



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

Bangladesh: Desk Study of Extension and Advisory Services

Developing Local Extension Capacity (DLEC) Project

March 2017



digitalGREEN



Acknowledgements

Written by Sarah Huber in collaboration with Kristin Davis of IFPRI, this analysis was compiled for the DLEC project under USAID Cooperative Agreement No. AID-OAA-L-16-0002

This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Digital Green and do not necessarily reflect the views of USAID or the United States Government.

ACRONYMS

a2i	Access to Information Initiative
AESA	Agricultural Extension in South Asia Network
AIP	Agro-Inputs Project of USAID
AIRN	Agro-Input Retailers Network (AIRN)
AIS	Agricultural Information Service
ANGeL	Agriculture Nutrition and Gender Linkages Project
BADC	Bangladesh Agricultural Development Corporation
BAEN	Bangladesh Agricultural Extension Network
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BAU	Bangladesh Agricultural University
BEES	Bangladesh Extension Education Services
BFRI	Bangladesh Fisheries Research Institute
BIID	Bangladesh Institute of ICT Development
BINA	Bangladesh Institute of Nuclear Agriculture
BLRI	Bangladesh Livestock Research Institute
BRRI	Bangladesh Rice Research Institute
BSMRU	Banggobandhu Shekh Mujibar Rahman Agriculture University
CARE	Cooperative for Assistance and Relief Everywhere, an international NGO
CBO	Community-based Organization
CSISA	Cereal Systems Initiative for South Asia
DAE	Department of Agricultural Extension
DAM	Department of Agricultural Marketing
DLEC	Developing Local Extension Capacity Project
DLS	Department of Livestock Services
DOF	Department of Fisheries

EAS	Extension and Advisory Services
FFS	Farmer Field Schools
FPG	Farmer Producer Group
GDP	Gross Domestic Product
GFRAS	Global Forum for Rural Advisory Services
GISB	Grameen Intel Social Business
ICT	Information and Communication Technology
IFMC	Integrated Farm Management Component Project
IFPRI	International Food Policy Research Institute
IRRI	International Rice Research Institute
MIS	Management and Information Systems
NAEP	National Agricultural Extension Policy
NATP	National Agricultural Technology Project Phase II
NGF	Nowabenki Gonomukhi Foundation
NGO	Nongovernmental Organization
RDRS	Rangpur-Dinajpur Rural Services
RIB	Research Initiative of Bangladesh
SAU	Sher-E-Bangla Agriculture University
SMS	Short Message Service Text
TMSS	Thangamura Mohila Shobuj Sangho
TRAIN	Targeting and Realigning Agriculture for Improved Nutrition Project
USAID	United States Agency for International Development
USAID/AESA	USAID Agricultural Extension Support Activity Project
USAID/AIP	USAID Agro-Inputs Project
VPKA	Voluntary Paribar Kalyan Association

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INTRODUCTION

Agriculture is critical to the livelihoods of millions in Bangladesh. However, there are many challenges to rural agriculture in terms of increasing soil and water salinity, flooding, access to quality agricultural inputs and advice and limited access to equitable markets, particularly in the southern region. As a result, productivity of agricultural land ranges widely, and there is much scope for improvement. Agricultural extension, education and advice to farmers on appropriate agricultural practices and market linkages are critical for maximizing land productivity and the incomes of the rural dwellers in Bangladesh. Agricultural extension typically includes training on selection and use of inputs and technologies, crop selection, soil health maintenance, crop-specific cultivation practices, managing the effects of climate change, livestock management, post-harvest transportation and processing, storage of grains and seeds, and marketing of agricultural products. Historically, Bangladesh's extension and advisory services (EAS) system was focused on rice production, but in the past couple of decades it was expanded to education and training support in livestock, fisheries and vegetable production. As a result, it has begun to reach more coastal communities than before. Many public, private and civil society organizations in Bangladesh provide agricultural extension services in a dynamic pluralistic system. However, there is need to coordinate, scale and make sustainable these services as well as to better reach farmers, especially women.

In an effort to raise incomes and increase resilience of smallholder farmers and their families in Feed the Future countries, the United States Agency for International Development (USAID) funded the Developing Local Extension Capacity (DLEC) project. This project is led by Digital Green in partnership with the International Food Policy Research Institute (IFPRI), CARE International (CARE) and multiple resource partners. DLEC will work with country stakeholders and USAID missions to scale and improve locally relevant, cost-effective and pluralistic agricultural extension systems that bring together information technologies and community-based organizations. By collaborating with USAID missions, host-country governments, public and private extension and advisory service (EAS) providers, rural civil society organizations and host-country research institutes, DLEC will help host-country extension systems become more effective, accountable, scalable and sustainable. The first stage of DLEC's work includes conducting diagnostic assessments of local EAS contexts and capacities in Feed the Future and aligned countries.

This report reviews existing documentation on EAS in Bangladesh to recommend areas for potential investment by government, donors, nongovernmental organizations and the private sector, and serve as an input into the design of an on-the-ground engagement under DLEC. The evidence generated through the on-the-ground engagement will contribute to the knowledge base of best-fit practices for strengthening EAS in Bangladesh and may provide a basis for future investments in EAS in the country by various actors. The modified DLEC best-fit conceptual framework described below structures and focuses the DLEC project and this report.

CONCEPTUAL FRAMEWORK

The modified DLEC framework (Figure 1) uses the original best-fit framework (Birner et al., 2009) to determine EAS or characteristics in which to improve extension. The frame conditions (political environment, business environment, civil society/collective/community environment, agroecology and broader agricultural innovation systems) all influence agriculture in the country, particularly extension and advisory services. However, in terms of on-the-ground engagements, they are outside

DLEC's manageable interests. The best-fit framework includes certain characteristics of EAS, plus the overall agricultural innovation system. EAS characteristics noted in the original best-fit framework include (i) governance structures and the policy environment, (ii) organizational and management capacities and cultures, and (iii) advisory methods. The DLEC framework adapted this framework and added additional characteristics where EAS can play an important role: (iv) market engagement, (v) livelihood strategies and (vi) community engagement. These six characteristics also fall within DLEC's manageable interest for engagement. Additional manageable areas under this framework include the system-level performance areas of access, quality and sustainability. The ultimate impact at the farm-household level is outside DLEC manageable interests for engagement.

The building blocks for EAS are also useful in framing recommendations for engagement. They are as follows:

- ◆ Customer – farmers and their unique needs
- ◆ Content – knowledge being shared
- ◆ Methods – how information and knowledge is shared
- ◆ Provider – who shares information and knowledge

This report also addresses cross-cutting EAS issues, such as women and youth engagement, climate change resilience, food and nutrition security, and use of information and communication technologies (ICTs).

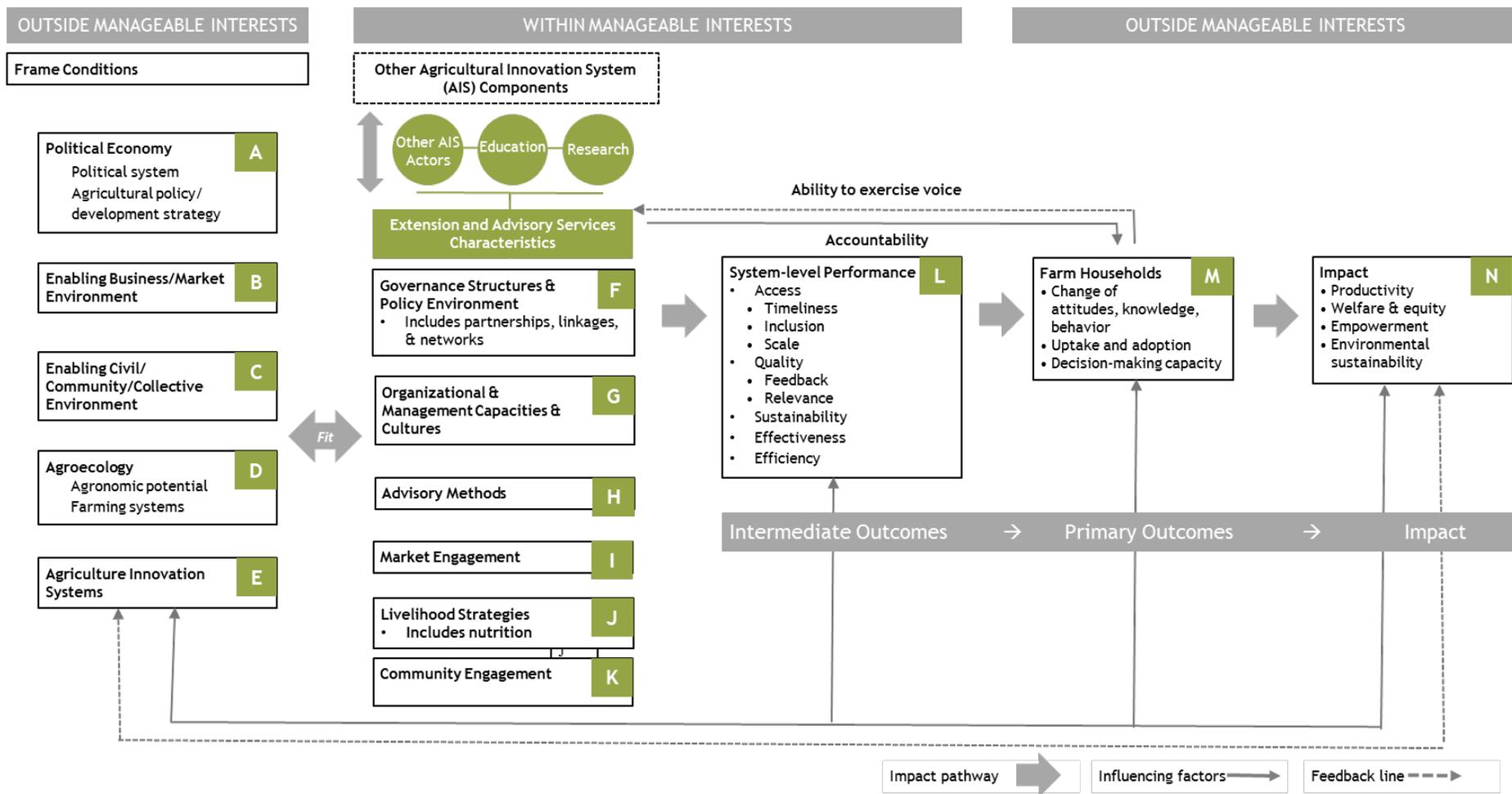


Figure 1. Conceptual Framework for the Study

Source: Adapted from Birner, et al., 2009.

METHODS

This report is based on a review in November 2016 of existing literature on the status of the Bangladesh extension system. This review includes annual reports, monitoring and evaluation reports, academic studies and government policies published over the past five years by both local and foreign governments, nongovernmental organizations (NGOs), universities and companies. Key results were presented and validated at a meeting of Bangladeshi EAS stakeholders 4-5 December, 2016. This report does not include any primary data or direct observation of EAS activities in Bangladesh.

BACKGROUND

Bangladesh is a lower middle-income country with a population of 161 million people in 2015 (World Bank, 2016b). About a third of the population lives on less than US \$2 per day, and 85 percent of the poor live in rural areas (GSMA, 2014). Some 48 percent of the population is directly employed in agriculture, and 70 percent depend on agriculture in some way for their livelihood (Ali, 2016). Nearly half of those employed in the agriculture sector are below the upper national poverty line (IFPRI, 2016). On food security, the Economist Intelligence Unit ranked Bangladesh 95 out of 113 countries in 2016.

Bangladesh has nearly eight million hectares of arable land, which is 61 percent of total land (DAE, [date unknown]). However, this land is declining at a rate of one percent per annum (Planning Commission, 2012). Small and marginal farms comprise 86 percent of all farms. Some 53 percent of farm households have less than half an acre of land. In 2014, 60 percent of agricultural production value came from crops, and the rest from fishery, livestock and forestry, in that order. Rice is grown on 75 percent of the cultivated land. Irrigation is available on 56 percent of the cultivated land ([DAE, [date unknown]]).

Adult literacy is at 58 percent (UNICEF, 2016). According to the Bangladesh Telecommunication Regulatory Commission, mobile and internet subscribers are a high proportion of the population at 118 million and 62 million subscribers, respectively. (Although these numbers are not adjusted for people with multiple mobile subscriptions, the penetration is relatively high given Bangladesh's income level.)

Bangladesh's gross domestic product (GDP) reached \$195 billion in 2015 (World Bank, 2016b). The economy grew at an average rate of six percent over the last 10 years (World Bank, 2016c). Over the past 10 years, agriculture declined as a proportion of GDP from 20 percent to 16 percent in 2015 (World Bank, 2016d). The World Bank's Ease of Doing Business indicator ranks Bangladesh 176 out of 190 countries, reflecting challenges on a range of issues from access to electricity to enforcement of contracts. Complicating effective policy implementation, Bangladesh ranks 139 out of 176 countries for corruption according to Transparency International.

Bangladesh's national development framework, Vision 2021, aims to transform Bangladesh into a middle-income country by 2021 and attain self-sufficiency in food production. This framework gives overall direction to extension and advisory services and those organizations investing therein.

Selected agricultural goals of Vision 2021 with implications for extension include achieving self-sufficiency in rice production, water management for irrigation, diversification of agricultural crops

and focus on crops suitable for each geographic area, livestock breed development, forming production and marketing cooperatives (including fishing cooperatives) and providing them with concessionary credit as well as extension for proper input use, soil fertility management and closed water fisheries (Planning Commission, 2012).

Information and communication technologies (ICTs) and digitization are viewed as important tools to extending extension's reach. The Digital Bangladesh campaign, another part of Vision 2021, led to the digitization of much government data and procedures recently, including the Prime Minister's Access to Information Initiative and the establishment of Union Information Service Centers with a goal of full coverage in all 4,554 unions (the smallest rural administrative and local government unit in Bangladesh) by 2020 (Planning Commission, 2012).

The agriculture sector grew an average of four percent annually from 2007 to 2014, which is one of the fastest productivity growth rates in the world, second only to China. (World Bank, 2016e) However, Bangladesh invests very little in agricultural research relative to its agricultural GDP. The nation's agricultural research intensity ratio stayed at 0.4 percent between 2000 and 2012, despite rapid population growth, a shrinking natural resource base, climate change effects on agriculture and changing consumption patterns (Compact 2025, 2016). In comparison, the agricultural research intensity ratio for middle-income countries was 0.6 percent and for high-income countries, three percent in 2008 (Beintema et al, 2012).

Civil society organizations, many of whom are focused on service delivery, are included in the development landscape and processes in Bangladesh (Ahmed, 2011). Services provided include relief, microcredit, education and sanitary programs ([ADB], 2008). NGOs often serve as an intermediary between society the government. They also provide jobs ([ADB], 2008).

RESULTS

After setting the overall frame conditions, we move on to the EAS system, focusing on the six characteristics from the best-fit framework in Figure 1.

Governance Structures and Policy Environment

In the background section, we looked at the macro level and the enabling environment played by the federal government and policies. This section and the next on organizational and management capacities and cultures focus on the meso level, which links between the national policy level and implementation level (where we look at methods) through EAS governance structures, organizational policies, and EAS program management. The meso level also includes the links to education, research, the private sector and farmers.

The National Agricultural Extension Policy (NAEP) set out by the Department of Agricultural Extension was updated in 2012. The mission of the NAEP is to provide efficient, effective, coordinated, decentralized, demand-responsive and integrated extension services to help farmers in Bangladesh access and utilize better know-how, improve productivity, optimize profitability and ensure sustainability, thereby ensuring the wellbeing of their families. The 2012 revision contains a variety of modern and practical measures, including use of ICTs for linking marketing and production systems and establishing digitized databases and management and information systems (MIS) down to the *upazila* (district) level, better coordination among public and private sector actors,

increased farmer-responsiveness, increased women’s participation, etc. From 2003 onward, there was no separate funding for the NAEP. Ownership from staff of the various government extension bodies was limited due to lack of consultation with all stakeholders in drafting of the policy and the need for a coordination mechanism between the various bodies (Karim et al, 2009). Whether the measures promulgated in the 2012 revision have been broadly supported or funded is unclear.

EAS in Bangladesh is dynamic, with a high number of actors from different sectors, and very decentralized. The high plurality leads to difficulties in coordination between different types of EAS actors (public, private and NGO/multilateral) as well as between different areas of EAS (crops, livestock and fisheries). There is thus need for a coordinating mechanism or incentive structure to facilitate cooperation among EAS providers (Swanson, 2011).

Public sector EAS actors generally act independently of each other and need a more effective system for taking farmer input or measuring farmer satisfaction or impact (Swanson, 2011). Also, many public-sector actors do not always have sufficient operational funds to effectively implement programs, with majority of funding going toward salaries and capital costs. The limited resources result in farmers in harder to reach areas, such as the riverine islands, not having the same level of access to EAS than in other parts of the country. Public extension institutions include the following:

- ◆ Department of Agricultural Extension (DAE), www.dae.gov.bd
- ◆ Department of Fisheries (DOF), www.fisheries.gov.bd
- ◆ Department of Livestock Services (DLS), www.dls.gov.bd
- ◆ Agricultural Information Service (AIS), www.ais.gov.bd
- ◆ Department of Agricultural Marketing (DAM), www.dam.gov.bd
- ◆ Bangladesh Agricultural Development Corporation (BADC), www.badc.gov.bd

The DAE is the largest organization and employs 14,092 field-level extension agents,¹ with each responsible for 900-2,000 farm families (Miah, 2015). The DOF and DLS have few field-level extension agents—usually only two to three at the *upazila* level (which includes 60,000 to 70,000 farms) and none at the union or block level (Swanson, 2011). These departments mainly have project-based funding. While welcome to infuse additional resources into government programs, project-based funding also has some drawbacks. According to the Planning Commission, “the major weaknesses of this project dependency are that certain areas seem to attract repeated projects whereas others get none; duplication of efforts, while similar approaches may be tried repeatedly without success; and the content of the extension may depend on the parameters set by the project rather than a consideration of local need” (Miah, 2015: 39).

Public research and educational institutions have a greater knowledge of location-specific agronomy and of up-to-date farming techniques, but have limited ability to disseminate this information to farmers, in part due to the need for operational funds. The DAE is not in regular contact with the public research institutions (Swanson, 2011). Agricultural universities help to demonstrate new

¹ Donor/project stakeholder communication, 30 November 2016

technologies and train farmers in neighboring villages, but have limited reach (Ali S., 2016). Public research institutions and universities in EAS include the following:

- ◆ Bangladesh Agricultural Research Council (BARC), www.barc.gov.bd
- ◆ Bangladesh Rice Research Institute (BRRI), www.brri.gov.bd
- ◆ Bangladesh Institute of Nuclear Agriculture (BINA), www.bina.gov.bd
- ◆ Bangladesh Agricultural Research Institute (BARI), www.bari.gov.bd
- ◆ Bangladesh Livestock Research Institute (BLRI), www.blri.gov.bd
- ◆ Bangladesh Fisheries Research Institute (BFRI), www.fri.gov.bd
- ◆ Bangladesh Agricultural University (BAU), www.bau.edu.bd
- ◆ Sher-E-Bangla Agriculture University (SAU), www.sau.edu.bd
- ◆ Banggobandhu Shekh Mujibar Rahman Agriculture University (BSMRU), bsmrau.edu.bd

Private sector EAS actors also contribute significantly to EAS in Bangladesh. They include agricultural input manufacturers (e.g., seed, fertilizers, pesticides, equipment), agro-retailers of agro-inputs and crop buyers, including contract farming organizations, wholesale market dealers and local traders. Although there are many of these actors, none of them work at scale, and, thus, the number of private field-level workers amounts to around 3,500.² Table 1 in Annex 1 includes a list of significant actors, as judged by geographic reach, number of extension personnel and size of programs.

Other EAS actors include multilateral and development agency projects as well as international and local NGOs and civil society. Several thousand NGOs are estimated to be working in Bangladesh. They provide broad technical, organizational and financial support to farmers, but often have limited reach (Miah, 2015). For instance, the Agriculture Nutrition and Gender Linkages project (ANGeL) reaches 3,125 farmers in 16 districts and the USAID-funded SPRING project is in 40 districts. An NGO called Rangpur-Dinajpur Rural Services claims to reach 2,000,000 people in 13 districts for extension and other programs. USAID-funded extension projects often focus primarily on higher-income, more progressive farmers due to their need to hit milestones on schedule, usually only reaching several thousand farmers (Swanson, 2011).

Numbers of staff range between 48 people (in 28 districts) for Agricultural Advisory Services to several hundred. The estimated number of NGO field-level workers is 2,500.³ Major civil society actors, NGOs and donor-led projects are outlined in Table 2 in Annex 1.

As a platform for all of the various extension actors in the country and part of the Global Forum for Rural Advisory Services (GFRAS) and its regional network Agricultural Extension in South Asia (AESAs), the Bangladesh Extension Network (BAEN) was formed in September 2014. BAEN is meant to help coordinate various EAS actors in Bangladesh. The objectives of BAEN are also to

² Number validated by participants during DLEC Stakeholder Workshop, Dhaka, Bangladesh, December 2016.

³ Number validated by participants during DLEC Stakeholder Workshop, Dhaka, Bangladesh, December 2016.

identify, document and disseminate good agricultural practices and extension approaches; develop innovation in extension approaches; strengthen capacity of the extension professional; support research for socio-eco-friendly sustainable agricultural productivity; and promote awareness, knowledge sharing and networking for building effective and efficient extension and advisory services nationally, regionally and globally. The BAEN executive committee meets regularly. BAEN participated in a South Asia extension and advisory services capacity assessment exercise with AESA (Prasad et al, 2015).

Organizational and Management Capacities and Cultures

Organizational and management capacities and cultures are also an important component of the meso level of extension, providing the framework and tools to implement programs. They include program management, human and physical resources, education and training and staff incentives.

Numbers of human resources in extension in Bangladesh were covered in the previous sections. Extension staff typically hold diplomas from one of the 11 Agricultural Training Institutions. The training tends to be mainly technical with a focus on cropping systems (Swanson, 2011).

Projects often provide special training to extension agents. USAID/AESA is working with 530 DAE agents in four *upazilas* (Barisal, Faridpur, Kalia and Chowgaccha). They provided five days of training to the agents, including crop production management and gender issues.⁴

The DAE also trains field-level extension agents upon induction, but offers no continuing education. Agents are relatively well paid, receiving BDT 35,000 - 40,000 (US \$450-500) per month on joining and BDT 50,000 (US \$630) with five years of service. Extension agents could be further incentivized in their work with the following resources:

- ◆ Funding for transportation, mobile phones, training, or extension programs or events for farmers – Most extension workers walk or take the bus and use their personal phones for work very occasionally (Swanson, 2011).
- ◆ Access to an office/desk – A work space was cited as the most important support by some front-line workers during a DLEC scoping visit, because it enabled them to serve more farmers (people knew where to find them), and helped them be seen as being more pro-poor in their delivery (i.e., not just helping larger farmers).
- ◆ Tools to access the plethora of data on the soon to be launched Agriculture Information Service (AIS) website and the Agro Knowledge Bank Portal that USAID/AESA – Some agents are funded phones and/or data through development projects, but this does not exceed 10 percent of the agents. About five percent have their own smartphones.⁵
- ◆ Training on livestock and fisheries topics (Swanson, 2011) or on forming producer groups

⁴ Donor/project stakeholder communication, 30 November 2016

⁵ Donor/project stakeholder communication, 30 November 2016

- ◆ Training on gender issues – These are usually addressed in donor projects with DAE, but not usually outside of the donor project areas.⁶

In terms of private sector incentives and training, agro-input manufacturers and retailers provide advice with the goal of helping them to sell agro-inputs, either for immediate sales or to build trust with farmers for future sales. Agro-retailers are usually incentivized based on margin, that is, the difference between the price they buy inputs at from manufacturers or distributors and the price they sell at to farmers. Other factors also play a role, including turnover of inventory or speed of sale to farmers, provision of credit by their suppliers and concern for their reputation in the village. Agro-input manufacturing companies conduct extension through their field sales team, who are often paid on commission. This practice often leads to an unequal geographic distribution of extension and advisory services provided by the private sector, since those areas that have a high transaction cost for the agro-manufacturers and retailers end up getting neglected.

In addition, Agro-input sales teams often build capacity of retailers in a cascade of training (often with support of development projects), although with limited quality control. There is usually some company orientation when they join, but most of their training is on the job. Retailers typically do not have any formal agricultural education, but often have first-hand experience with farming. The level of formal agricultural education varies widely.

Crop buyers provide extension to the extent that it is required to match their customers' demand for yield and quality. Typically, the most engaged buyers are companies that contract with farmers for specific production, either for fresh produce for urban hotels and restaurants, processing or export. These contract farming organizations deal in higher margin crops (particularly fruits and vegetables), and, hence, can afford to spend more time training farmers on appropriate agricultural practices. These companies want to maximize yield to reduce the number of farmers they have to deal with, and they want to maximize quality to get higher prices and longer-lasting relationships with their customers. Agricultural traders, on the other hand, typically do not have fixed relationships with either farmers or customers, so their incentive to help farmers optimize yield and quality varies.

NGO and donor project extension staff often include public-sector extension agents hoping to earn more and gain access to operational funds for transport, demonstrations and so forth. Most of the projects have a limited (several year) lifetime with little long-term financial sustainability. Many of these projects have shifted to a market focus from an earlier focus on production.

In February 2016, the BAEN and the AESA Network held a workshop on Capacity Needs Assessment of all EAS providers in the country and identified training on ICT and forming farmer producer groups as key areas of need for extension personnel (Ali, 2016).

Performance monitoring is typically seen as a good practice in organizational theory; however, it is practiced to a limited extent in Bangladesh. In July 2016, USAID/AESA started joint monitoring and digital reporting with DAE in their target areas. This joint effort is the first time that DAE reported through a digital system.

⁶ Donor/project stakeholder communication, 30 November 2016

EAS Methods

EAS methods used by the various providers in Bangladesh are similar to traditional EAS methods in other countries, including on-farm demonstrations, organizing farmer groups and farmers' training, training of extension providers and developing training modules and materials. The key challenges are improving effectiveness, coordinating efforts and sustaining activities.

The most widespread EAS activity is farmers' informal discussions with both agro-retailers, when a farmer goes to purchase inputs at an agro-retailer's shop, and/or with more experienced farmers in their villages. These informal discussions may present a unique opportunity to reach farmers with advisory services more organically, and, thus, more sustainably than through formal organized group meetings.

Most of the following methods are executed by government extension, NGOs or development agencies, and specifically track the participation of women. Details are included in Annex 2.

- ◆ Demonstration plots
- ◆ Farmer field days/visits to model farmers or demonstration plots
- ◆ Extension agents visiting farmers one-on-one
- ◆ Forming and training farmer producer groups
- ◆ Farmer field schools
- ◆ Training model or lead farmers
- ◆ Training agro-retailers
- ◆ Establishing new agricultural extension service centers
- ◆ Crop-specific advice packaged with agricultural services
- ◆ Call center/hotlines
- ◆ Video screening
- ◆ Mobile phone/website agronomic information
- ◆ Agricultural exhibitions

Market Engagement

Assisting with market engagement is an important area for EAS to consider to improve the livelihoods of farmers, to help increase incomes and ensure a better quality of life. Extension's role here can include training, advice on access to inputs and credit, links to market and forming farmer groups.

Training by EAS for both agro-retailers and farmers on recognizing quality seed, fertilizers and pesticides is valuable due to the fact that many fake or low-quality agricultural inputs are sold in Bangladesh. Research institutes could help here, but they are generally not well coordinated with DAE (Swanson, 2011). Donor projects and multi-national input manufacturers typically have access

to international best practices, but need the localization knowledge of the research organizations in Bangladesh.

Information and advice to farmers on markets is important, as supply and demand for many commodities go through a three or four-year cycle of rising and falling prices. Low production leads to high prices. High prices encourage farmers to cultivate greater acreage under the given crop. Supply spikes and then prices fall, causing farmers to switch to different crops. Reduced supply causes prices to rise again. This volatility was seen recently in the crash of potato prices in Bangladesh in 2014. While this effect is partially due to the seasonality of certain crops that is less avoidable, it can be largely ameliorated through better flow of market information to farmers, technology and capital to store stock for better prices and certain insurance products (Miah, 2015).

EAS can also help with the transition to new crops and products. Consumption patterns in Bangladesh shifted with decreased per capita consumption of rice and increased consumption of meat, fish, milk and edible oil. However, farmers have been slow to respond to this diversification with the share of rice value added in the total food value remaining fairly constant (Miah, 2015). Additionally, 75 percent of cultivated land is still used for rice ([DAE], [date unknown]). The AESA project focuses training on six particular agricultural value chains. This training on cultivation of non-rice crops is needed on a much larger scale.

The AESA project worked on the following value chains with farmers: jute, chili, mung bean, dairy, fish and beef. World Vision worked on the poultry value chain, including establishing three egg sales centers, and providing linkages to suppliers of vaccines and medicines as well as hatcheries. They also worked with 250 farmers on vegetable value chains ([WVB], [date unknown]). For both, market price fluctuation is a challenge for adoption of practices by farmers.

DAE extension support mostly focuses on crops for food security, with a lack of support on agribusiness, quality, nutrition and supply chain topics.

With regard to agricultural credit, because of the stringent requirement of collateral, bank loans go mostly to large and medium farmers. On the other hand, the loan portfolio of NGOs consists of predominantly non-farm activities, with a lesser focus on crop activities. An exception is Grameen Bank, which has half of its loan portfolio in agricultural production. Grameen also provides agricultural training along with loans. In 2009, Bangladesh Bank launched a special fund of BDT 500 crore (US \$62,766,755) to provide agricultural loans, distributed on a large scale by BRAC through its group-based lending (Miah, 2015). Another recent exception is the A-card, a pilot initiative launched in August 2016 through the AESA project to extend micro-credit loans to farmers for inputs.

Another challenge is to ensure that what farmers grow can be sold at profitable prices, both to maximize rural incomes and to optimize the use of limited natural resources. Aside from producing diversified crops, smallholders also need to be supported with linkages to domestic and international buyers. For example, the Syngenta Foundation specifically worked with linking farmer producer groups to vegetable and pharmaceutical processors, such as SQUARE Pharmaceuticals. Many of the NGO and development agency projects in the country focus on forming producer groups to help with aggregation for better prices and links to market, as well as for reaching many farmers at once. However, these projects may not always fully link producer groups to buyers to ensure aggregation or support post-harvest steps.

Livelihood Strategies

Ultimately extension's role is to help farmers with various types of livelihood strategies in a demand-driven fashion. Livelihoods can be affected by many external events, and resilience is an important part of extension content and support. Bangladesh is particularly susceptible to climate change and severe weather events. Crop production is affected in the northern region due to drought. In the southern region, sea levels are rising, and the intrusion of saline water and increasing manifestation of soil salinity affects crop, livestock, fisheries and forestry. The Comprehensive Disaster Management Programme and other analyses done at the Climate Change Cell of the Department of Environment suggest that 10-15 percent land of the country will be inundated due to sea level rise of 45 cm by 2050. The decline of arable land heightens the need for improved productivity and other livelihood options. Additionally, waterlogging and salt intrusion require introduction of tolerant seed varieties.

The EAS of private-sector companies is usually based on what inputs the company is selling rather than the particular needs of the farmer. That said, companies rely on farmers buying their products to sustain their business, so they inherently must listen to the opinions of their customers. Typically, they will be guided more by large farmers than small farmers. Crop buyers and traders are primarily guided by their customers, and not by farmers, in terms of what crops they decide to focus on. However, they will respond to farmers' requests to the extent they need support to grow the target crop. Private-sector EAS actors are typically both content creators and extension providers.

NGO and development agency projects typically survey producer groups for topics of interest. This sector typically has separate content creators and extension providers, but coordinates them fairly well.

The public-sector extension providers and content creators at research institutes and universities, on the other hand, do not coordinate much, so much of the content of public-sector EAS is outdated and does not satisfy farmers' needs to address all aspects of their livelihoods.

Women farmers too are often left out of content creation, although they have unique livelihood needs. Bangladesh's EAS must be more easily accessed by and tailored to the needs of women, based on their roles in agriculture. Gender transformative approaches, which create opportunities for individuals to discuss and change gender norms and address power inequities, should be investigated. Specific needs of women EAS providers should be considered and supported in all programs. In order to encourage participation of these women, extension curricula should reflect the crops that women are farming. Once these women are engaged, the curricula should extend to other crops, tools and innovations that would help make them competitive with other farmers in their community.

Nutrition is another important element of livelihood strategies that is often left to the health sector or special projects and programs, rather than being mainstreamed into EAS in general. EAS training should include the basics of nutrition and training institutions should offer special courses to upgrade skills in this area.

Community Engagement

Finally, communities and the various needs of community members are the major point of contact for extension at the field level. EAS services need to engage with community members to share information, but also to receive feedback.

Many providers work through community based-organizations, which occur naturally or have been set up by a variety of NGOs and donor projects for community saving and lending and other topics. Women are the main participants in some of these groups.

Extension must be aware of social norms and how to reach different community members. For example, many farmers gather at village tea stalls in the evening to chat, drink tea, smoke and watch TV, but these are usually men. Culturally appropriate means are needed to reach women farmers too.

Union Information Service Centers were established in thousands of villages to help people file and receive government documents electronically and, also, act as hubs of information, although no agricultural services are yet offered through the centers.⁷

Most farmers get their information from local agro-input retailers and experienced farmers. Some also get information from government or NGO-sponsored farmers clubs or producer groups. Contact with DAE extension agents is limited. NGOs, research institutions and contract farming organizations generally have a very specific focus and limited reach. Farmers in villages involved with these organizations benefit from significant education and training.

EAS must be well aware of how decisions are made on farm and the different roles of men and women in agriculture. Men generally make all farm investment decisions with the exception of very small farms, where women are the primary decision makers because the household men are either working on another farm or have other employment. With regard to the role of women, 75 percent of women in the agricultural sector are involved with vegetable crops, 51 percent with livestock and 49 percent with poultry ([DAE], [date unknown]). Syngenta employs female advisors in its field team in Bangladesh in order to reach women farmers, since societal norms often prevent them from speaking with the male advisors (Syngenta, 2016). The USAID Agro-input Project (AIP) project has specifically targeted women retailers, but has often found that women-only trainings are required to ensure participation and learning ([CNFA], 2016).

Extension services must be able to reach women effectively, as they play an important role in agriculture, but tend to be unreached. Rural women in Bangladesh are not often visible in the agricultural sector and, due to cultural seclusion, cannot easily receive agricultural information in markets or from male extension agents (Sraboni et al, 2013). Women get most of their information from word-of-mouth or from women-targeted NGO activities, if available in their area. According to a study of 62 villages in Bangladesh, women's participation in agriculture showed negative correlation with village-level electricity, education of household head, distance of bus stop from village, wage rate in non-agriculture activities, landholding and age, beyond a limit. However, women's participation in agriculture was positively correlated with NGO membership of women, remoteness of village, age of female workers, irrigated area of female workers' households and

⁷ Donor/project stakeholder interview, 6 December 2016

agricultural wage rate in the village (Jaim and Hossain, 2011). Several studies show a significant wage difference between men and women in agriculture ranging from 16 percent to 40 percent less for women (Miah, 2015).

Based on this analysis, EAS targeting women should focus on middle-aged women on smaller irrigated farms and in villages that are more remote, with less electrification, less non-agriculture work and greater NGO activities for women's groups. However, to truly transform the EAS system to be engage all women farmers, both gender norms and power inequities must be addressed. Extension curricula should also reflect the crops that women are farming, in order to further engage them.

Government extension workers occasionally take input from farmers, but are not always able to incorporate feedback into new programs. The Seventh Five Year Plan suggested creation of a database of completed project records, to help identify future program directions. The report also noted that to improve the relevance of extension, it may be considered to revive the previous Upazila Agriculture Extension Coordination Committee and District Committees, etc. These were quite effective with bottom-up planning approach with the participation of research and other extension departments, with support from funds allocated at district level. Unfortunately, the public-sector extension providers and content creators at research institutes and universities do not coordinate often, so much of the content of public-sector EAS is outdated.

RECOMMENDATIONS

Based on the desk review and December 2016 DLEC stakeholder meeting that brought together EAS actors to validate the findings of this report and agree upon a future vision of extension in Bangladesh, DLEC offers the recommendations for potential investments found here, organized by the six characteristics of EAS. Before listing recommendations for future EAS investments to improve extension, we first identify the major resources already existing in Bangladesh that can be leveraged to strengthen and drive success of extension and advisory services in the country:

1. Huge network of DAE agents with adequate technical training
2. Thousands of agro-retailers, including 3,000 trained under USAID/AIP
3. Contract farming companies
4. Large number of existing farmer producer groups
5. Localized content developed at research institutions
6. High mobile penetration
7. Existing policies and government initiatives, such as the government's Access to Information (a2i) initiative and Digital Bangladesh

We offer the following 15 recommendations to strengthen extension in Bangladesh, making it more effective, relevant, sustainable and scalable. The recommendations are intended for any EAS stakeholder interested to improve extension, be they government, donors, the private sector, NGOs or others.

Governance structures and policy environment

1. Fund DAE, DLS, and DOF as regular government ministries and not on a project basis to allow for long-term planning, budgeting and mutual commitments with partners.
2. Scale efforts to connect agro-retailers with farmer producer groups, with specialized training based on needs identified in the respective groups.
3. Develop and implement policies that are gender transformative, addressing not only the immediate needs of women farmers (e.g., access to land, EAS, market and credit), but also discussing gender norms, promoting positions of influence for women, and addressing gender power inequities within the community.

Organizational and management capacities and cultures

4. Provide continuous education for DAE agents and other incentives, such as operational funds for transport, communication and farmer events, with integration of ICT for agent training. For instance, the New Extensionist Learning Kit of GFRAS could be used to upskill existing human resources. While some intensive training on fisheries, livestock and ICT skills and one-time funding of smartphones and motorcycles could be implemented through a donor project, this requires long-term government commitment to budget properly for operational and continuing education expenses.
5. Provide training and ICT tools for agro-retailers, given that most farmers get their advice from agro-retailers currently as part of their purchase of agriculture inputs. This recommendation requires outside support until the training and ICT tools are seen to add sufficient value to retailers' operations that they assume full responsibility for this additional service for their farmer customers.
6. Develop a program with built-in incentives for agro-retailers and service centers to voluntarily report their activities and locations in exchange for something like a certification, privileged access to DAE support or similar.
7. Encourage more women EAS agents through flexible educational and work environments, and provide incentives for EAS providers to extend their reach to the women farmers in their communities.
8. Communicate to farmers through networks of agro-retailers and/or agro-input manufacturers, possibly using follow-up SMS on proper usage of seeds, fertilizers and pesticides after purchase.
9. Train DAE agents on ICT support tools, such as video production.

Methods

10. Leverage the large networks of agro-retailers and/or agro-input manufacturers to communicate directly with farmers: Through the AIRN network of trained agro-retailers and CARE's Krishi Utso micro franchise network, an ICT tool could provide follow-up SMS texts on proper usage of seeds, fertilizers and pesticides after purchase. This recommendation requires incentivization of the agro-retailers to collect appropriate

information from farmers and/or advertising directly to farmers in shops or on product packaging to encourage them to register for the service.

11. Distribute videos produced with Bangladesh research institutions, input manufacturers and major crop buyers through channels found effective by the AAS video study (see Annex 2 on video screening).
 - a. The videos were most effective when given to tea stalls, Union Service Offices, NGOs and community-based organizations. Further testing of giving videos to agro-retailers, potentially along with projection equipment, would be valuable. (The sample size of agro-retailers in the AAS video project was too small to be significant.)
 - b. Content for videos should be driven by needs of specific geographic locations in terms of land type, climate, access to market, etc. Videos should be produced locally and validated before mass production. Local DAE agents could be trained to produce videos and share with other agents, as well as farmers, through a common site or cloud storage, which require funds for equipment and data fees. Videos should be used both to train the trainers as well as directly with farmers. Separate viewing groups should be set up for women in the afternoon and men in the evening.

Market engagement

12. Streamline output market linkage through aggregation and technology, leveraging farmer organizations, training local service providers (i.e., agro-retailers) and using digital finance with credit scores in partnership with current value-chain projects.
13. Strengthen input chains through high-quality inputs, organization of agro-retailers, digitizing transactions and provision of credit in partnership with current and planned value-chain projects.

Livelihood Strategies

14. Expand extension content by including agriculture-sensitive nutrition information, climate adaptive agricultural content, and content that addresses the unique needs of women farmers. This expansion would involve working with non-traditional extension actors, such as health, environmental and women empowerment organizations.

Community Engagement

15. Expand access of extension and rural advisory services to women farmers through the hiring of more female extension agents, conducting women-only trainings and addressing gender norms within communities.

Given the above recommendations, the DLEC Consortium may be able to pilot specific recommendations based on its mandate, capabilities and budget. These recommendations are shown in Annex 3.

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ANNEX I. EAS PROVIDERS IN BANGLADESH

Table 1. Private Sector Actors

Name	Type	Extension activities
A.R. Malik & Namdharee Seeds	Inputs manufacturer	Inputs
Advanced Chemical Industries Limited (ACI)	Limited company	Inputs, knowledge sharing
Aftab Bahumukhi Farm	Limited company	Feed inputs
Agri Concern	Private company	Inputs, information, processing, storage, marketing, transport
Agro-Input Retailers Network	Industry association	Inputs
Alpha Agro	Limited company	Inputs
Bangladesh Agro-Processors Association	Industry association	Information
Bangladesh Crop Protection Association	Industry association	Information
Bangladesh Fertilizer Association	Industry association	Information
Bangladesh Seed Association	Industry association	Information
Bayer Agrocorp	Private company	Marketing and processing
Bayer CropScience	Inputs manufacturer	Inputs, information
BIID	ICT company	Piloting Farmbook and Five Skill Set
Blue Moon International	Trading house	Inputs – mainly seed
BRAC Seeds	Manufacturer and distributor	Research, inputs
ERAS	Company	Soil testing services
Global Agro Resources Incorporation (GARI)	Contract farming for potatoes	Inputs and advice
Global Agrovat Limited	Limited company	Inputs
Grameen Bank	Microfinance company	Training, loans
Krishi Utso franchisee network	Distributor	Inputs

Name	Type	Extension activities
Kusthia Seed Stores	Company	Inputs
Lal Teer Seed Limited	Company	Inputs
Masud Seed Company	Company	Inputs
McDonald (Bangladesh) Ltd.	Limited company	Inputs – contract farming for potatoes
Mollika Seeds	Company	Inputs
mPower	Social enterprise	Mobile apps for farmers
Naafco	Traceability for inputs	Information, certification
Quasem Food Processing Industries Ltd.	Limited company	Inputs – contract farming for potatoes
Seba Ltd.	Limited company	Contract farming for potatoes – supplies Kellogg’s
SQUARE Pharmaceuticals	Company	Contract farming for <i>bashok</i>
Supreme Seed Company	Company	Inputs manufacturer
Syngenta	Company	Inputs manufacturer
Taiwan Food Processing Industries Ltd.	Limited company	Contract farming for potatoes and baby corn
Tinpata Seeds	Company	Inputs manufacturer

Table 2. Civil Society Actors and Donor Projects

Name	Type	Extension activities
Agricultural Advisory Society	NGO	Advice
Agriculture Nutrition and Gender Linkages (ANGeL) project	Donor project	Provides extension agents with nutrition activities and messages
Association for Social Advancement	NGO	Microcredit financing
Bangladesh Agriculture Extension Network	NGO	Information, coordination, advocacy
Bangladesh Extension Education Services (BEES (http://www.bees-bd.org/))	NGO	Training, behavior change communication, social mobilization
BRAC	NGO – largest in Bangladesh,	Microcredit

Name	Type	Extension activities
	international reach	
CARE	NGO – international	Farmer organization, information, training
Caritas	NGO – international	Integrated development and human resource development in eight districts
Cereal Systems Initiative for South Asia (CSISA), http://csisa.org/	Project	Agonomic messaging through private sector partners and dealer networks; video
D-Net	NGO	Building an ICT network to provide better access to information on human health problems, but some attention is being given to agricultural extension
Dhaka Ashania Mission	NGO	Education, advice, marketing, value chain production
Helen Keller International	NGO – international	Nutrition education
Helvetas	NGO – international	Agribusiness and producer organization support
iDE	NGO – international	Market development support
Integrated Farm Management Component (IFMC) project	Donor project	Capacity development of farmer organizations
International Rice Research Institute (IRRI), (http://irri.org/our-work/locations/bangladesh)	International research institute	Training
Local Agri-Business Network	Donor project (Katalyst)	Information and training
Manusher Jono Foundation (http://www.manusherjonno.org/)	NGO	Capacity building
National Agricultural Technology Project Phase II (NATP)	Donor project	Technology generation, strengthening market access
Nowabenki Gonomukhi Foundation (NGF)	NGO	Rural finance

Name	Type	Extension activities
Practical Action	NGO – international	Technology promotion, market access, supporting women
Rangpur-Dinajpur Rural Services (RDRS)	NGO	Information, ICTs to promote technology adoption, other programs
Rural Enterprise for Alleviating Poverty project	Donor project w/Winrock	Seed and technical assistance to increase horticulture aquaculture production, while linking farmers to coordinated production and marketing opportunities
Research Initiative of Bangladesh (RIB)	NGO	Research and information
Shouardo project	Donor project w/CARE	Women’s empowerment
SPRING	Donor project w/JSI Research & Training Institute	Promoting nutrition and hygiene
SUSHILAN	NGO	Gender-sensitive eco-agriculture
Targeting and Realigning Agriculture for Improved Nutrition (TRAIN) project	Donor project	Nutrition extension, male sensitization, social mobilization
Thangamura Mohila Shobuj Sangho (TMSS)	NGO	Microcredit
USAID Agri-Inputs Project (AIP)	Donor project	Training agro-input dealers on proper usage of inputs
USAID Agriculture Extension Support Activity (AESA)	Donor project	Training farmers on six value chains – jute, mung bean, chili, dairy, beef and fish
Voluntary Paribar Kalyan Association (VPKA)	NGO	Promoting modern agriculture technology
World View International Foundation	NGO	Teaching and training
World Vision	NGO – international	Promotes poultry, vegetable value chain, duck-fish integrated farming, vermicomposting

ANNEX 2. EAS METHODS USED BY VARIOUS PROVIDERS

- ◆ Demonstration plots
 - Syngenta, ACI, Lal Teer Seed, and Bayer Crop Science collaborated with USAID/AIP project to set up 321 demonstration plots over the last two years. The demo plots provided information to 21,000 farmers about vegetable seeds and pest and disease management for rice, maize, lentils and vegetables. ([CNFA], 2015, 2016)
- ◆ Farmer field days/visits to model farmers or demonstration plots
 - Syngenta Foundation organized nine such visits for farmers in 2015. (Syngenta, 2016)
 - AIP organized 358 field days during the year ended September 2016. ([CNFA], 2016)
- ◆ Extension agents visiting farmers one-on-one
 - CARE employed Livestock Health Workers
 - Syngenta Foundation's Sustainable Agriculture for Santal Communities project agents worked with 500 farms, focused on production planning, technical support, product aggregation, local service provider development and linking farmers to markets. (Syngenta, 2016)
- ◆ Forming farmer producer groups (FPGs)
 - USAID/AESA formed 3,854 FPGs as of 2015, of which 2,557 received training that year, based on input from farmers on their needs with respect to the six prioritized value chains (e.g., chili, jute, mungbean, fishery, dairy and beef fattening). ([DAS et al], 2016)
 - World Vision formed FPGs for vegetables in Dinajpur with 250 farmers. ([WVB], [date unknown])
- ◆ Group trainings for FPGs
 - CARE Krishi Utso held seminars on cattle
 - AESA hosted group trainings on six value chains using a variety of videos, flipcharts and manuals for training of trainers and a few farmers. (Mazid, 2016)
 - The Katalyst program encourages trader associations to facilitate trainings for farmer groups in their area, in exchange for trainings the trader associations receive. Farmer group representatives, trader association representatives and DAE officials jointly pick topics and plan for the trainings. 1,900 training programs were conducted so far. Agro-input manufacturers, including ACI Ltd, Bayer Agrocorp and Haychem, sponsored a number of trainings and printed leaflets. (SwissContact, [date unknown]).

- Syngenta Foundation’s Sustainable Agriculture for Santal Communities project conducted 13 group trainings in 2015 for single vegetable production, forming 282 groups and providing training for 1,104 smallholder farmers.
- Contract farming organizations conducted group training for vegetable production.
- Farmer groups and private sector companies conducted workshops (including input suppliers, crop buyers, service providers, etc.). USAID/AESA held 48 workshops in 2015, including representatives from 1,726 producer groups and 679 private sector representatives.
- ◆ Farmer field schools (FFS):
 - IFMC project with Government of Denmark is planning 20,000 FFS, with 6,956 implemented so far. Trainers are selected from previous FFS participants and given 26 days of training.
 - CARE Pathways uses the Farmer Field Business School model, a holistic training integrated with the seasonal calendar that also includes gender, marketing, nutrition and climate-smart agriculture.
- ◆ Training model or lead farmers:
 - Syngenta Lead Farmers Network trained 19 groups of lead farmers in 2015. (Syngenta, 2016)
 - USAID/AESA trained almost 7,000 farmer leaders of producer groups, with the expectation they will conduct informal sessions with farmers in their village.
- ◆ Training agro-retailers
 - AIRN trained 2,580 agricultural input dealers on proper use of agricultural inputs as of September 2016 as part of their normal sales and support process. The retailers are organized into upazila committees and supported by an AIRN call center. Further trainings are now offered on a fee basis. AIRN partnered with the CIMMYT-CSISA USAID project to produce a manual on integrated weed management for training of AIRN staff and agro-retailers. A variety of booklets, posters and billboards have been developed to spread awareness and educate farmers on proper usage of inputs. AIRN also produced three Public Service Announcements on three major TV channels and is launching a series called “Connecting Bangladesh, an agricultural Q&A show” on the ATN News TV channel. (CNFA, 2016)
- ◆ Establishing new agricultural extension service centers:
 - USAID/AESA established 129 Agriculture Extension Service Centers as of November 2016 for use both by DAE extension agents and local agro-input sellers. DAE agents in these areas were also provided with motorcycles, phones and data service. The effect of these resources on the quality of EAS provided by the agents is currently being tested. USAID/AESA set up soil testing labs with

the private company ERAS, providing initial marketing and cost-share for the equipment.⁸

- Syngenta Foundation's Krishan Bazaars provide aggregation of crops, serving 500-1,000 farmers, linkage to 10-20 buyers, rent equipment, provide soil testing and quality seedlings, and provide information and group training to farmers on crop cultivation. There are 17 hubs in Bangladesh now. They train local villagers to run the hub. (Syngenta, 2016)
 - Bangladesh Agricultural Research Institute Technology Villages established in 26 villages. (Ali S., 2016)
 - CARE Krishi Utsho microfranchise network set up 92 shops reaching 17,000 people, livestock focused with plans to expand to poultry, aquaculture and horticulture. (Ali A., 2016)
 - Gyaner Haat (Local Knowledge Centre) of Practical Action reached 6,000 households in the 12 months ended March 2016. Thirty centres in operation with 12 extension workers staffed in each, providing inputs, ICT and photocopying services, in addition to training in order to ensure sustainability.
- ◆ Crop-specific advice packaged with agricultural services:
 - Syngenta's Tegra is four-stage comprehensive service for rice cultivation, including seed, raised seedlings, transplanting, labor for logistics while transplanting and application of herbicides at the time of transplanting, besides advisory on agronomic practices. The package was implemented on 50,000 acres globally and launched in Bangladesh in 2013 with a target yield increase of over 20 percent. (Syngenta, 2013)
- ◆ Call center/hotlines
 - Krishi Call Center was launched in 2014 and operates out of the AIS premises in Dhaka. They reached 31,082 households in the 12 months ended March 2016. (Practical Action, [2016])
 - Bangladesh Institute of ICT Development (BIID) has a call center.
- ◆ Video screening
 - AAS screened the Save More video on improved agricultural machinery to 85,000 people in 332 communities during 2012 and 2013. AAS also distributed 1,149 DVDs to people who had seen the first screenings and encouraged them to show them to others.
 - Some tea stalls owners/operators with televisions enthusiastically showed videos in the evenings to farmers.

⁸ Donor/project stakeholder communication, 30 November 2016

- Union Information Service Centers (local offices to help people process government documents) screened videos.
- ◆ Mobile phone/website agronomic information
 - Syngenta Foundation reached 6,774 farmers this way in 2015. (Syngenta, 2016)
 - AIP project created an GIS-based input market information system.
 - BIID and CRS piloted a customized version of Farmbook translated into Bangla by BIID. BIID promoted the Farmbook application under its e-Krishok service, an ICT-enabled extension and market linkage services for farmers and extension workers. Farmbook allows extension workers to assist farmers to prepare farm business plans and analyze farm profitability and was piloted with DAE agents. Now it has been customized further to develop two components: the Business Planning Canvas and the Profitability Calculator. ([BIID], 2016)
 - BIID developed its own ICT applications such as 16250, a voice and SMS-based help line and e-learning program for extension officers.
 - Grameen Intel Social Business (GISB) piloted four agriculture-related applications for farmers' use, including *mruttika* for soil analysis and fertilizer recommendation; *ankur* for seed selection and recommendation; *protikar* for managing diseases, pests, and weeds; and *vistar* for accessing market or buyer information.
 - AESA and mPower created a number of mobile applications listed below and an Agro Knowledge Bank Portal. In 2015, AESA selected and trained 227 ICT Champions from the elected ICT leaders from each FPG. Each ICT Champion then provided training to approximately 20 ICT leaders from the FPGs. They also trained 185 extension agents on the use of these applications:
 - Farmer Query System
 - Crop Diagnostic
 - Seed Variety Recommendation
 - Fish Diagnostic
 - Livestock Management System
 - Digital Diary for extension agents
 - Work Scheduling for extension agents
 - Crop Statistics
 - Area information for building a database of local geographic and agricultural information
 - USAID/AIP, USAID/AESA and the USAID/Aquaculture for Incomes and Nutrition (AIN) project built a smartphone app and website for the Krishi Yellow Pages agricultural input supply information. ([CNFA], 2016)

- Krishi Call Center published its content online on Practical Action's website at <http://answers.practicalaction.org.bd/QnA>. The website reached over 12,000 people in the 12 months ended March 2016.
- Syngenta Foundation sent out SMS alerts on potato cultivation and contract farming organizations. (Syngenta, 2016)
- ◆ Agricultural exhibitions
 - AIP and DAE organized the Agro-Tech Fair in March 2016 that had 10,000 visitors. Two additional Agro-Tech Fairs are planned before the end of 2016. ([CNFA], 2016)

ANNEX 3. RECOMMENDATIONS FOR POTENTIAL DLEC ENGAGEMENT

Based on the general recommendations for improving extension and advisory services in Bangladesh, we list here the options for specific efforts by the DLEC Consortium in a pilot engagement.

Table 3. Recommendations for Potential DLEC Engagement

Area	Recommendation
Governance structures and policy environment	Scale efforts to connect agro-retailers with farmer producer groups, with specialized training based on needs identified in the respective groups.
Organization and management capacities and cultures	Support continuing education for DAE agents through online means.
Methods	<p>Communicate to farmers through networks of agro-retailers and/or agro-input manufacturers, possibly using follow-up SMS on proper usage of seeds, fertilizers and pesticides after purchase.</p> <p>Train DAE agents to support video production and enable sharing</p>
Market engagement	<p>Streamline output market linkage through aggregation and technology, leveraging farmer organizations, training local service providers and using digital finance with credit scores in partnership current and planned value-chain projects.</p> <p>Strengthen input chains through high-quality inputs, organization of agro-retailers, digitizing transactions and provision of credit in partnership with the current and planned value-chain projects.</p>
Livelihood strategies	Opportunities presented in the recommendations section are outside DLEC manageable interest; see general recommendations, conceptual framework section and Figure 1 for more information.
Community engagement	Opportunities presented in the recommendations section are outside DLEC manageable interests; see general recommendations, conceptual framework section and Figure 1 for more information.