Administrative structure

- The organization will have an organized structure with formal staff hierarchy
- It is assumed that any business entity starting AgroTech SmartEx would be involved in some other business and hence some infrastructure like Head Office can be shared and senior management time can be shared
- The business entity will have Head Office and branch offices' network
- Apart from managerial and administrative staff, the business will have CAS to provide services and CAS Managers to monitor and support CAS
- CAS have been assumed to be locals from the community and hence will have limited travel expense
- At full-capacity each CAS will be able to manage 150 farmers, this capacity utilization has been gradually increased
- For every 25 CAS there will be a CAS Manager
- 2 CAS Managers will operate from one branch, each branch will have 2 more admin staff

Expenses

- Salary and admin expenses will have increment of 10% per annum
- Salary for CAS for base year has been assumed at GHC500, for CAS Managers it has been assumed at GHC 1,200 and for middle management staff, the salaries have been assumed in the range of GHC2,500 to 3,000 and for the top management from GHC5,000 to 8,000 per month
- Salaries of CEO and CFO have been allocated to 30% to the business, assuming they will also be involved in other activities
- Rents for HO and branches have been assumed as GHC 3,000 and GHC 800 per month, respectively. Since branches will be located mostly in smaller towns or in countryside, the rents have been assumed to be lower for branches.
- HO rent has been allocated to the extent of 30% to the business
- Depreciation has been assumed at 37% for electronic devices and at 15% for other assets, per annum

Revenue

- Revenues have been assumed to come from two sources – farmers and other institutions and business (financial institutions and agri-businesses)
- Revenue of GHC 20 per acre per season has been assumed, this translates to GHC 40 per year per acre for a farmer, assuming 2 seasons
- The payment by farmers has been assume to come at six monthly frequency only, post harvest
- Average landholding has been assumed as 3 acres per farmer
- Farmer clients are assumed to reach around 1,000 by the end of year 1; 25,000 by the end of year 2 and to 140,000 by the end of year 5.

- Revenue from other sources has been assumed as % of revenues from farmers. This proportion has been assumed as 0% in first year, 10% in second year, 15% in third year and 25% thereon

Balance sheet related assumptions

- Entrepreneur is assumed to invest a capital of GHC2 million spread over first 3 years. Further, borrowings of GHC2 million, spread over 3 years have been assumed to manage initial cash requirements
- Repayment term has been assumed as 3 years for borrowings
- Interest on borrowing is assumed at 12% per annum
- Each CAS will need devices worth GHC1,500 on an average
- Tax on profit has been assumed at 30%

Projected figures

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
No. of farmer clients	1,093	25,457	69,487	99,074	141,254
No. of branch offices	-	3	9	12	18
No. of CAS	10	163	445	635	905
No. of total staff	17	194	505	713	1,006
Farmer revenue as % of total revenue	100.0%	90.9%	87.0%	80.0%	80.0%
Institutional revenue as % of total revenue	0.0%	9.1%	13.0%	20.0%	20.0%

Projected Balance sheets (Figures in GHC)

Assets	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Cash	197,846	634,435	1,586,069	4,149,416	7,892,786
Farmer fee receivable	-	-	-	-	-
Current assets	23	2,080	11,373	22,040	27,107
Fixed assets	27,395	217,760	462,475	435,225	603,330
Total assets	225,264	854,275	2,059,917	4,606,681	8,523,223
Liabilities	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Loans	-	416,667	1,500,000	833,333	291,667
Loan Interest liability	-	11,250	51,458	83,125	96,458
Current liabilities	39	3,467	18,954	36,733	45,178
Total Liabilities	39	431,383	1,570,413	953,191	433,303
Equity brought forward		225,225	422,892	489,504	3,653,489
New equity infusion	500,000	1,500,000	-	-	-
Current year profit/loss	(274,775)	(1,302,333)	66,612	3,163,985	4,436,431
Net worth	225,225	422,892	489,504	3,653,489	8,089,920
Total L+E	225,264	854,275	2,059,917	4,606,681	8,523,223

Projected Income statements (Figures in GHC)

Income	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Revenue from farmers	3,480	530,520	5,211,480	11,226,000	15,835,200
Revenue from other sources	-	53,052	781,722	2,806,500	3,958,800
Total income	3,480	583,572	5,993,202	14,032,500	19,794,000
Expenses	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Salaries	155,900	924,550	3,396,712	6,138,572	9,073,321
Admin expenses	102,320	590,623	1,554,535	2,196,866	2,970,314
AFAS payments	10,930	218,930	513,926	630,166	772,671
Depreciation	9,105	112,635	288,285	410,250	578,895
Interest on loans	-	39,167	144,583	136,667	61,042
Total expenses	278,255	1,885,905	5,898,041	9,512,521	13,456,242
Profit/Loss before tax	(274,775)	(1,302,333)	95,161	4,519,979	6,337,758
Tax@30%	-	-	28,548	1,355,994	1,901,327
Profit after tax	(274,775)	(1,302,333)	66,612	3,163,985	4,436,431

Projected cash flow statements (Figures in GHC)

Cash In flow	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Opening cash		197,846	634,435	1,586,069	4,149,416
Equity inflow	500,000	1,500,000	-	-	-
Loan	-	500,000	1,500,000	-	-
Revenue from farmers	3,480	530,520	5,211,480	11,226,000	15,835,200
Revenue from other sources	-	53,052	781,722	2,806,500	3,958,800
Current liabilities	39	3,428	15,488	17,779	8,445
Total in flow	503,519	2,784,845	8,143,125	15,636,348	23,951,861
Cash Out flow	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Salaries	155,900	924,550	3,396,712	6,138,572	9,073,321
Admin expenses	102,320	590,623	1,554,535	2,196,866	2,970,314
AFAS payments	10,930	218,930	513,926	630,166	772,671
Loan repayment	-	83,333	416,667	666,667	541,667
Interest repayment	-	27,917	104,375	105,000	47,708
Fixed Asset purchase	36,500	303,000	533,000	383,000	747,000
Taxes	-	-	28,548	1,355,994	1,901,327
Current assets	23	2,057	9,293	10,667	5,067
Total out flow	305,673	2,150,410	6,557,056	11,486,932	16,059,075
Net cash	197,846	634,435	1,586,069	4,149,416	7,892,786

Conclusion:

- The model suggests that the business has the potential to be profitable in between 2 to 3 years
- Under the assumptions taken, the business will need capital to the tune of GHC4-5 million before the cash flows become self-sustainable
- Under the business model, managing cash flows will be critical as payments will not be regular throughout the year but will be aligned to the crop cycles and hence will only come intermittently

3.2 Conservative scenario

Most of the assumptions are same except for the following:

- Growth in the number of farmers is assumed to be slow, as shown in table below for the 5 years.

Year→	1	2	3	4	5
No. of Farmers	920	14,369	39,224	55,923	79,732

- Annual fee per farmer has been assumed to be GHC15 per acre instead GHC20 per acre in 'normal scenario'.
- Weighted average cost of borrowings has been assumed to be @18% instead of 12% under 'normal scenario'.

Projected figures

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
No. of farmer clients	920	14,369	39,224	55,923	79,732
No. of branch offices	-	2	5	7	10
No. of CAS	9	92	251	358	511
No. of total staff	16	118	295	415	580
Farmer revenue as % of total revenue	100.0%	90.9%	87.0%	80.0%	80.0%
Institutional revenue as % of total revenue	0.0%	9.1%	13.0%	20.0%	20.0%

Projected Balance sheets (Figures in GHC)

Assets	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Cash	210,175	930,631	581,317	667,560	397,838
Farmer fee receivable	-	-	-	-	-
Current assets	15	887	4,807	9,341	12,939
Fixed assets	24,560	139,385	303,340	300,570	380,265
Total assets	234,750	1,070,903	889,465	977,472	791,043
Liabilities	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Loans	-	416,667	1,500,000	1,208,333	500,000
Loan Interest liability	-	16,875	77,188	145,000	177,813
Current liabilities	25	1,478	8,012	15,569	21,566
Total Liabilities	25	435,019	1,585,200	1,368,902	699,378
Equity brought forward		234,725	635,884	(695,735)	(391,430)
New equity infusion	500,000	1,500,000	-	500,000	-
Current year profit/loss	(265,275)	(1,098,841)	(1,331,619)	(195,695)	483,095
Net worth	234,725	635,884	(695,735)	(391,430)	91,664
Total L+E	234,750	1,070,903	889,465	977,472	791,043

Projected Income statements (Figures in GHC)

Income	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Revenue from farmers	2,205	239,130	2,205,585	4,752,945	7,222,305
Revenue from other sources	-	23,913	330,838	1,188,236	1,805,576
Total income	2,205	263,043	2,536,423	5,941,181	9,027,881
Expenses	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Salaries	152,400	742,610	2,274,074	3,982,219	5,691,250
Admin expenses	98,440	370,276	915,947	1,285,998	1,726,488
AFAS payments	9,200	123,573	290,101	355,702	436,141
Depreciation	7,440	66,675	171,045	243,270	337,305
Interest on loans	-	58,750	216,875	269,688	146,563
Total expenses	267,480	1,361,884	3,868,042	6,136,876	8,337,746
Profit/Loss before tax	(265,275)	(1,098,841)	(1,331,619)	(195,695)	690,135
Tax@30%	-	-	-	-	207,041
Profit after tax	(265,275)	(1,098,841)	(1,331,619)	(195,695)	483,095

Conclusion:

- Based on these assumptions, the projections show that it may take up to 5 years for achieving operational break-even, while retained losses may still for coming years.
- There will be high cash requirements with high equity infusion needed from time to time.

4 Financial viability of AFAS**Key assumptions**

- AFAS will be a support body or an association jointly managed by GFUSA and FRI. It will also act as a Self-regulatory Organization (SRO) for AgroTech business model
- The revenue earned by AFAS will be split between GFUSA and FRI, based on proportion of services provided
- It will have simple model with small staff structure and infrastructural needs
- AFAS will earn revenues from its members (service delivery channel) as they will pay some licensing fee or membership. In addition, it will also get sponsorships and grants. However, in the model below only fee from members have been assumed.
- The model below assumes 10 staff for AFAS with average salary of GHC3,000 per month.
- While AFAS will have other potential revenue sources such as advertisement revenue of Farm Radio, data services and other service provided by AFAS to agriculture companies, these have currently not been assumed in the below model.

The table below shows that cost estimates for AFAS.

AFAS operating expenses		
Expenses	Monthly	Annually
Salary	60,000	720,000
Rent	1,500	18,000
Utilities	1,500	18,000

Travel	8,000	96,000
Training	3,000	36,000
Upgradation	5,000	60,000
Marketing	2,000	24,000
FRI advertising	5,000	60,000
Total	86,000	1,032,000

Based on the costs above, the number of members needed to break-even with different level of fee charged and under different operating costs, are shown in the table below.

Break-even matrix for different levels of operating expenses and fee structures

Fee per farmer per acre (GHC)↓	Annual Expenses (GHC)			
	750,000	1,032,000	1,500,000	2,000,000
5	150,000	206,400	300,000	400,000
10	75,000	103,200	150,000	200,000
15	50,000	68,800	100,000	133,333
20	37,500	51,600	75,000	100,000
25	30,000	41,280	60,000	80,000

Conclusion:

- AFAS can break-even when farmer beneficiaries cross 200,000, in a scaled-up model these levels are achievable.
- The break-even level in terms of farmers can get lowered depending on revenues from other sources
 - financial institutions, agri-input companies, agri-service providers
 - revenue from advertising on Farm Radio

5.3 Potential risks to proposed business model

In the current model the most important risks that can have adverse effect on the expected results are:

a. Lack of willingness of farmers and other institutions to pay for services

The primary clientele for AgroTech solution are farmers. Hence, it is the farmers that should be paying for the services. Under the proposed business model, farmers have been assumed to be the first and the main source of revenue.

While the proposed business model also envisions institutions such as banks, MFIs, Agri-distributors to be the potential clients and thus potential sources of revenues, they will come onboard once the model demonstrates success and significant outreach with farmers.

During this study, a significant need for such services and willingness of farmers to pay for such services was found. This is consistent even with ARP viability research earlier done by FRI. Discussions with other actors in value chain also showed interest of these institutions in AgroTech services and showed even their willingness to pay.

However, the real proof can come only when these potential clients actually pay for these services. Thus, not paying for services would be the biggest risk. The report has already presented ideas for enhancing likelihood of success of the model and for increasing willingness of farmers to pay.

b. Lack of standards regarding eligibility of delivery channels and quality of service delivery

Currently, there are no fixed standards adhered to within the model for:

- The selection of delivery channels
- Technical capacity of CAS
- Delivery and quality of services to farmers

The lack of these standards can lower the quality of services and in turn the willingness of farmers to pay for these services. Additional funding is therefore required to conduct field-level profiling to identify potential CAS and private sector institutions as well as for their comprehensive training to apply the recommendations of this report in the following areas:

- To create standards for eligibility of delivery channels
- To provide more comprehensive trainings to CAS on a variety of subjects
- To recommend CAS to Farmer ratio
- To create technical reference material for CAS
- Develop brand equity through marketing efforts
- Reporting of key performance indicators to 'umbrella body'

c. Initial investments needed, particularly in case of larger business entities

In case a business entity wants to carry out AgroTech business on a larger scale in an organized manner, there will be need for initial investment in the business to manage liquidity until the time the business is able to generate profits and also cash. This, ability to invest the business during initial phase can become a constraint. This is particularly, important for the nature of business of AgroTech where cash inflows will only be periodic, in all likelihoods, twice a year after harvest in each season.

It is therefore, recommended that entities that are unable to make significant investments initially should try and keep the costs low. The business should be organically developed. The financial modeling showed that AgroTech model has the potential to break-even at lower scales with minimal costs, as managed by OBs. A business entity with limited capacity for initial investment may adopt that model and can slowly grow as cash requirements in the model at larger scale can be high.

d. Additional funding needed

The survey findings suggest that a pilot of financial viability for integrated model will be needed.

There is a need to test the new channels and to upgrade software application. GFUSA and FRI must therefore have additional funding to engage more value chain actors like FSPs, Agri- dealers and to understand the kind of services they need and the actual willingness and ability to pay.