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Mapping of Digital Service Providers in Bangladesh for the Aquaculture: increasing income, diversifying diets, and empowering women in Bangladesh and Nigeria project

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About WorldFish

WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving aquatic food systems, including fisheries and aquaculture. It collaborates with numerous international, regional and national partners to deliver transformational impacts to millions of people who depend on fish for food, nutrition and income in the developing world. Headquartered in Penang, Malaysia and with regional offices across Africa, Asia and the Pacific. WorldFish is a member of the CGIAR, the world's largest research partnership for a food secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources.

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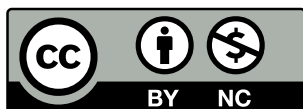
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The opinions expressed herein are those of the author and do not necessarily reflect the views of the Bill and Melinda Gates Foundation and World Fish.

Some parts of the study which highlighted the activities and projects of relevant stakeholders are excerpts from the website or communications materials of those respective companies. It was not possible to verify all information the companies claim to have done or can do.

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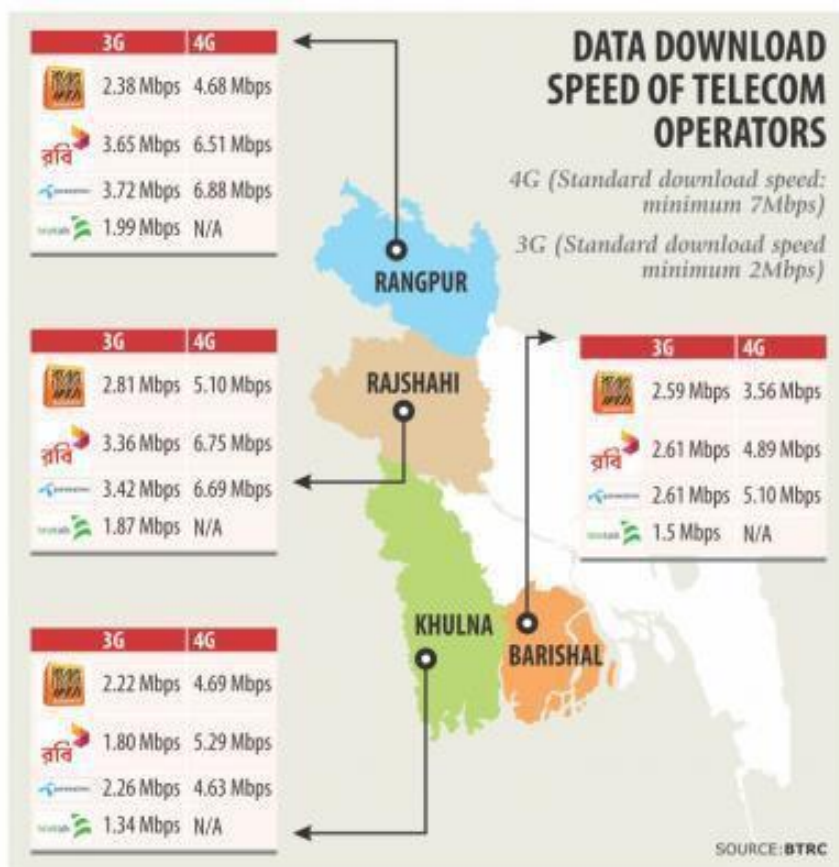
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List of acronyms

| | |
|----------|--|
| ACI | Advanced Chemical Industries |
| AIN | Aquaculture for Income and Nutrition |
| AVC | Agriculture value chain |
| BANA | Bangladesh Aquaculture and Nutrition Activity |
| BASIS | Bangladesh Association of Software and Information Services |
| BFP-B | Business Finance for Poor in Bangladesh |
| BIID | Bangladesh Institute of ICT in Development |
| BTRC | Bangladesh Telecommunication Regulatory Commission |
| CSR | Corporate social responsibility |
| DSS | Decision support service |
| FMCG | Fast moving consumer goods |
| GAIN | Global Alliance for Improved Nutrition |
| ICT | Information communication and technology |
| INGENAES | Integrating Gender and Nutrition within Agricultural Extension Service |
| IOT | Internet of things |
| IFC | International Finance Corporation |
| KII | Key informant interview |
| MAMA | Mobile Alliance for maternal Actions |
| MFS | Mobile financial services |
| MSTAR | Mobile Solutions Technical Assistance and Research Project |
| OTC | Over-the-counter |
| RDC | Rice and Diversified Crops Activity |
| SBCC | Social and behavior change communications |
| SHIFT | Shaping Inclusive Finance Transformation |
| SOFTEXPO | Software Exposition |
| SMS | Short message service |
| UNCDF | United Nations Capital Development Fund |
| UNDP | United Nations Development Program |
| UNICEF | United Nations Children's Fund |
| USAID | United States Agency for International Development |
| UDC | Union digital centers |

Executive Summary

Digital services have certainly made it easier to reach a large number of people all at once. But to what extent it has organically reached beyond the urbanites still remains a question that needs to be answered. While Bangladesh boasts of being the ninth-largest mobile market in the world with 85 million unique subscribers in 2017 (roughly half the population), only 45 million use smartphones, mostly low-cost devices. However, with a predominantly 2G mobile market, a significant digital divide prevails in the country as only one in five Bangladeshis subscribed to mobile internet services in 2017.¹



In a recent survey conducted by the Bangladesh Telecommunication Regulatory Commission (BTRC), none of the mobile operators were found able to maintain the required 4G speed of a minimum seven megabytes per second in any of the four surveyed divisions, while in Khulna division, a reputed mobile operator failed to meet the minimum threshold of 3G speed.

This makes it difficult for the scalability of digital services among the rural population because most of the digital services

require a fast internet connection and decent smartphone to work. Although different studies may provide different results, the consultant has found, due to a close working relationship with retailers and farmers, that only a handful of people in the rural districts use smartphones. And even the ones who use them are not familiar with most of the features a smartphone can have, and resort to mainly capturing photos, videos and scrolling Facebook. The cost of internet is also an issue as the consultant in a previous project found that the usage rate fell drastically as soon as the subsidy for internet packages was lifted.

Regarding free internet, there are approximately 112,249 WIFI hotspots in

Bangladesh.ⁱⁱ However, approximately 90,000 of them are in Dhaka and 9,000 in Chittagong, despite being the second biggest city. Rajshahi enjoys a measly 706 free hotspots while there are 299 in Rangpur city, mostly around city centers, airports, railway stations and universities.

Development partners and initiatives, especially over the last decade, are constantly trying to minimize the digital divide by creating mobile applications and digital materials that benefit the rural population who are mostly engaged in farming, fishing and other formal and informal professions, and by delivering digital services to rural people. But it is too early to measure the success of these efforts by the commercial viability of these digital services. In fact, the consultant could not find a single digital service that is commercially sustainable on its own.

In 2009, Katalyst partnered with Banglalink to launch an agricultural helpline for farmers, called “Banglalink Jigyasha 7676”. With more than 400,000 calls logged in call centers in the two years of the project, the agriculture helpline showed great potential. But it was later found to be commercially unsustainable and was discontinued in March 2018. Despite this, many companies like ACI, BAYER and Metal Private Limited have adopted call centers as part of their service to their farmers or consumers, and most of them are toll-free. This highlights how some companies are embedding digital technology within their services. And this adoptability could be one way of measuring success of minimizing the digital divide, although they are very far and few in between. This is not particular to Bangladesh. In the recent Digital Technologies for Resilience workshop in Thailand in December 2018, the Digital Director of BBC Media Action in India shared that out of all the digital services that development partners are promoting in India, only one has been adopted by the government, whereas the rest of them faded away when the project ended.

Another example was Grameenphone’s Mobile for Health (mHealth) initiative in 2011–2013, where it partnered with Dnet to deliver health information to expectant and new mothers in Bangladesh via SMS and voice as part of the Mobile Alliance for Maternal Action (MAMA) initiatives, supported by USAID under the United States Global Health Initiatives.ⁱⁱⁱ But, like the previous one, this did not continue. However, Grameenphone incorporated those lessons and launched ‘Tonic’, a new digital health service for its 50+ million subscribers.^{iv} This suggests that it is targeted for the mass population, instead of a niche such as pregnant women. The service provides tips on leading a healthy lifestyle, eating well, staying active and keeping hydrated on a daily basis to its subscribers. This health focus demonstrates how telecom operators focus more on the urban customers who have different needs than the project beneficiaries. But on the flip side, health is a thematic area where Grameenphone has always focused its corporate social responsibility (CSR) initiatives. Bulk messaging is also an option open to anyone.

During a stint engaged with a USAID-funded Feed the Future project, the consultant oversaw bulk messaging to its 3,000 project beneficiaries on a monthly basis. Almost all

telecom operators have this service. It was around the same time that the consultant recognized that beneficiary farmers or retailers will use a mobile application as long as their internet bill is covered or heavily subsidized by the project. It is for these reasons that some companies have also adopted technology where a farmer's call generates a 'missed call' for the companies to call back. This could be due to many reasons, including content not being developed with users in mind and poor and extremely poor people still not being ready to embrace digital technology for their own good.

In principle, any decent technology service provider is capable of developing a digital service built on programming and logic. Yet during the study, it was interesting to find a stark difference in digital services being used by private companies and development partners. In the private sector, the services are mostly designed for product or service-centric digital marketing as part of a campaign that lasts for a quarter or two, or in some cases a year. The return-on-investment is calculated at the end of the campaign, mostly short-term in nature, after which a new campaign begins. But in the development sector, as well as with the government, digital services are mostly used to raise awareness and disseminate information, and are expected to last a lifetime. But a quick look at the number of downloads of some mobile applications by agricultural stakeholders, ranging from as low as 50 to 10,000 downloads, suggests a different story. This is a very poor number considering the number of stakeholders involved in the agriculture sector—farmers, retailers, dealers, company representatives, companies, government officials and others. Despite the limitations, many development projects have initiated digital services through their projects, which has resulted in some good feedback and positive results. But it is difficult to pinpoint a stand-out service provider among hundreds of companies that now develop software, mobile applications, banking solutions and many other information communication technologies (ICT) and internet of things (IoT) related services. There are some usual suspects who work with development organizations and projects. But there are plenty of other organizations who also provide digital solutions for large local and multinational corporations, and even for the international market. Finding the right partner depends on the nature of the activities, the capacity and experience of the organization, and the specific demand of the client.

But if sustainability and scalability are priorities for a project, it should partner with a private company like ACI Limited that has a commercial interest to continue digital technology as an embedded service. It is also true that large agro or agro vet companies may not be as efficient and effective as they claim to be when it comes to the design, development, implementation and modification of a digital service. This is where a project could broker a partnership with a tech-based company like mPower, Dnet or BIID who have significant experience in these areas.

This qualitative survey was carried out over a month to understand the digital services and service providers that the Aquaculture: increasing income, diversifying diets, and empowering women in Bangladesh and Nigeria project led by WorldFish can partner with. While there are hundreds of companies at present in Bangladesh who can

develop digital services, a large chunk of them being members of Bangladesh Association of Software and Information Services (BASIS), the names that came up in most discussions were looked at for this study, which could be subjective and not free from bias. Besides primary research, more than twenty industry stakeholders and development professionals were asked about their experience with digital service providers to shortlist about forty companies for this study.

1. Objective

The objective of the study is to map the existing digital service providers and projects in Bangladesh in the areas of agriculture, aquaculture, nutrition and women's empowerment. This information will be key to selecting a digital project partner who will collaborate with the Aquaculture: increasing income, diversifying diets, and empowering women in Bangladesh and Nigeria, funded by the Bill and Melinda Gates Foundation, to design project interventions and digital materials and applications for the fish farmers in Rajshahi and Rangpur divisions in Bangladesh.

2. Methodology

The assignment, intended as a qualitative and exploratory study, primarily involved doing a desk review and conducting key informant interviews (KIIs) in person, and over the phone and social media. The KIIs were conducted with more than 20 people from the corporate sector, development partners, government-supported platforms and tech-based companies to gain a better understanding of the market and market actors. Based on the response, a rapid online search was conducted on most of those companies that were mentioned by the respondents to comprehend their activities. Some companies were contacted directly to get an overview of their services and gather additional information. As per the guidance of the client, the identification of digital service providers was segmented by three themes: e-commerce, e-finance and e-services.

For the recommendations, the consultant relied on his personal experiences, perceptions and feedback from the industry stakeholders. The consultant has been active in the private sector development space for more than a decade, a period which has seen a number of new initiatives around digital technology. He was actively involved in designing interventions that used digital technology such as mobile applications, call centers and interactive voice response for agricultural market actors, mainly farmers and input retailers.

3. Limitations

The study was intended to be a short and qualitative one that would explore the existing digital service providers and services available in Bangladesh. Due to the limited time, not all digital service or service providers could be covered. It was also not possible to get users' feedback on those digital services. However, the consultant formulated the recommendations based on word-of-mouth feedback from industry peers interviewed for this study and his own experience of coming across digital services that were mentioned by development partners.

The study also lacks a deep assessment into hundreds of software and IT companies in Bangladesh who primarily serve the private industry, both in the local and international market. The largest software exposition in Bangladesh—the 15th BASIS SOFTEXPO by the Bangladesh Association of Software and Information Services (BASIS)—took place on 19–21 March 2019, which made it difficult to schedule interviews with the software firms and their owners to gauge their interest, experience or challenges of working with development partners.

4. A brief look at potential partners

4.1 Potential partners under e-commerce

A number of online marketplaces exist in Bangladesh, mostly catering to urbanites. Most of the websites claim to have a wide portfolio, but the layout of the websites, advertisements, and promotional messages mostly focus on fast-moving-consumer-goods (FMCG), electronics and clothing items.

When partnering with such e-commerce platforms, WorldFish must consider their product portfolios and supply chains as well as their resources and ambition. There have been numerous complaints about delivery times, the quality of products received and transactions, which are usually cash-on-delivery. Managing an effective supply chain is key to managing regular customer traffic in these online marketplaces, and unless the volume of orders is ensured, it is difficult to be cost effective and sustainable in the long run. Alternately, it could be said that unless a wide product portfolio is ensured, the user-base will not grow.

For the study, ten e-commerce sites—Amar Desh E-shop, Shoparu, Bagdoom, Chaldal, Shwapno, Parmeeda, Othoba, Fresh Fish Bangladesh, Dokani and MeenaClick by Meena Bazaar—were studied and reviewed on the basis of suitability to the project. From these, the three sites listed below stand out as potential partners.

4.1.1 Chaldal

Chaldal, founded in 2013, is a Bangladeshi online grocer and food products provider. It sells fresh fruits and vegetables, meat and dairy, groceries, and personal care and household items via its website and mobile apps. It is currently serving all of Dhaka city, except for certain parts of old Dhaka because of the narrow streets and

unsystematic addresses. Chaldal depends on a network of warehouses, and currently has eight warehouses. As per their website, it claims to have had more than 1.3 million orders. Based on the last six months average, fish-related pages on its website were viewed 50,057 times, which is 1.2% of the total 3,928,736 pageviews. In the last six months (September 2018- February 2019), 2,924 sales transactions of BDT 881,419 were completed.

Chaldal received financing from the International Finance Corporation (IFC) and World Bank.^v In addition, the company received financing from other private, national and international venture capitalists, and is further attracting investment from both global and local.^{vi} Chaldal works with development partners, and has recently gone into a partnership with the Rice and Diversified Crops Activity (RDC), funded by USAID, where the consumption of nutritious crops grown in Feed the Future zones in Bangladesh will be promoted.

4.1.2 Parmeeda

Parmeeda is a local online marketplace that has carved out a niche market. It is an agribusiness organization committed to providing safe and organic food to the consumers of Dhaka and, in the future, all over Bangladesh. Fish is a specific focus of the organization. In addition to selling food, they provide training to fish farmers in certain districts. The CEO of Parmeeda is a former development consultant who managed multiple Katalyst projects through GMark.

Parmeeda has grouped their fish products into three categories: (1) inland fish, (2) marine fish and (3) dry fish. Their product range on the website is quite extensive.^{vii}

4.1.3 Othoba

Othoba is one of the top ten e-commerce sites in Bangladesh.^{viii} It is owned by PRAN-RFL, one of the country's biggest and fastest-growing conglomerates and agricultural companies. That Othoba is a subsidiary of PRAN-RFL highlights the great potential of this online market place.^{ix} It has a decent collection of fish items—both frozen and dried—on their website. PRAN separately has an arrangement with multiple development projects, but to what extent their subsidiary Othoba.com is involved needs to be explored further.

4.2 Potential partners for e-finance

E-finance, largely known as digital finance services (DFS), has taken a major leap in the last few years in Bangladesh. This has been possible due to contributions by: (1) the Mobile Solutions Technical Assistance and Research Project (mSTAR) managed by FHI 360 and funded by USAID; (2) Shaping Inclusive Finance Transformation (SHIFT) Project managed by the United Nations Capital Development Finance (UNCDF) and funded by the European Union; and (3) Business Finance for Poor in

Bangladesh (BFP-B) Project managed by Nathan Associates and funded by DFID. MetLife Foundation, an arm of the MetLife Insurance Company, has run an 'Inclusion Plus' competition to identify and support entrepreneurs, non-profit organizations and other impact organizations to help advance financial wellbeing across the world. About 15 initiatives under UNCDF, BFP-B and MetLife Foundation have been looked at in this study to find possible partners for promoting financial inclusion for market actors and farmers engaged in fisheries.

Traditionally, large financial institutions do not provide loans to farmers directly because the risks are too high. In addition, banking transaction costs are so high that it is not economically feasible to provide services to a customer who is dealing in small amounts of money. However, a number of financial institutions (both banking and non-banking organizations) have started working with development partners. Among them, Bank Asia Limited has been the pioneer. City Bank is also looking for avenues to work with development partners. IPDC, a leasing company, and Green Delta Insurance Company are also quite active in this space of digital financial services, including loans and insurance. Most of the companies are building their own IT systems to carry out these activities. But there are few other technical solution providers who are supporting some of these initiatives, like SSL Wireless Ltd., SSD Tech and CloudWell among some.

Mobile financial services (MFS) is another e-finance mechanism where Bangladesh has outshined many other countries in the world, mostly because of bKash. Although Bangladesh now accounts for more than 8% of mobile money accounts worldwide, the pattern of transactions suggests that the MFS market is yet to move beyond basic transactions—many of which are conducted over-the-counter (OTC) via an agent's account. Loan facilities are not available through bKash, and of the 57 million registered MFS users, only 52% are active.

While a number of initiatives promoting the use of digital finance are provided in the annex, the most suitable partner, Bank Asia, and its activities are highlighted below.

Out of all the formal financial institutions, Bank Asia seems to be the most active in reaching out to the rural market with their products and services, whereas almost all the banks are focused on the cities and prefer to focus on corporate clients. Building on the cutting-edge technology, the Bank is offering online banking with added delivery channels like ATMs, agent banking, tele-banking, SMS and net banking. What differentiates Bank Asia from other banks is their more than 1,700 agent banking outlets that are spread across Bangladesh and are offering support where a formal bank branch is not present. Bank Asia has partnered with multiple development partners—United Nations Capital Development Fund (UNCDF), Business Finance for Poor in Bangladesh (BFP-B), Metlife Foundation, CARE, Voluntary Service Organization (VSO), United Nations Development Program (UNDP), United States Agency for International Development (USAID), Swiss contact and many others. Bank Asia is currently in talks with WorldFish's Bangladesh Aquaculture for Nutrition Activity

(BANA) Project to reach out to fish farmers with a financial loan at low interest rate (9% yearly) with flexible repayment terms and conditions (anytime within six months).

4.3 Potential partners for e-services

Over the last 10 years, development projects have begun to use a number of e-services to reach out to their beneficiaries, create efficiency in monitoring, expedite activities and provide better solutions to meet project objectives. While most projects started off with call centers, digital services have now expanded to mobile applications, websites and digital mapping through geodata.

A brief look at some of these services and service providers allows us to have a better idea of the market. For this qualitative research, technology companies catering to both the private and development sectors were considered. Most of the digital services in the development space are catered for the agriculture and health sectors, but the technology principles are similar across all the sectors. Similarly, it can be said about companies working with corporates that they should be able to provide solutions for development partners.

A list of the companies, platforms, initiatives and technologies that were reviewed for this study are given below:

| | Name of tech companies | | Name of tech companies | | Name of tech companies |
|---|---------------------------|----|--|----|------------------------|
| 1 | Grameen Intel | 10 | Misfit Technologies | 19 | Digital Green |
| 2 | Win Miaki Ltd | 11 | Kirshi Seba by Bayer | 20 | Q-soft |
| 3 | Dnet | 12 | ACI Fosholi | 21 | Truck Lagbe? |
| 4 | BIID | 13 | ACI Rupali | 22 | SSD Tech |
| 5 | SSL Wireless Ltd | 14 | Smart Feeder by ACI | 23 | Amadeyr Cloud |
| 6 | Jeeon | 15 | Brainstation 23 | 24 | Viamo |
| 7 | BRAC | 16 | Ministry of Fisheries and Livestock | 25 | Boomerang Digital |
| 8 | mPower Social Enterprises | 17 | Access to Information (a2i) | 26 | Analyzen |
| 9 | Source Trace | 18 | Agriculture Information System under Ministry of Agriculture | 27 | Simprints |

While a brief overview of all 27 of these initiatives or companies are presented in the annex, the most potential ones are discussed below:

4.3.1 mPower Social Enterprises

mPower is a ten year old social enterprise that has worked with clients from across the world— including from Bangladesh, Myanmar, Nepal, India, Philippines, Haiti, Guatemala, Zambia, Rwanda, Botswana and USA—on issues related to health and nutrition, water and sanitation, agriculture, livestock, governance and rights, education, livelihood and poverty alleviation, and climate change.

4.3.2 Dnet

Dnet is a social enterprise that designs innovative product and service solutions for women, children and youth in rural and urban settings to create social impacts, and for institutions to enhance their capacity and productivity. Started in 2001 with a vision to empower the lives of marginalized and people with limited access to infrastructure and communications, Dnet has so far worked with both government, corporate and international agencies. Different ministries of the Bangladesh Government—such as the Ministry of Health and Family Welfare, ICT Division, Ministry of Labor and Employment, and Ministry of Science and Technology—have been their clients. Dnet has also worked with Action Aid, British Council, Institute of Development Studies, Oxfam, Plan International, Save the Children, The Asia Foundation, UKAID, UNDP, UNICEF, USAID and a few others. Dnet also provides call center solutions for all kinds of businesses and organizations with fully-fledged, technologically sound, ready to deploy infrastructure, and now supports UNCDF with mobile applications and monitoring. Out of many initiatives developed by Dnet, two social enterprises are quite relevant to agriculture and nutrition.

LifeChord, a sister concern of Dnet, is a social enterprise taking forward the legacy of Aponjon, the largest mHealth service with an innovation around health and wellbeing by educating citizens on healthcare through behavior change communication. Built on ICT-based innovation and with the experience of Aponjon, LifeChord aims to reach 10 million clients with smart digital health solutions for maternal and child health care, non-communicable disease management and automated predictive personalized health care by 2021. LifeChord, as a separate entity, has partnered with international agencies such as World Vision, ICDDR, and FHI 360, and numerous local NGOs.

Some of their projects like *Aponjon Shogorbha* 1000 comes with its messaging service to help families create happy and healthy lives. The messages of this service are delivered through SMS or voice calls. The subscriber (expecting or mother of child) will receive the service for a maximum of 141 weeks from the 6th week of pregnancy up till when their child is two years old. The subscriber will receive two messages per week during this period. Registration for this service is as simple as a call to 16227.

Similarly, *Aponjon Shoishob* is a comprehensive health information service that delivers important weekly messages to parents of children aged 2–5 years. The service is designed to cover all aspects of the child’s growth, including physical, mental, social, familial and spiritual areas. The messages are aligned to time-specific needs according to the age of the child, along with common issues that occur year round.

The other popular social enterprise that was borne out of Dnet is iSocial, which is short for ‘Infolady Social Enterprise Limited’—formerly known as Infolady, and ‘Kallyani’ at present. It is a ‘women-for- women’ family-based info-preneurship model, where a young woman entrepreneur equipped with modern ICT devices (i.e. tablet, smartphone, dongle, laptop), travels around villages on her bicycle, and facilitates the well-being of marginalized lives by creating informed choice options. It is based on a fee-for-services operations—‘service with information’ or ‘service and product with information’. A ‘Kallyani’ earns between USD 60 to USD 260 per month, depending on her skills and daily time allotment. Kallyanis are selected according to their willingness and ability to commute/travel in the locality, minimum required literacy, good communication skill, family’s permission, ability of partial investment and previous experience.

Through partnership and support from the ICT Division of the Bangladesh Government, iSocial’s plan is to first expand to 16 districts deploying 1000 Kallyanis and then gradually across all of Bangladesh to deploy 10,000 Kallyanis by the end of 2021.

Instead of acting like a vendor, mPower likes to engage as a partner and likes to design, develop, customize and implement solutions. mPower has developed digital services for the Government of Bangladesh and international development partners. Most of the services are focused on tracking and recording data for monitoring support. Their services around digital SBCC are not insignificant either, having worked in this area with Save the Children, Management Science for Health, Food and Agriculture Organization, BRAC, Population Council and ACIDI/VOCA.

On e-learning, mPower has worked with Save the Children on a USAID-funded project to create a web- panel as well as a mobile application, which enables the capacity building of the users through a one- off test that includes text, audio, videos and games. This web-panel can be customized and allows any client to create an e-learning solution.

On e-services, mPower goes to the field and helps to design solutions with the help of their internal resources who are former Department of Agriculture Extension (DAE) staff. mPower also has developed a chatbot to engage with youth and help them to create an action plan or track progress.

In agriculture, with geodata used in the control of potato blight in Bangladesh (GEOPOTATO), mPower has developed and is implementing a decision support

service (DSS) in Bangladesh to control late blight in potato. The DSS provides farmers with preventive spray advice when a late blight infection period is predicted to occur. The DSS also evaluates past sprays, which may result in curative spray advice when, despite past sprays, infection is likely to have occurred in the past few days. This early warning system can enable huge cost savings for farmers as they no longer need to resort to expensive fungicides for damage control.

Besides GEOPOTATO, mPower has a mobile application called Farmer Query System, which responds to queries by farmers. However, previous experience with FQS suggests that the call center needs to be supported with external support. In addition, mPower has developed a web-portal called *Krishoker Bondhu* and videos that can be accessed offline, and a mobile and web-portal for Crop Diagnostic Application, Seed Variety Recommendations, and Extension Agent Scheduling and Reporting system with support from a USAID-funded project.

Although mPower does not have any product specifically related to aquaculture, they claim that it should not be a problem as the software and mobile applications are based on algorithms, and aquaculture, as per their understanding, is less susceptible to external variables compared to agriculture.

4.3.3 Bangladesh Institute of ICT in Development (BIID)

BIID is an inclusive business initiative engaged in developing ICT-enabled products and services to support private and public (government and NGO) initiatives targeted for the base of the pyramid segment, in particular, and general citizens. BIID has worked with international agencies such as Catholic Relief Services, USAID Agriculture Value Chain (AVC) project, CARE, CIMMYT and Embassy of the Kingdom of Netherlands, and local NGOs including Dhaka Ahsania Mission, VSO and Oxfam.

The product portfolio of BIID that is relevant to agriculture includes:

1. Program for Advanced Numerical Irrigation (PANI) is a smart solution for irrigation systems using GIS mapping and image processing of the ground
2. MOJAI MOJAI PUSHTI SHEKHA is an android-based mobile game that helps the user to learn about nutritional foods while playing the game. BIID has developed this in collaboration with the Global Alliance for Improved Nutrition (GAIN).
3. E-KRISHOK is a mobile application for farmers and small entrepreneurs, providing a business planning solution for agriculture. With this application, farmers and small entrepreneurs can easily calculate the profitability of a specific crop cycle and store new business plans. Moreover, tips and brief information on agriculture and business development are also available in this application.
4. A nutrition-based animation is a platform used to create social awareness regarding nutrition among youth. The animation features two adolescents named Milon and Mita and a nutrition expert genie named "*pusti guru*", whom meet each other and have a conversation regarding nutrition in the Bengali language.

Besides their own products described above, BIID has been involved with development partners around women's empowerment, nutrition and agriculture which can be adapted for stakeholders working in the fisheries sector. Some of these projects are listed below:

1. Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES) strives to increase agricultural production and the incomes of men and women in rural areas who rely on agriculture for their livelihoods. INGENAES works with local partners to identify needs and opportunities for making improvements in their projects so that they can more effectively integrate nutrition-sensitive information and to achieve gender equality, improved household nutrition, and increased women incomes and, as a consequence, household food security.
2. The Farmbook Business Planning Tool in Bangladesh, part of BIID's e-Krishok service basket, is a field-based application developed with support from Catholic Relief Services to understand the cost elements, technology and quality input support services of farmers and to monitor the profits that different types of farmers gain from using technologies and linking to markets.
3. The Ground Cover App for Irrigation Scheduling project with CIMMYT is a smartphone application to support the irrigation services of farmers of the southern delta of Bangladesh during the dry season.
4. Business Network Firm to Support the Development of Peer-to-Peer Business Networks in Southern Delta is another initiative that got support from the USAID-funded Agricultural Value Chain Project.

In addition, BIID introduced *Nirvoya* to build awareness and skills to address the emerging issues of cyber bullying against girls and women in social media under a research project, "Cyber Bullying against Girls and Women over Social Media", run by the ICT Division, Ministry of Post, Telecom and ICT, Government of Bangladesh.

4.3.4 ACI Rupali

ACI Agribusiness and WorldFish, with support from the USAID-funded Feed the Future Bangladesh Aquaculture and Nutrition Activity, will jointly develop Rupali, a digital platform that will provide timely and free access to a commercial digital advisory service to small-scale fish farmers and providers of local inputs, market services and other services. For fish farmers, it will assist in all aspects of aquaculture from stock planning to taking the end-product to the market. It is expected to enable fish farmers to increase their productivity and generate more income by following the platform's advice.

Users will be able to access Rupali, which is due to be launched in the second half of 2019 (around August/September), via a mobile app, website, SMS, or outbound and inbound call centers. ACI Agribusiness as part of its WorldFish grant will initially provide training to farmer groups to implement Rupali in five districts in south-west of

Bangladesh—Bagerhat, Gopalganj, Jeshore, Khulna, and Satkhira—but the platform will be available country wide eventually. In addition, discussions with ACI indicated that it could allow nutrition and other messaging material to be included on the site.

This will be a commercial platform with ACI recovering their investment through input and market dealer’s advertisements and linkages that the platform will provide.

5. Recommendations

The selection of the right private technology service providers depends on many variables, starting from the existing capacity of the company to their ongoing assignments, which will hint at the extent of the resources it will deploy to get the job done, from evidence of working with similar projects to dynamics of their relationships with their clients, which is very important in understanding their comfort level with the task at hand. Often companies that fared well in the past may disappoint or fail to meet the objective of new project, while emerging companies might do exceptionally well to make a mark in the industry.

This suggests that no recommendation in pinpointing the right technology partner can be conclusive. But, certainly, shortlisting of partners can be done based on their previous record and the demand for their current project/s. While shortlisting for the Aquaculture: increasing income, diversifying diets, and empowering women in Bangladesh and Nigeria, which has an objective to increase productivity, income, nutrition and women’s empowerment for smallholder fish farmers in Bangladesh—the five results that are to be achieved were considered to be the crucial factors.

- Result 1: Productivity of homestead fish production systems increased
- Result 2: The value of fish and fish-based products marketed by smallholder farmers increased
- Result 3: Quality, reach efficiency and sustainability of extension services increased
- Result 4: Consumption of nutrient-rich foods, including fish and fish products improved (women and youth focus)
- Result 5: Empowerment of women engaged in aquaculture production and fish value chains increased

However, it must be mentioned that while the agriculture and nutrition sectors have seen a host of digital services, the aquaculture industry has been left far behind. There are only a handful of companies like Source Trace that have trod along the path, many of which resulted in or produced questionable outcomes. For example, Source Trace worked with WorldFish earlier in the Aquaculture for Income and Nutrition (AIN) Project, but World Fish did not have a good experience with them. This suggests that the industry may lack significant verified content on aquaculture practices, which the project’s technical staff will have to provide. If the content on aquaculture technologies and other information comes from the project, ideally any mid to large technology company should be able to roll this out. But it can be said, without a shadow of a doubt,

that input companies with a track record in agriculture can potentially be a better choice as they are familiar with the set of key factors for good aquaculture practice such as land size, crop pattern, weather forecast, input related challenges, perishability of the outputs and other topics that are common for aquaculture.

For the first, fourth and fifth results, given the number they need to reach, the project may have to rely on digital social behavioral change communication (SBCC) techniques through digital partners. If the list of beneficiaries can be provided to the technology provider, **Dnet and its subsidiaries such as LifeChord, BIID and mPower** can be potential partners because of their experience in agriculture, health and nutrition.

In terms of the third result, which deals with quality inputs, ideally a feed company can be a potential partner, but not too many feed companies have the capacity to work closely with development projects. Except for ACI, the study failed to connect with the right people within other feed companies such as Paragon, Quality, Mega and Nourish who could demonstrate significant use of digital services. The people spoken to within these companies did not seem to have a clear knowledge of the extent of the digital services being used by their respective companies, a finding that largely speaks for itself. If finance is considered as an input, which it is, it is better to work with a financial institution which has an in-house technology platform, otherwise the project will have to do multiple partnerships with a tech-provider and a bank separately. This could be very time consuming and subject to confidentiality issues as banks will allow only trusted partners. So far, **Bank Asia** with its sister-wing ERA Infotech, is the most active formal financial institution that has targeted rural groups of people as their potential customers and is willing to work with development partners. Bank Asia is currently in talks with the Bangladesh Aquaculture for Nutrition Activity (BANA) led by WorldFish to promote a small loan of about BDT 20,000 each for 600 fish farmers, hatchery owners and other market actors.^x

The second result which is about improving quality and reach of extension services could see the project work with a wide range of service providers from e-commerce sites to UBER-like transportation systems that allow perishable products like fish to be linked with the right market. Out of a large number of e-commerce sites that are available in Bangladesh, **Chaldal and Parmeeda** seem to be the best allies. While Parmeeda is quite small compared to Chaldal or other large e-commerce sites, it has created a niche market for fish buyers, and also has the technical capacity to provide training to fish farmers. Chaldal, with an investment of USD 5 million from IFC, certainly stands out from the other players, which speaks of its ambition and the due diligence it runs to get such an investment. For better reach and efficiency at market linkages, a partnership with Digital Green could be explored.

While these technology service providers may provide excellent design and implementation support, it is likely that most of them will not run these activities beyond the life of a project. Therefore, it would be ideal to partner with a company that has

commercial interest in running these digital services, and for that, **ACI (ACI Godrej Agrovat Private Limited and ACI Agri-Business) seems to be the right candidate.**

The fisheries feed component is under ACI Godrej Agrovat Private Limited, while aqua- medicine and hatchery-related technology is overseen by ACI Agribusiness. ACI has already partnered with the BANA project led by WorldFish, which will help them to develop digital services for south- west Bangladesh. Digital contents and services can be modified for northwest Bangladesh. The biggest advantage that ACI may have is a readymade list of fish farmers and market actors such as hatchery owners, feed dealers and local service providers such as *patilwalas* and also aquaculture experts in the company team. But although ACI claims to have an efficient IT team, their capacity needs to be measured before deciding whether the company could launch a platform on its own or an independent partner whose core focus is digital services with whom they need to be tagged with such initiatives in the initial years.

Outside of the usual suspects, two digital agencies who primarily serve multinational and corporate companies working in Bangladesh—Boomerang and Analyzen—could bring in the commercial angle and fulfil the demands of the project. Due to their long list of corporate partners, they might be able to find or convince companies who would be willing to continue the digital service beyond the life of the project.

Regardless of the partner, the poor and extremely poor population are missing out on the full benefits of smartphones due to language and technological barriers, some of which could be as basic as navigation skills in the online space. The consultant tested this with a selected group of people and walked them through the process of going to a Google store and downloading an application to make them comfortable with the navigation and search options. It is also the opinion of the consultant that some of the low-cost smartphones lag and are not very user-friendly when it comes to navigating a website that allows two-way communication. And according to a report by the Daily Star, the internet connection outside Dhaka is still below the standard level.^{xi} Union digital centers (UDC), formerly known as union information and service centers, could be an option since there are more than 4500 of them in all union councils, serving as one-stop information and service delivery outlets.^{xii} But the services they provide—for example, registration of births, deaths and exams; photocopying, computer browsing, electricity bill payment and other government services—do not suggest an environment where the UDC entrepreneurs will be able to help the project beneficiaries. The UDC entrepreneurs might be able to link the farmers to feed companies and help to link them with potential buyers, but as per the TIB report, unskilled entrepreneurs, the lack of space, slow internet and load shedding are affecting the performance of UDCs.^{xiii} Ninety-eight percent of UDCs are using a SIM model that is, usually, slower than fiber optic connectivity. Ironically, among the surveyed UDCs, 32.2% of computers, 37% of printers, 42% of photocopiers, 57.8% of multimedia projectors were non- functional.

With technology, the first wave of users is very crucial to establish its success. Development agencies mostly concentrate on creating an application, and often give little attention to promoting the application. As per the country manager of UBER in

Bangladesh, a mobile application, or for that matter any digital service, requires serious investment into promotional materials and marketing in the initial few months, and if it does not catch a critical mass in the first few months, it is very difficult to survive in a competitive market.

The project needs to consider all of the above when working with a service providing partner. Except for ACI, it is difficult to find another company continuing the service on its own for commercial purposes. So, if sustainability is a key element, a commercial platform like the one by ACI could be an automatic choice. But the project must learn from other initiatives, many of which have been outlined here, to create something that is demand-driven and generates revenue either directly or indirectly. Besides working with a large partner, the project could also test out a few innovative options on the side with other partners on specific issues. While a large commercial platform has a greater chance of being sustainable, it may not have room to test out a few innovations, which can be incorporated with the main initiatives if they prove to be successful on a smaller scale. But for content and quality assurance, the project must remain responsible as not much has been done on aquaculture.

Annex A: Study areas for mapping of digital service providers in Bangladesh

The purpose of this study is to carry out an institutional analysis and mapping of the existing digital service providers and projects in Bangladesh in the areas of agriculture, aquaculture, nutrition and women's empowerment. The findings will be key to selecting a digital project partner to collaborate with on designing project interventions and digital material and applications for the fish farmers in the project area. More specifically, the main objectives of this study are to:

- identify existing private and public digital entities, services, products and projects
- collect detailed information on the nature, scope, terms and level of digital services of these companies and projects in Bangladesh
- identify the customers using the ICT/digital-related services and in which regions
- produce a mapping report that will assist the project to select a company/ies and products/services to work with.

Methodology:

The study involved undertaking a literature review and consultations with key stakeholders, as per the following approach:

1. Prepared a stakeholder list based on the BASIS database and references, online information of digital service providers, services, products and projects in Bangladesh
2. Held meetings with the listed entities and collected profiles
3. Verified service provider services and products
4. Produced the final report (not exceeding 10 pages, excluding annexes) outlining this exercise and detailing the different entities and services available.

Annex B: Other potential partners for e-services

1. Grameen Intel

Technology for Social Impact (TSI) is a brand of the Grameen Intel Social Business Ltd. bringing innovative tech solutions for social impact in the areas of agriculture, health and education. They are pioneers in bringing the power of technology to the development frontier. Its sponsors and investors include the Yunus Centre, named after Nobel Laureate Dr. Md. Yunus, Grameen Trust and Intel Capital—Intel’s global investment organization that makes equity investments into innovative technology start-ups and companies worldwide.

Currently, TSI’s agricultural products are used in around 40 locations in Bangladesh by national and international partner organizations and clients. Their partners and clients include IDE Bangladesh, Solidaridad Network Asia, HELVETAS Swiss Incorporation Bangladesh, Practical Action Bangladesh, ACI Fertilizer Ltd., Rahimafrooz Renewable Energy Ltd., Padakhep Manabik Unnayan Kendra, Rural Reconstruction Foundation and Gono Unnayan Kendra.

Grameen Intel has its own products ranging from agribusiness to e-learning to wellbeing. A brief outline of their products related to agriculture is provided below:

- A) Ankur** is a seed selection and recommendation application. Rural entrepreneurs use Ankur to help farmers with better seed selection to achieve increased productivity. This application analyzes the season and farmer's land condition and prescribes the best seed.
- B) Mrittikā** is a soil nutrient analysis and recommendation software. Rural entrepreneurs offer soil testing services to farmers and use Mrittikā to analyze the results to recommend the best fertilizer to achieve optimum productivity in a cost-effective way.
- C) Protikār** is a crop software for managing plant diseases, weeds and pest organisms that damage agricultural crops. Protikār provides crop protection recommendations about harmful insects and numerous plant diseases that afflict crops. It also provides curative measures to prevent crop losses from herbicides, insecticides and fungicides.
- D) Vistār** is a software application that helps farmers to get direct access to market or buyer information so that they can sell their crops at an optimum price. This application provides a considerable business opportunity due to its enormous potential to connect buyer and seller.
- E) Soil Master** is a portable, affordable and easy to use soil testing device integrated with fertilizer recommendation software. Details of the Soil Master can be found here: https://www.youtube.com/watch?v=HDuJq_PtIE

Besides these products, which primarily cater for farmers and other agriculture market

actors, one of Grameen Intel's products, Coel, has earned a reputation for helping pregnant mothers keep cultural values in mind. Coel is a smart wearable bangle that provides pre-recorded messages for maternal health. As an additional feature, it can alert the wearer of the presence and level of indoor air pollution (particularly carbon monoxide) during daily activities like cooking, which often involves burning wood, charcoal or animal dung.

Coel is a water-resistant bangle made of high-quality durable plastic. The device lasts for 10 months (the entire pregnancy period) without charging and is programmed to "speak" about 80 pregnancy wellness messages. The device does not require internet connectivity to function. Details of Coel can be found at this link:

<https://www.youtube.com/watch?v=xU4KWJJSJQs>

Recommendation by the consultant: While Grameen Intel has some fantastic products, it might not be able to cater to the specific needs of a project. It is not a vendor, nor a contractor. The organization brings out products that aim for commercial viability. The fact that they have not developed any product solely focused on aquaculture or the capture fish market may provide us with a reality check in terms of the sustainability of a software or a mobile application beyond a project's life. But it could also be that they lack enough linkages and knowledge in fisheries. Conversations could be initiated with Grameen Intel to see if it can come up with products that may benefit aqua-stakeholders, but such a product may take years to come out and be vetted to go to market. But inspirations can be taken from these or similar products that are available in the market and a product specific to the industry could be created with or without engaging with Grameen Intel Ltd.

2. Win Miaki Ltd.

Win Miaki Ltd (WML) has been one of the pioneers in engaging digital technology to support development projects. Starting off with Katalyst, Win Miaki went on to work with a number of development partners including Oxfam, CNFA, Practical Action, Helen Keller International, WorldFish, ACDI VOCA and IRRI.

Win Miaki Ltd. (WML) aims to contribute to developing the agriculture sector in Bangladesh through its low-cost agricultural input helpline. The helpline provides farmers with advanced agri-information on agriculture, livestock, fisheries and nutrition, which thereby empowers farmers through access to information on local market trends via ICT. WML provides call center-based updates and farmer-friendly information from their agri-content bank, which is highly customized and developed with support from the government and NGOs. Its product and service portfolio includes:

- A) Agro IVR** provides interactive voice records for agro-related information. Win Miaki claims to have developed about 1500 farmer-friendly contents for IVR services.
- B) Agro call center** is a live call center with agriculturalists.
- C) Agro voice SMS** provides voice records for specific rural/urban segments, which get pushed weekly through outbound calls. Win Miyaki claims to have developed about 1500 agro-related and 150 nutrition-related voice SMS in partnership with government and NGO sources.
- D) Agriculture SMS tips** provides tips for specific rural and urban segments based on the location of the customers.
- E) Weather updates.** Win Miaki has partnered with the Bangladesh Meteorological Department (BMD) to deliver a nationwide weather and agro-met information service through different channels that include daily weather updates/alerts, weekly forecasts of local weather, and special forecast updates during natural disasters.

F) Adulterated Product Tracking (APT) is an ICT-based service to fight counterfeit products.

G) *Krishi Yellow Pages* is a product created with support from CNGA that lists the contact details of local farmers and retailers.

Recommendation by the Consultant: WML is one of the usual suspects that development partners engage with. The company has some notable results and have provided support to: the USAID-funded Agro-Input Project where they developed the *Krishi Yellow Pages* and adulterated product tracking; the USAID-funded Agriculture Extension Service Activity led by Dhaka Ahsania Mission; Oxfam's PROTIC (participatory action research intervention) project, where agricultural and agro-metrological information is being provided through SMS, out bound dialer (OBD), interactive voice response (IVR) and call centre support to the project participants.

However, copyright can become an issue. It is debatable if products and services made with donor funds can be commercialized beyond a project's life. In that case, Win Miyaki does not become a vendor; it turns into the owner of that specific product. If this can be sorted during negotiation, WML could be a legitimate partner.

3. Dnet – discussed above

Recommendation of the Consultant: Dnet and the social enterprises developed by Dnet mostly relate to maternal and child health, as well as the infolady service. While it has worked with micro-merchants through support from UNCDF, Dnet may not have engaged with fish farmers and other stakeholders involved in this sector. To what extent the info lady service, who usually deals with FMCG products, will be successful for feed or other inputs is something that has not been explored before.

4. Bangladesh Institute of ICT in Development (BIID) – discussed above

Recommendation by the consultant: BIID has been working in the market for more than a decade. It has spread itself over a range of issues, which can be both good and bad. That they have worked with development partners on agricultural issues makes them a possible candidate. However, the size of their team and existing engagements need to be checked before getting into a partnership.

5. SSL Wireless Ltd

Over the last decade, Software Shop Limited (SSL Wireless) has been focusing on developing media and financial services. Currently, it is serving more than 20 TV and online news channels, more than 45 leading private and public banks, more than 12 insurance companies, and more than 800 corporate businesses of Bangladesh by offering application software solutions including mobile VAS, mobile financial services,

messaging solutions, mobile recharge, online payments, internet banking VAS and payments solutions and agent banking services. SSL Wireless is also serving the government by providing SMS services to the passport office, Bangladesh Road and Transport Authority and Dhaka Electric Supply Company.

With its consistent efforts, SSL has become the largest merchant solution provider serving more than 1000 merchants across the country through its internet payment gateway solution called [SSLCOMMERZ](#). Of the total online transactions in Bangladesh, 80% of those are processed through this gateway. SSL has already signed agreements with 10 prominent banks, including Standard Chartered Bank and BRAC Bank.

SSL provides all sorts of bulk SMS and push services, offers promotional call and outbound call service solutions, provides search engine optimization solutions (the process of affecting the visibility of a website or a web page in a search engine's search results), social media marketing (the process of gaining website traffic or attention through social media sites), creates mobile portal and application solutions, and offers an in-house call center. For supply chain-oriented businesses where the retailers can send messages for a stock request and the principal/central office can also send information about new products and inquire stock reports, SSL has an inventory and order management system. This can be used as a two-way communication tool between manufacturers and retailers. For companies needing marketing and sales support, SSL has a mobile-based solution that makes managing field sales or service teams easier. With features such as service call management and scheduling, lead management, time and location reporting, travel and expense capture, this application provides valuable field insights to management, ensures the effective deployment of field personnel, and empowers them to complete their activities and reporting through their mobile phones.

Recommendation by the consultant: The name—SSL—came up in most of the interviews and conversations during this study. SSL seems to be one of the top players that offers a wide range of services. While the company may not be a technical expert on agriculture or aquaculture, it is an expert in digital services, and could support any initiative related to e-service, e-commerce or e-finance. However, SSL seems to cater to the government and large banks, which could suggest that they prefer or deliberately choose to work with large contracts, but that may not be the case always.

6. JEEON

Jeeon supports and promotes pharmacies with a simple app that builds their capacity and connects them to quality healthcare services, drugs and products, thereby improving the quality of care for their patients. Jeeon has enlisted over 500 pharmacies in their network and covers all seven divisions. Jeeon is also working to digitize the distribution of quality drugs and products. Its supporters include USAID, Frontier Innovators, SPRING Accelerator and the ICT Division of Bangladesh. Jeeon has a telemedicine app and an e-learning app as well.

Recommendation by the consultant: JEEON is focused on the health sector. While they will not work in any other sector, the technology behind telemedicine or working through designated retail shops/pharmacies could be a lesson for any company trying to distribute products and serve its stakeholders.

7. BRAC

BRAC has developed a technology using remote sensing and GIS for river bank erosion prediction. The technology involves a number of stages that begin with the remote sensing analysis of high-resolution satellite images to identify erosion risk areas. The combined application of GIS with the results of remote sensing analysis leads the way to spatial presentation of risk areas. Later the GPS survey and land use map analysis with ERDAS Imagine 14.0 (Remote sensing) and ArcGIS 10.3 (GIS analysis), the spatial data of risk areas are identified. The overlay analysis of risk areas and social map results in a risk map showing vulnerable areas. Once the vulnerable sites are identified, a number of dissemination materials are prepared, including base maps, posters and leaflets. The materials are then distributed among members of the community, and community meetings are organized to spread awareness and inform vulnerable communities about the extent and possibility of erosion. Red and yellow flags are used to mark zones with details on the precise location according to the GPS point. Currently, this technology is being used by 3000 individuals.

Recommendation by the consultant: BRAC is known to be an implementer, not a technology service provider. This example shows how GIS could be used for decision-making. Many USAID-funded projects are collecting GIS information, but to what extent the projects are using this data is something that's unknown

8. mPower Social Enterprises – discussed above

9. Source Trace

Source Trace promises complete digitization of the value chain in the agriculture and allied sectors, which includes aquaculture, plantation and forestry. Source Trace has worked with VSO, WorldFish, BRAC, Catholic Relief Services, TechnoServe, C&A Foundation and many private companies. For the Aquaculture for Income and Nutrition (AIN) Project led by WorldFish, Source Trace introduced a new technology for shrimp farmers in the southern part of Bangladesh. The app, eServices Everywhere (ESE™) of Source Trace, processed and analyzed data from all aspects of shrimp farming to offer traceability details throughout the production process, from hatchery to harvest. The objective of the initiative was to get real life experience with Source Trace's e-Services Everywhere (ESE™) platform to establish a digital traceability system. It was also designed to record feed input.

Some of their recent projects include: a supply chain management system for VSO Bangladesh for their Kellogg 100k potato farmers' contract farming program; Daily Rain and Hailstorm reporting solutions from 4500 unions supported by the World Bank for the Department of Agriculture; and Farmer Advisory Solutions for Agro Meteorological Information System Development (AMISD) Project, funded by the World Bank, again for the Department of Agriculture.

Recommendation by the consultant: Source Trace has significant experience working in the supply chain of both the agriculture and aquaculture sectors. Past experience of working with them will play a key role in deciding how suitable they are and how committed they are to their promises. As per feedback from WorldFish representatives, the previous experience was not so good. But, that the company is engaged in large projects funded by the World Bank may speak of their capacity and quality.

10. Misfit Technologies

Misfit Technologies Ltd. is a technology company focusing on artificial intelligence (AI) and internet of things (IoT), with a primary focus on agri-tech and consumer tech. Their IoT capability includes devices that can collect soil parameters (pH, moisture, fertility, weather data) to provide data for precise agricultural practices. The company is developing "fitbit" for cows, which is a low-cost device that can measure different health parameters of a cow, especially the heat cycle of a cow. Farmers can lose up to USD 400 dollars each time they miss the heat cycle in a cow. Through the device, farmers will get a notification when a cow is in heat and ready for artificial insemination. Their IoT capabilities also include automated and intelligent fish feeding system. Eighty percent of fish farming costs come from feeding. The intelligent auto-feeding method can help farmers to optimize that cost, resulting in better feed performance, water

quality and fish growth. The company has also developed Bangladesh's first crowd farming platform called iFarmer, where anyone can invest in farming activities. The platform won the Startup with the Most Social Impact Award by the Swiss Embassy in Bangladesh. Clients and partners of Misfit Technologies include Grameenphone, Solidaridad, CARE Bangladesh and UNDP Youth Co: Lab.

Misfit is also focusing on AI and machine learning-based consumer data technology and working with clients like Unilever, Uber, Star Cineplex and more. They have offices in Singapore, Bangladesh and Myanmar.

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Misfit is also focusing on AI and machine learning-based consumer data technology and working with clients like Unilever, Uber, Star Cineplex and more. They have offices in Singapore, Bangladesh and Myanmar.

Recommendation by the consultant: Misfit Technologies has products that are quite advanced. The IoTs like sensors and other technologies are a bit expensive, and mostly used for commercial farming. Some of the products need to be tested on a wider scale as they have fantastic potential, but if poor and extremely poor households are the beneficiaries, these devices will be out of reach for many, if not all. But commercial feed companies or input companies can certainly use these digital technologies to make informed decisions and improve their efficiency.

11. Krishi Seba initiative by Bayer Crop Science Limited Bangladesh

The Krishi Seba initiative aims to support farmers by giving timely advisory services tailored to local needs. Every crop clinic (Bayer Krishi Seba) has one crop clinic advisor, one field associate and a field demonstrator covering 10 villages. The crop clinic provides solutions through its own expertise, and maintains a disease catalog and flowchart and shares photo of diseased plants in its WhatsApp group of experts.

Bayer also has farm advisors, who demonstrate new farming technologies, conducts live displays of pest symptoms and has a call center.

12. ACI FOsholi

ACI Agribusiness recently launched an ICT-based mobile application named 'Fosholi' with the technical support of the Netherlands Space Office (NSO) and SNV Netherlands, and financial support from Geodata for Agriculture and Water (G4AW). The mobile application provides agricultural information services including inputs usage, cultivation techniques, disease control, harvesting and post-harvest techniques; location-specific weather updates; location and contact details of local input retailers and dealers of ACI; contact details of local agricultural extension officers; and the option to sell produce directly to ACI-enlisted suppliers or traders. It also offers advisory support on crop suitability and crop growth stages, and provides pest and disease alerts and a crop yield forecast.

Thirty thousand users have already been reached through promotional campaigns. 100,000 farmers have been targeted where 25% are female farmers. The initiative will be gradually spread if the pilot phase meets the expected results. Farmers have been trained in using the application and are expected to train another 25 local farmers.

13. ACI Rupali – discussed above

14. Smart Feeder implemented by ACI

The USAID Feed the Future Asia Regional Project (AIFA) managed by Winrock International, promoted smart feeder, a technology developed by an Indonesian entrepreneur that informs the right time for feeding based on the fishes movement. ACI bought a few smart feeders for use in their ponds. But the smart feeder is very expensive and can only be used for commercial fish-farming. However, due to its high cost and issues linking the application to the feeder, the technology supposedly did not work.

15. Brain Station 23

Brain Station 23 is now a global name which has spread out to Netherlands, Denmark, Switzerland, Canada, UK, USA, Israel and the Middle East. From working with startups to developing enterprise solutions and managing business processes, the company helps its clients with customized IT solutions to minimize their IT headaches and keep their IT operations run effectively.

Brain Station 23 can provide all range of services from banking solutions to mobile application, from software development to ecommerce. Its portfolio for corporate clients includes an intranet portal for Robi Telecom, a survey app for British American Tobacco in Bangladesh, mobile Sales Force automation for Incepta Pharmaceuticals, a SharePoint portal for Beximco Pharmaceuticals, and the PriyoShop e-commerce site.

Recommendation by the Consultant: Similar to SSL Wireless, BrainStation 23 was mentioned in almost every discussion, and seems like one of the top players. But the top players have also been overlooked by development partners either because they are engaged mostly with corporate partners or because the development sector has failed to reach out to them.

16. Ministry of Fisheries and Livestock (MoFL)

Amid all the digital services available from the private sector, the Ministry of Fisheries and Livestock has also embraced technology and supported the development of a mobile application called Fish Advice. Fish Advice is a mobile application containing various pictures of fish diseases, symptoms, preventive measures, fish culture methods and other problems, and addresses all sorts of fisheries-related problems within the remit of the Ministry of Fisheries and Livestock. However, only approximately 10,000 users installed the application. It is not clear how many of them are still using it. The application was last updated two years ago.

There is another mobile application, Dr. Fish, listed on the MoFL website but it does not work. MoFL also has a web service for fish feed licensing and fisheries hatchery registration.

17. Access to Information (a2i)

Access to Information (a2i) in collaboration with the Department of Agriculture Extension (DAE) has developed two digital platforms, “Krishi Batayon” (agriculture portal) and “Krishi Bandhu Phone Sheba”, to expand e-agriculture services across the country. Any farmer included in the list of Krishi Batayon can ask any agricultural question by making a call to 3331.

A2i has nothing focused on nutrition or fisheries. Engagement with them could be initiated to develop a similar knowledge bank for aquaculture. Although self-autonomous, a2i, housed in the Prime Minister’s Office (PMO) ,is heavily influenced by government priorities.

18. Agricultural Information System

The Agricultural Information Service under the Ministry of Agriculture (MoA) provides information to the mass people on technology advancements for enhanced development. As per their claim, one can get detailed information and advice on how to plan production of a profitable agro-based product such as a land crop, fisheries and livestock by using the mobile application. Further, one can also know about the implementation methodology, management and maintenance of the agro-based products.

AIS has developed a call center with a short code of 16123 with support from Practical Action Bangladesh. AIS also has a mobile application that has been downloaded more than 10,000 times. These are running parallel to the initiatives launched by a2i.

19. Digital Green

Digital Green is a global development organization that empowers smallholder farmers to lift themselves out of poverty by harnessing the collective power of technology and grassroots-level partnerships. It started as a Microsoft research project in 2006 to test the role of technology in small- scale agriculture system. A peer-reviewed paper shows that Digital Green's low-cost community- driven video extension model can improve the speed and effectiveness of the extension system ten- fold per dollar spent. Banking on the success of its model, Digital Green has since scaled the technology to 14 countries, reaching 1.8 million households, and has worked with a wide range of development partner and government extension system.

Over the last few years, Digital Green has received funds from USAID, Bill and Melinda Gates Foundation, Google, Oracle, Ministry of Rural Development (Government of India) and Ministry of Agriculture and Natural Resources (Government

of Ethiopia). Digital Green has multiple solutions available:

- A) Community videos.** Digital Green has more than 6000 locally-relevant videos in more than 50 languages.
- B) Loop** is an UBER-like app that provides a logistics service to sell a farmer's fresh produce.
- C) Training courseware** involving a digital training curriculum with online and offline components that has practical instructional videos to guide trainers and a mobile training app that assesses the skill level of frontline workers.
- D) Connect Online Connect Offline (CoCo)** allows users to collect and visualize crucial insights anytime, anywhere, on any device, regardless of network connectivity.
- E) VideoKheti** is a responsive web application that provides access to Digital Green's video library through an easy-to-navigate interface for low-literate farmers and extension workers on any device. The navigational layer uses graphics, audio and touch interaction to make simple choices about crops and crop phases.
- F) Farmerbook** is an open-access platform that displays detailed timeline-based activities of farmers that Digital Green have worked with, along with villages plotted on Google Maps.

Recommendation by the consultant: Digital Green is fairly new in the country and works mostly with USAID. However, the contract needs to be at least USD100,000 a year for Digital Green to be engaged in a partnership. Like Grameen Intel, Digital Green has its own products. To what extent it will be willing to customize its products needs to be explored. On top of this, their content is focused mostly on agriculture, and they may lack rich content around aquaculture.

20. Q-Soft Precise Assistance

Q-SOFT is a computer software developing company that is starting a revolutionary break-through in the field of software development. It provides total software and hardware solutions, support and development. Q-Soft Precise Assistance successfully developed a smart phone-based collection process for the BRAC Microfinance Programme. In addition, they have successfully designed and developed the Department of Agricultural Marketing's official website (www.dam.portal.gov.bd) and an agri-market software based on the Department of Agricultural Marketing requirements. It should be noted that the Department of Agricultural Marketing is a government department responsible for marketing agricultural products and techniques in Bangladesh.

21. Truck Lagbe?

Truck Lagbe is a mobile application for easy access of trucks across the country for transporting goods and different products for anyone. Everyday, tons of products are delivered across the country by different commercial vehicles and sometimes it becomes a huge hassle when one cannot find a proper and safe transport to deliver heavy goods. Most of the trucks take a delivery and then come back empty, which increases supplier costs unnecessarily. Truck Lagbe aims to develop a connection between the service receiver and the truck owner or the agency, ensuring a safe delivery of goods to their proper destination. The app is operated by the owner of the vehicle and directly connects them to shippers.

22. SSD-Tech

Systems Solutions & Development Technologies Limited (SSD-Tech) is a renowned global software development company. Since 2004, SSD-Tech has successfully provided proven and integrated telecommunications and business solutions to both large corporations and small enterprises in the banking, telecom and various other industries. SSD-Tech now operates and has liaison offices in Afghanistan, Bhutan, Nepal, South Africa, Pakistan and the United States. Its blue-chip clients include Airtel, Banglalink, BBC, Bhutan Telecom, British American Tobacco, BT, Fedex, Finlays, Grameenphone, Robi, and Unilever, among others. Notable work of SSD-Tech includes Video Doctor for Grameenphone, mHealth service for Aponjon, a reporting system for British American Tobacco, an e-commerce platform for Robi, and enabling a remittance validation and disbursement system via SMS notification and confirmation for Robi Service Partners (retailers and distributors).

SSD-Tech has services on mLearning that facilitates an education service and sharing knowledge base through telecom network by using mobile phones as a learning tool.

This service can be provided by audio services accessed via IVR, SMS services and WAP portal. It also have an mHealth (mobile health) service that broadly encompasses the use of mobile telecommunication technologies in health care delivery. The premise of the service is to provide important health messages, by IVR and SMS, to pregnant women, mothers with newborn babies and husbands/guardians to help reduce maternal and child mortality rate through improved health seeking behaviors. Other mHealth applications include the use of mobile devices to: collect community and clinical health data; deliver healthcare information to practitioners, researchers, and patients; undertake real-time monitoring of patient vital signs; and provide direct care (via mobile telemedicine). In Bangladesh, SSD-Tech's mHealth service is available on all telecom operators in Bangladesh. In addition, SSD-Tech has voice portal, which is an interactive voice response-based service that allows a user to listen to updated information on news, sports, entertainment and infotainment services.

23. Amadeyr Cloud

Amadeyr Cloud Ltd. (ACL) is an information communications technology-based solution provider for a wide range of industries including the public and private sectors. Specifically, ACL focuses on delivering optimized solutions that add value to an organization's products and processes that help reduce the costs of service delivery.

In keeping up with the changing digital technology landscape, ACL invests in research and development to develop original software products in-house based on market needs and trends. As a result, most of ACL's solutions are considered to be ahead of the curve. ACL is Bangladesh's first cloud services provider with both public and private cloud installations in Bangladesh. ACL also develops mobile applications, designs and web applications. The client list of ACL includes BanglaLink, Bangladesh Bureau of Statistics, Buro Bangladesh, Department of Agriculture Extension, and Quality Feeds Limited.

24. Viamo

Viamo is one of the largest development-focused mobile communication service providers in Africa and Asia. It helps partners to run large-scale behavior change campaigns and surveys through mobile phones. In Bangladesh, Viamo has worked with Save the Children around social accountability, BRAC around disaster resilience, ICDDR, B around health and a few other clients. Some of the products Viamo claims to have worked on in the agriculture sector are a mobile curriculum, content libraries, farmer calendars, farmer surveys and polls, and a buyer-seller marketplace

25. Boomerang

Boomerang is a digital agency that specializes in website and mobile application development, UX/UI design and content strategy. Although the agency has not worked with development partners, its corporate clientele is quite impressive, having worked

with Bagdoom, Bata, Beximco, British Council, Chaldal, City Bank, Grameenphone, IPDC and Telenor Health.

26. Analyzen

Analyzen is a digital agency that primarily serves the private sector on developing digital and web content, apps and games development, analytics, enterprise software, digital strategy and digital buying. Its client list includes ACI, Berger, bKash, British American Tobacco, Marico, Nestle, Pizza Hut, Samsung, Unilever and many other private companies.

27. Simprints

Simprints is a nonprofit technology company that originated at the University of Cambridge. Backed by the Gates Foundation, USAID, DFID, Draper Richards Kaplan Foundation and others, the company builds biometric fingerprint technology for use by governments, NGOs and nonprofits for people in the developing world who lack proof of legal identity. The company promotes a portable biometric system designed for front line workers. The technology uses Bluetooth to connect to an Android mobile device that is interoperable with existing mHealth systems.

In Bangladesh, Simprints has worked with the BRAC Manoshi project where they have recorded 11% more post-natal care visits for newborns, and 38% more maternal health visits.

Annex C: Other potential partners for e-finance

A brief look on the some of the e-finance activities will allow us to identify suitable options as partners to provide credit products for the project clients.

Initiatives under UNCDF

With support from UNCDF, Bank Asia, Grameenphone and MicroSave are implementing an initiative where 500 Grameenphone agents are turned into agents of Bank Asia so they can channel government disbursements under social security (G2P) and process business transactions (B2P) for the FMCG market. Bank Asia has developed a payment gateway system for this and a mechanism by which the credit worthiness of these agents are assessed. MicroSave is responsible for orientation, training, reporting and module development.

iSocial by Dnet has hundreds of mobile agents/vendors who sell FMCG products door-to-door in the rural market. Through support from UNCDF, these agents, named 'Kallayni', have been turned into agents for mobile banking. The initiative is also trying to allow these mobile agents to make bulk purchases from FMCG companies through the DFS channel.

Under UNCDF, Dnet has come up with a mobile application named '*amar dokan*' that allows a retailer to manage accounts and record sales data digitally.

There are other initiatives that UNCDF is supporting to expand mobile financial services among retail shops, and link FMCG companies directly with women entrepreneurs for payment.

Initiatives under BFP-B

CAPM Venture Capital & Finance Ltd. (CVCFL) has developed a financial product that considers the crop cycle and cash flow of farmers. It follows a hybrid model that is based on group collateral and functions through an online credit facilitation platform, which reminds the borrowers about repayment dates and the procedure to follow for repayment. With support from BFP-B, CVCFL expects to provide financial loans to 1600 farmers each year.

Bank Asia, VSO, Syngenta and RDRS are implementing another project with support from BFP-B where they are providing loans to farmers and supporting them with crop aggregation.

The Credit Rating Association of Bangladesh (CRAB) has come up with an alternate credit scoring system where they look at mobile data as well as 170 other parameters to assess the credit worthiness of borrowers. This is done for people who do not have a bank account or do minimal transactions through banking channels.

IPDC is implementing an initiative around supply chain financing. IPDC has procured blockchain technology from IBM where a transaction profile is built between a primary and secondary supplier. Usually, the transaction between a primary and secondary supplier is cash based, making it difficult to assess the profile of the secondary supplier. IPDC is working with Aarong and BSRM on this so they are able to provide financial products to a secondary supplier once a credible transaction history is created. This principle, if practiced, will provide the feed companies with a major advantage over their competitors.

IPDC is also supporting Unilever to create a transaction profile between dealers and retailers. IPDC is directly giving loans to retailers based on the data. If the retailers do not pay back the loans, companies will stop supplying the products to those retailers. Green Delta Insurance Limited has expanded its weather-based insurance that considers varied weather indices for fourteen different crops. They receive the data from Skymet and the Bangladesh Meteorological Department. So far, there has been 3200 claims out of which 40% have been paid.

The uniqueness of this insurance is that it is not subject to an in-person inspection. There are thresholds set in the system. If those thresholds are surpassed for any reasons, farmers get paid, allowing manipulation or miscalculation leading to all or most farmers demanding payouts. Green Delta Insurance settled a claim of 1000 tomato farmers in Chitalmari, Bagerhaat.

Initiatives funded by MetLife Foundation

As part of the weather-based insurance product mentioned above, Green Delta Insurance has received funding to pilot weather index-based agricultural insurance to develop and mitigate the weather-related risks faced by farmers during the cultivation process.

ShopUp is a credit evaluation and referral platform helping social media-based women entrepreneurs to get access to affordable financing and receive support.

Sajida Foundation, with partial funds from the MetLife Foundation, offers three specific solutions: (1) mobile money-based loan payment and saving services, (2) goal-oriented term deposit products using financial advisory services, and (3) remittance from migrant borrowers using formal channels to its members.

MetLife Foundation is also supporting the 30-month Sarathi—Progress through Financial Inclusion Project (Jan 2018–Jun 2020). It is working with commercial banks and ready-made garment (RMG) factories in Bangladesh to bring RMG workers, especially women, within the sphere of formal banking services and to enable them to conduct financial transactions as account holders and clients.

Other initiatives

ShopUp is a one-stop solution for Facebook entrepreneurs, mostly women. This platform provides social media based micro- entrepreneurs with a way to sell through better organization and access to affordable financing. Currently, over 50,000 entrepreneurs are registered on ShopUp's platform.



Figure 1: Screenshot of ShopUp's webpage

ShopUp, a messenger-based cart management system, was launched in 2016, allowing the company to capture day-to-day activities of a Facebook micro-enterprise. It facilitates the purchase of goods via

Facebook by installing a catalogue, cart and checkout system on the Facebook page, and providing the basic features of e-commerce directly on Facebook. The ShopUp algorithm analyzes 25 data points of a micro-enterprise and its owners, and assesses their capital requirement and repayment capacity. The platform then refers these micro-enterprises to partner with financial institutions that disburse loans directly to the merchants.

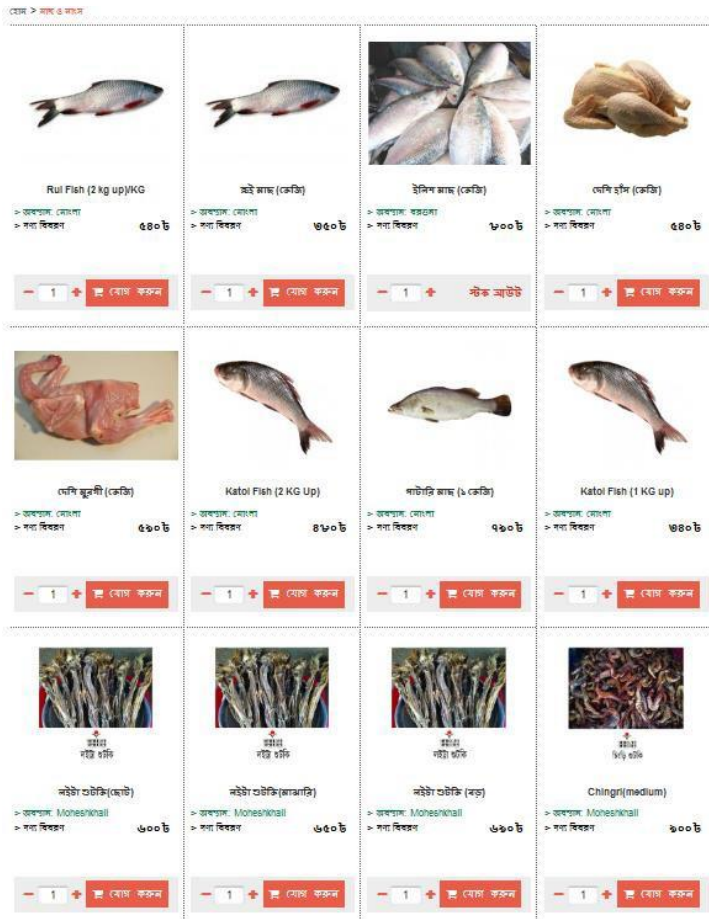
Annex D: Other potential partners for e-commerce

A number of online marketplaces exist in Bangladesh, mostly catering to urbanites. Most of the websites claim to have a wide portfolio, however, there have been numerous complaints about the delivery times, quality of products received and cash-on-delivery transactions. Managing an effective supply chain is key to managing regular customer traffic in these online marketplaces, and unless the volume of orders is ensured it is difficult to be cost effective and sustainable in the long run. Alternately, it could be said that unless a wide product portfolio is ensured, the user-base will not grow.

A brief outline of some of the online marketplaces for fish is provided below.

1) Amar Desh E-Shop by Amar Desh Amar Gram

Amar Desh Amar Gram (ADAG) is an initiative that has established an ICT-based



network that connects rural life with city life, and vice versa, to empower women, the underprivileged, and poor beneficiaries. Apparently it is run by local school students employed by the e-center and supervised by their headmaster, who is the head of management. They register members who want to sell, manage the inventory and customer orders, and facilitate delivery. The website has a decent collection of fishes, but the system only works when a certain volume of orders has been placed. If the site is not one of the top ten e-commerce sites it might struggle to manage delivery costs and provide timely delivery.

Figure 2 A snapshot of the fish section under Amar Desh E-shop

2) Shoparu by Grameenphone Ltd

Shoparu is an online marketplace from Bangladesh aspiring to delight customers with each transaction. As a marketplace, Shoparu integrates suppliers across Bangladesh and connects them seamlessly to online consumers all over the country. It is part of the Operator Agnostic Digital Initiative by Grameenphone.

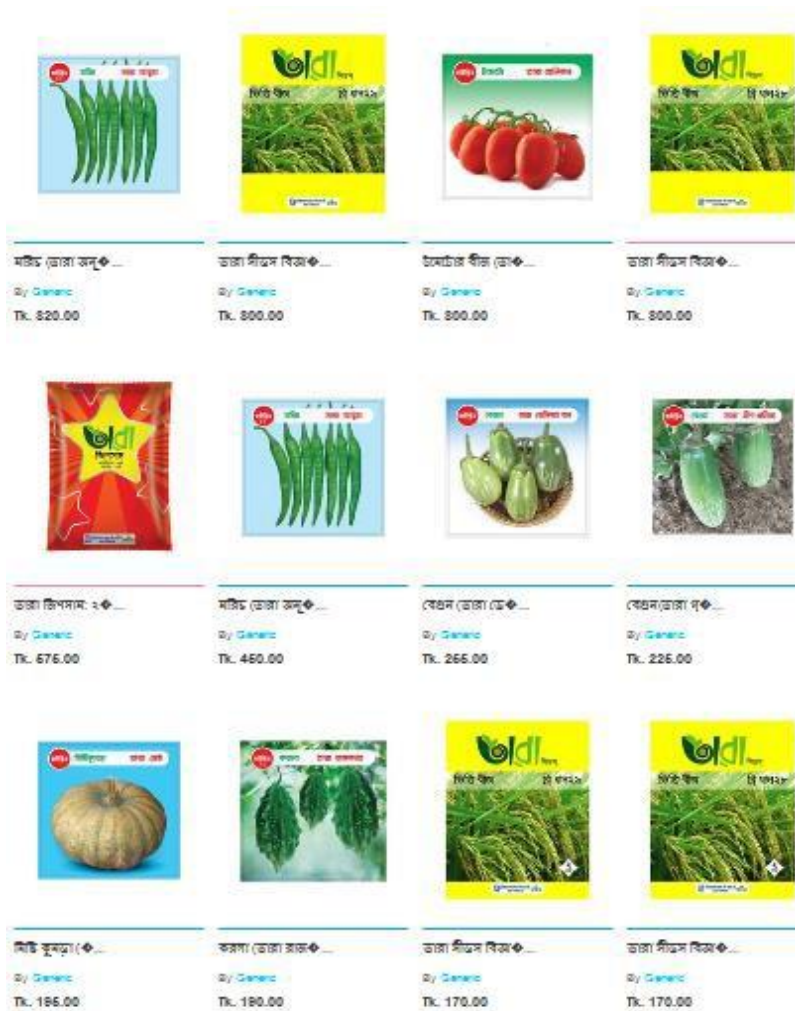


Figure 3 A snapshot of the Shoparu marketplace dedicated to agricultural produce.

Shoparu is in discussion with the USAID-funded Rice and Diversified Crops (RDC) Project to have inputs and outputs available in their marketplace. They have also partnered with the Solidaridad Network to link its beneficiaries' produce and mangoes with urban customers. However, a lot of these activities are in the pilot phase and that their page only has a few agricultural products suggests that they are not yet a popular online destination for customers of products.^{xiv}

The advantage of Shoparu is that it uses the distribution channel of Grameenphone and promises to deliver products to a customer's door. However, it is still yet to make a mark among the agricultural market actors.

ADAG is one of the finalists of the Tech4Farmers Asia Challenge 2.0.

The event, organized by USAID and Winrock International, brought together some of South and Southeast Asia's most promising ag-tech startups, vying to win support to help them to improve the adoption of their products in home and regional markets.

ADAG works very closely with the government and claims to have a regular customer base of 1500–2000, but for an online marketplace to work it needs far bigger customer base to maintain the supply chain. Quality control could be an issue as the school students and headmaster, who might be involved part-time or on commission- basis, may not have the technical expertise.

3) Bagdoom

Bagdoom^{xv} is one of the top ten e-commerce sites in Bangladesh, targeting urban customers with mostly FMCG products and electronics. Up till now, there are no agricultural products available on their website. However, in February 2019, Bagdoom and Women's Economic Empowerment through Strengthening Market Systems

(WEESMS) by IDE

Bangladesh partnered to launch the Krishti project with an aim to promote rural woman artisans and enable them to preserve the artistic heritage of Bangladesh. With IDE Bangladesh's industry experience and Bagdoom's e-commerce reputation, the partnership has resulted in facilitating women empowerment through financial inclusion. Although it sounds good, there are few products listed under this section. But, certainly, it has potential. In the long run, Krishti aspires to expand to accommodate more women under the system.

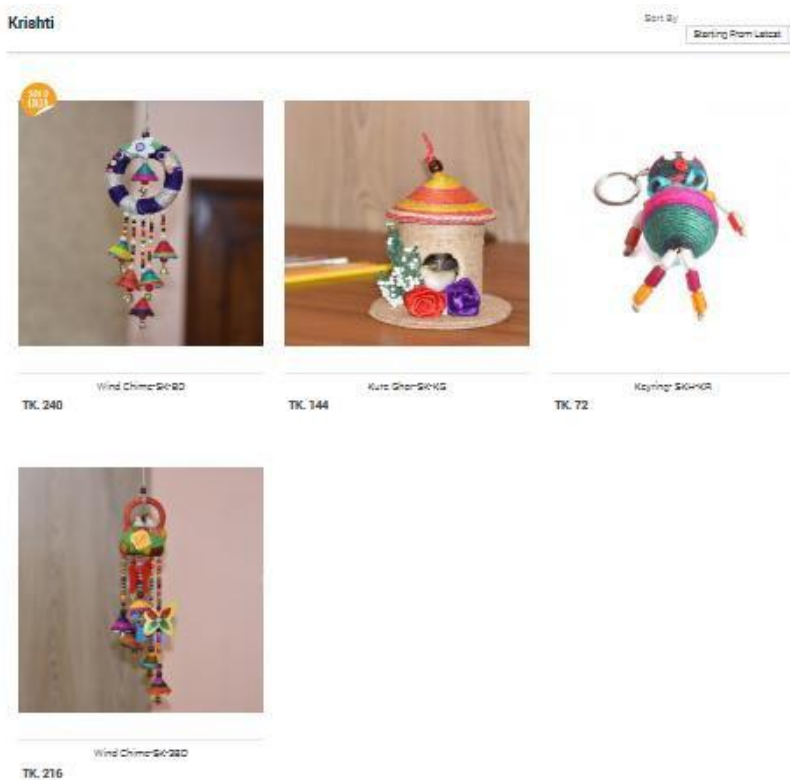


Figure 4: A snapshot of the Krishti page on the Bagdoom website

4) Chaldal

Chaldal, founded in 2013, is a Bangladeshi online grocery and food products provider. Chaldal believes time is valuable to Dhaka residents, and that they should not have to waste hours in traffic, brave bad weather or wait in line just to buy basic necessities like eggs! This is why Chaldal delivers everything its customers need right at their doorsteps and at no additional cost.

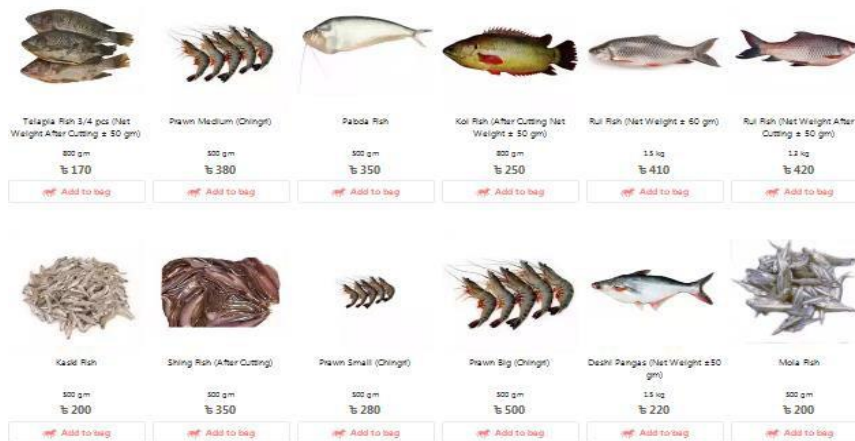


Figure 5 A snapshot of the fish products on Chaldal.com

As per the consultant's limited research, it was discovered that Chaldal is the most popular online marketplace for buying groceries. The consultant also regularly uses Chaldal for buying groceries every week. Their website has a good collection of fish.

5) Shwapno

Operated by ACI Logistics Limited, Shwapno is the top retail brand in Bangladesh. As the largest retail chain in the country, Shwapno serves over 35,000 households each day.^{xvi} However, its online site is fairly new and only seems to have a handful of products under the fish category. Although they have broken down fish into three categories—fresh water fish, sea fish and dry fish—there were only two products listed under the first category. Products in the other categories were unavailable at the time of research.

Through their website, Shwapno receives about 250 orders per day, of which 10–15% is for fish. An average fish basket size is BDT 400–500.

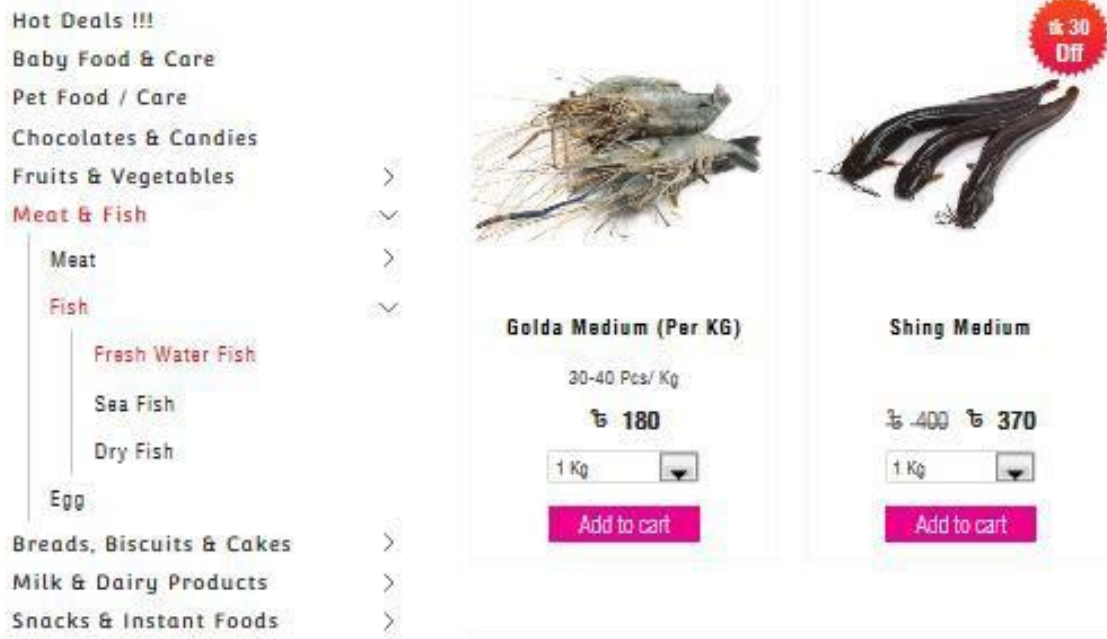


Figure 6 Shawpno's fish collection on their online marketplace

6) Parmeeda – described above

7) OTHOBA – described above



Figure 7 A snapshot of Parmeeda's online fish



Annex E: Key informant interviews

| | Name | Organization | Designation |
|----|-----------------------------|---------------------------------------|--|
| 1 | Azman Ahmed Chowdhury | BRAC | Head of Strategic Partnerships |
| 2 | Syed Mahmud Hasan | Practical Action | ICT Specialist |
| 3 | Sheikh Mahmuduzzaman Mashal | SNV Netherlands | Project Manager |
| 4 | Fayead Ahmedul Hye | ACI Agribusiness | |
| 5 | Md. Obaidul Islam | Nourish | Manager (Sales and Marketing, Aqua) |
| 6 | M A Razzak Mollah | Aftab Feed Products Ltd. | Manager (Sales and Marketing) |
| 7 | Abdullahil Mamun | SMS Feeds Limited | DGM (Sales and Marketing) |
| 8 | Md. Akhter Sayeed Khan | Quality Feeds Limited | Research and Development (Aqua) |
| 9 | Waseem Alim | Chaldal | CEO |
| 10 | Abu Saleh Md. Saifullah | F2F Program, Land O'Lakes | Field Coordinator |
| 11 | Abir Ahmed Chowdhury | iDE | Senior Technical Specialist |
| 12 | Nabeera Rahman | IFC | Consultant |
| 13 | Zaki Haider | mPower | Director of Innovation |
| 14 | Bipasha Sharmin Hossain | ACI Logistics Ltd. (SWAPNO) | Team Coordinator, Process Innovation and Data Science |
| 15 | Tanjim Ferdous | UNCDF | Consultant |
| 16 | Md. Majidul Haque | Bank Asia | Head of Business Planning, Products & Partnership, Agent Banking |
| 17 | Mahbubur Rahman | BFP-B | Deputy Challenge Fund Manager |
| 18 | Md. Arafat Hossain | BFP-B | Challenge Fund Manager |
| 19 | Jamil Akbar | Misfit Technologies | Co-Founder and Managing Director |
| 20 | Taufiqur Rahman | Access to Information (a2i) Programme | National Consultant - Innovation to Business |
| 21 | Md. Shakhawatul Islam | BRAC | Partnership Manager, Advocacy for Social Change |
| 22 | Sadman Sadek | Digital Green | Country Engagement Coordinator, Bangladesh |

| | | | |
|----|------------------------|------------------|-----------------------------|
| 23 | Aminul Hoque Chowdhury | USAID | Digital Development Advisor |
| 24 | Sebastian Manharts | Simprints | Chief Operating Officer |
| 25 | Abdullah Saqib | Viamo | Country Manager |
| 26 | Bernard Christopher | Lifechord | Chief Operating Officer |
| 27 | Tajdin Hassan | The Daily Star | Head of Marketing |
| 28 | Sabrina Haque | Chicks and Feeds | Director |

ⁱ <https://www.gsmaintelligence.com/research/?file=a163eddca009553979bcd5f2ef0&download>

ⁱⁱ <https://www.wiman.me/bangladesh>

ⁱⁱⁱ <https://www.grameenphone.com/bn/node/2310>

^{iv} <https://www.grameenphone.com/basic-page/free-health-service-tonic-launched>

^v <https://futurestartup.com/2017/09/06/ifc-invest-3m-chaldal-deal-street-asia/>

^{vi} <https://economictimes.indiatimes.com/small-biz/startups/features/global-investors-heading-to-india-are-beginning-to-make-a-stopover-at-bangladesh/articleshow/61678920.cms>

^{vii} <https://parmeeda.com/fish/>

^{viii} <https://www.brainstation-23.com/top-e-commerce-sites-bangladesh-according-alexa/>

^{ix} <https://www.othoba.com/fish>

^x Note: The consultant is helping Bank Asia to design and deploy this possible engagement with BANA.

^{xi} <https://www.thedailystar.net/business/news/telcos-fall-short-4g-speed-promise-1724716>

^{xii} <https://a2i.gov.bd/publication/union-digital-centers-in-bangladesh-present-status-and-future-prospects/>

^{xiii} https://www.ti-bangladesh.org/beta3/images/2017/UDC/Full_Report_UDC_02122017.pdf

^{xiv} <https://shoparu.com/product/category/agriculture-products>

^{xv} <https://www.bagdoom.com/>

^{xvi} <https://www.shwapno.com/>



WorldFish

