Collective Action for Inclusive Digital Transformation of Agriculture in the Asia Pacific

Final Report on

Current Scenario and Needs for the Development of an Inclusive Digital Agriculture Program

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PART 1: Background

The agriculture sector in Asia is facing a number of difficult challenges, which are making it hard for modern farming practices to be sustainable for both people and the planet. While digital technologies have the potential to help address some of these challenges, their adoption has been limited and not scaled up enough. One of the main reasons for this is the complexity of the agriculture sector itself, which includes small farm sizes, poor telecommunications infrastructure in rural areas, high regulatory burdens that raise costs, and limited revenues due to customers' limited ability and willingness to pay.

Some of the key challenges faced by the agriculture sector include the following:

- Small and marginal farmers (86% of farmers) own less than two hectares, causing unsustainable farm incomes and poverty;
- Unsustainable farming practices are causing soil degradation and water stress, making it difficult to maintain productivity in the long term;
- The lack of available datasets at the farm, farmer, and sector levels is making it harder to provide services to the agriculture sector and driving up costs;
- Gaps in market linkages, along with challenges in price discovery for farmers and price volatility in the market, are contributing to a challenging business environment for farmers;
- The lack of infrastructure for food processing, logistics, and warehousing close to farm gates is leading to increased wastage and inefficiencies;
- Challenges in financial and digital inclusivity are limiting access to financing and digital technology for farmers;
- Poor farm mechanization is often due to affordability challenges and the small landholding situation, making it difficult to adopt modern technologies.

Digitalization has the potential to accelerate the transformation towards more sustainable and inclusive agriculture and food systems and help achieve the Sustainable Development Goals (SDGs) established by the United Nations. The global digital agriculture market is valued at USD 5131.9 Million in 2020 and is expected to reach USD 10587.6 Million by 2027 with a Compound Annual Growth Rate (CAGR) of 10.9% over the forecast period. This growth reflects the increasing demand for digital technologies in agriculture and the potential for these technologies to revolutionize the way food is produced and distributed around the world.

Asia-Pacific Association of Agricultural Research Institutions (APAARI), in collaboration with Global Forum on Agricultural Research and Innovation (GFAR) and Asian Farmers Association (AFA), facilitated a regional chapter - Collective Action on Inclusive Digital Transformation of Agriculture in Asia Pacific to address the challenges faced by farmers. The aim of this initiative is to raise awareness and promote multi-stakeholder analysis and joint actions on the implications of advances in digital agriculture with a particular focus on inclusion of farmers, especially women-led farmers.

The key driver of this initiative is inclusiveness of farmers in the design and governance of digital solutions. APAARI, in partnership with GFAR and AFA, has co-designed and facilitated the building of this framework in collaboration with Member states and active partnerships with a range of stakeholders in the ecosystem, including research organizations, academic institutions, agritech, farmer organizations, agribusiness, and civil society. The ultimate goal of this initiative is to develop an evidence-based, consensus-driven governance framework.

PART 2:

Analysis of the farmer survey:

A regional survey was conducted to gather information from smallholder farmers and producers in several Asia Pacific countries, including Bhutan, Bangladesh, Iran, Sri Lanka, Samoa, and Vietnam. The survey aimed to assess the challenges these farmers face in adopting local digital tools and solutions, as well as to understand their current use of these tools and their expectations and needs.

The survey was conducted as part of the framework for Collective Action on Inclusive Digital Transformation of Agriculture, which was facilitated by the Global Forum on Agricultural Research and Innovation (GFAR). It was implemented by the Asia-Pacific Association of Agricultural Research Institutions (APAARI) in collaboration with its country core members, and supported by Asian Farmers Association (AFA) as a regional partner. The survey was distributed to APAARI's country core members in the form of an online Google survey.

Farmers' Profile:

The survey received 277 responses, of which 85 came from women and 192 from men. Further analysis of the survey data indicates that 199 of the responses were from individuals in Bangladesh, 29 were from Sri Lanka, 17 were from Samoa, 12 were from Iran, 12 were from Bhutan, and 7 were from Vietnam. The majority of the responses came from National Agricultural Research Systems (NARS), which are primarily country core members of APAARI. These organizations supported the survey effort by mobilizing additional responses from their networks.
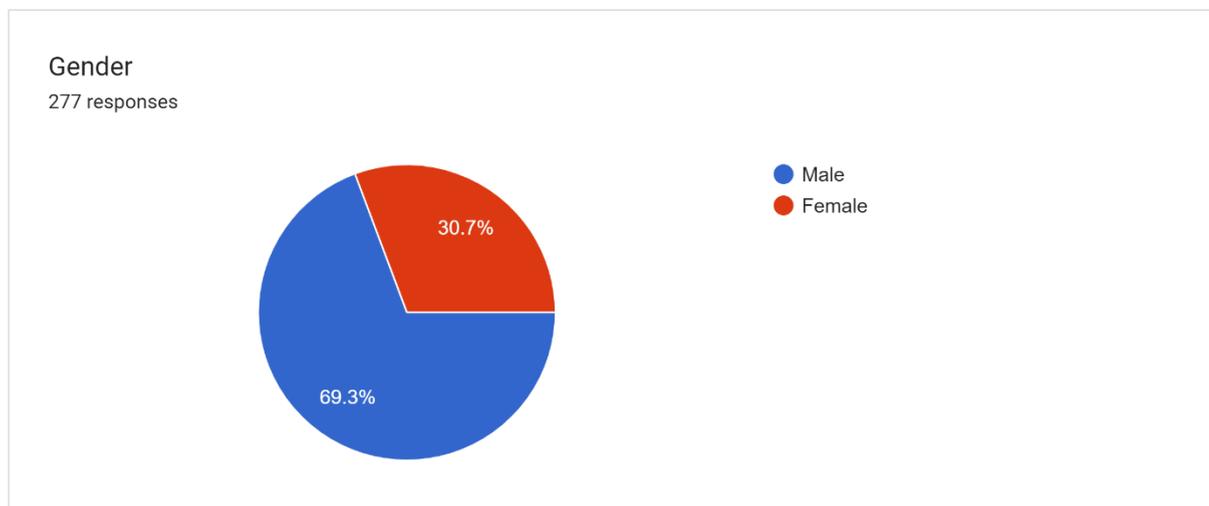
Figure 1 Gender distribution

Age and farm size: Factors impacting digital strategies

Two key factors to consider are the age of the farmers and the size of their farms. According to the survey results, approximately 51.6% of the responses came from farmers between the ages of 41 and 60, while 39% came from farmers between the ages of 24 and 40 (as shown in figure 2). and 26% of the women responded that they are ready to use any digital tools.

Figure 3 indicates that a majority of the respondents - approximately 83.4% - identified themselves as smallholder farmers. This highlights the importance of developing digital strategies that are tailored to the needs and capabilities of smallholder farmers, who often have limited access to resources and technology.

Age group in years
277 responses
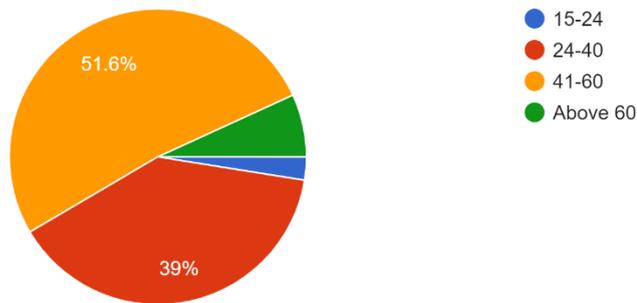
Figure 2: Age group distribution (in years) of the sample population

Farm size
277 responses
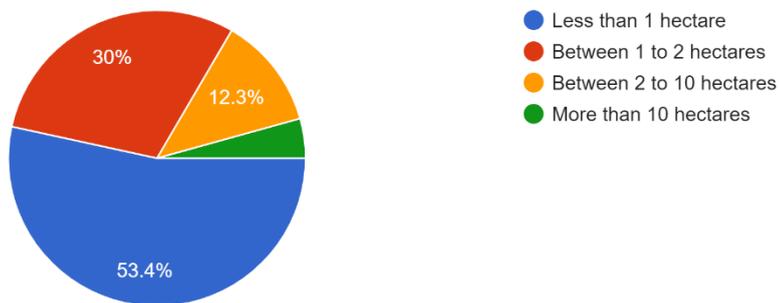
Figure 3: Farm size depiction of the sample population

Insights: Farmer's readiness to adopt Digital tools for agriculture

A. **Connectivity:** The survey found that farmers are generally well-equipped to adopt digital tools for agriculture, with high levels of mobile phone ownership and access to stable internet connections. Specifically, almost all of the farmers surveyed - approximately 98.6% - own a mobile phone, with a majority of them (62.6%) using smartphones, and the remaining 37.4% using basic phones. This indicates that digital tools designed for mobile devices could be an effective means of reaching and engaging with farmers.

Furthermore, the survey results suggest that a significant proportion of farmer families have access to computers, with 32.5% reporting ownership. In addition, more than 58% of the respondents reported having access to a stable internet connection. This provides further evidence of the potential for digital tools to support agricultural productivity and improve livelihoods.
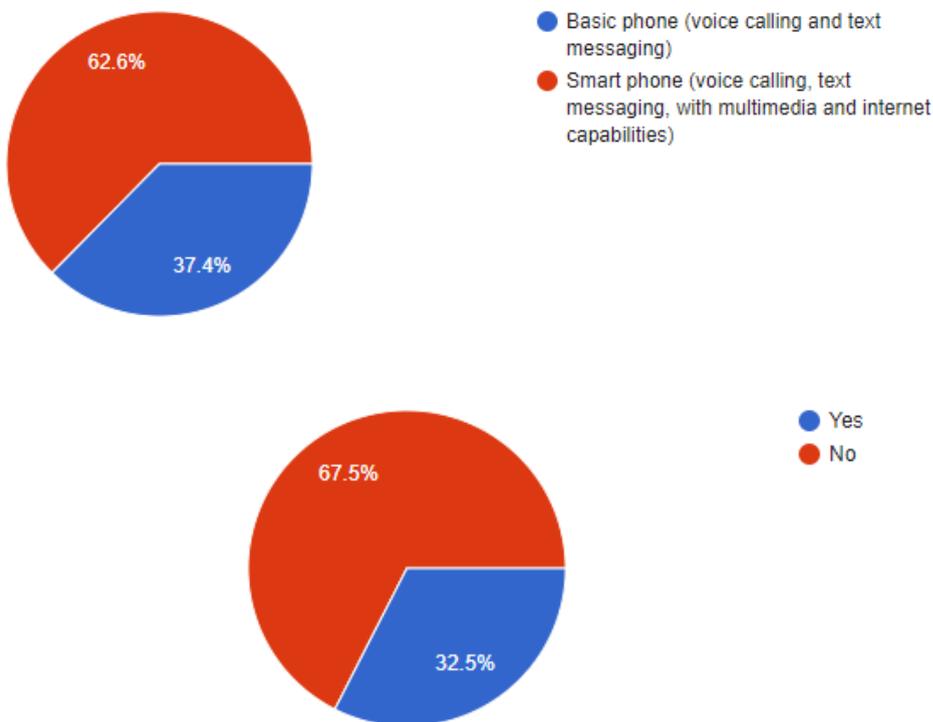
Figure 4A & 4B : Accessibility of mobile and internet connection

Approximately 40% of farmers polled use the national telecom provider internet services, 28% use international telecom services, 12% use cooperative/local entity data services, and 17% use community network internet services.
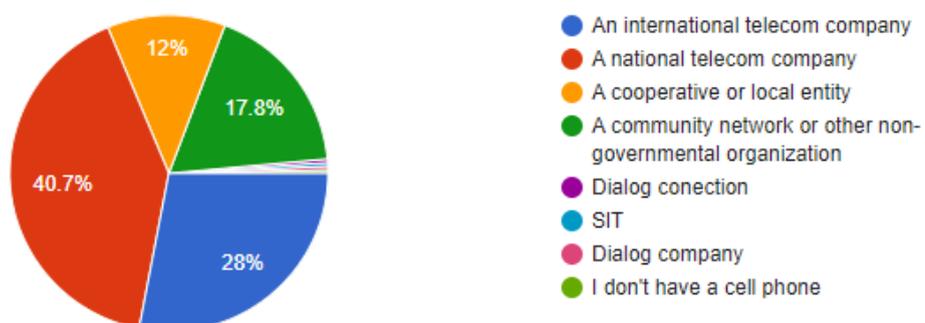
Figure 5: connectivity/internet service provider

B. Farmer readiness for digital engagement for better farm productivity

The data suggests that there is a growing recognition among farmers that digital tools and technologies can have a positive impact on their farm productivity and profitability. Approximately 82.7% of the sampled farmers agree that digital tools are needed to increase productivity, reduce labour costs, and increase income indicates a strong awareness among farmers of the potential benefits of digital tools. (Figure 6). The fact that 76.2% of the surveyed farmers are willing to use any digital technology, including mobile applications, indicates a high level of openness and receptiveness among farmers to new technologies.. The finding that 54.2% of surveyed farmers are willing to pay service fees for the use of digital tools suggests that farmers recognize the value of these tools and are willing to invest in them if they can provide tangible benefits., Finally, the high percentage of farmers, at 74.4%, who are willing to recommend digital tool adoption to other farmers in their region suggests a growing sense of community and collaboration among farmers.
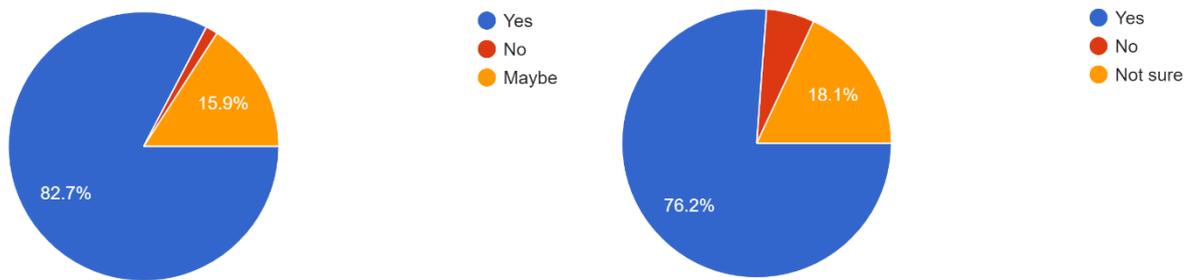
Figure 6 & 7: The first chart indicates whether or not farmers believe that farms and produce need digital tools/ technologies to increase productivity, save labour cost and raise income; while the second chart depicts whether or not the farmers are ready to use any digital technologies like mobile based applications.
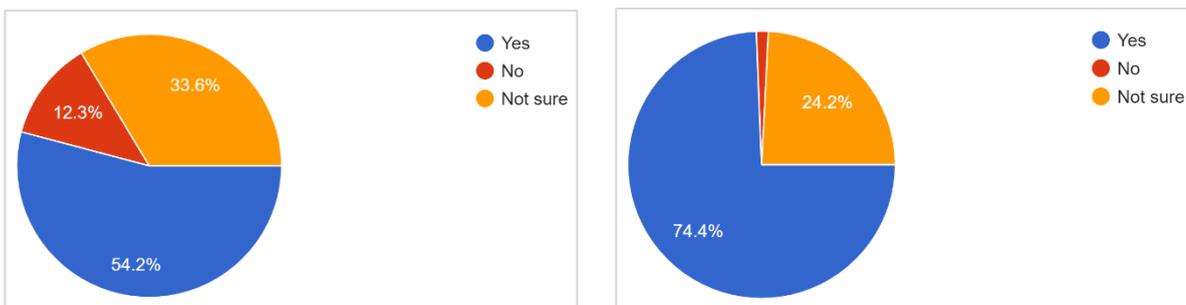
Figure 8: Willingness to pay service fees to use digital tools

Figure 9: Willingness to pay recommend the adoption of digital tools for other farmers in your region

Farmers are aware of a variety of technologies, including smart farming (e.g., digital extension services, drone-based pesticide application, fertiliser rapid soil analysis and e-Soil Health Card, pest prediction and control, and smart micro irrigation), agricultural drones and robotics, precision agriculture (e.g., IOT, sensors), intelligent crop planning (e.g., pre-season guidance to input suppliers for seeds, fertilisers, machinery, credit, and insurance), and smart micro irrigation (e.g., farmer to online retail market, traceability, and quality assessment). These technologies have the potential to increase productivity, reduce labour costs, and optimize resource use, and farmers are becoming increasingly aware of their benefits.
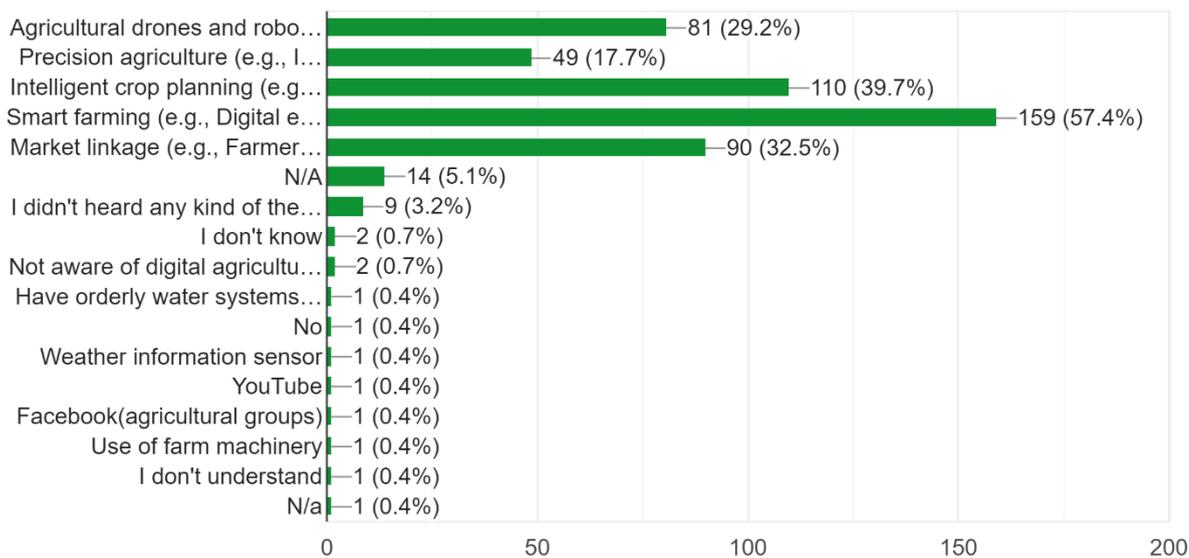
Figure 10: Awareness about the digital agriculture technologies
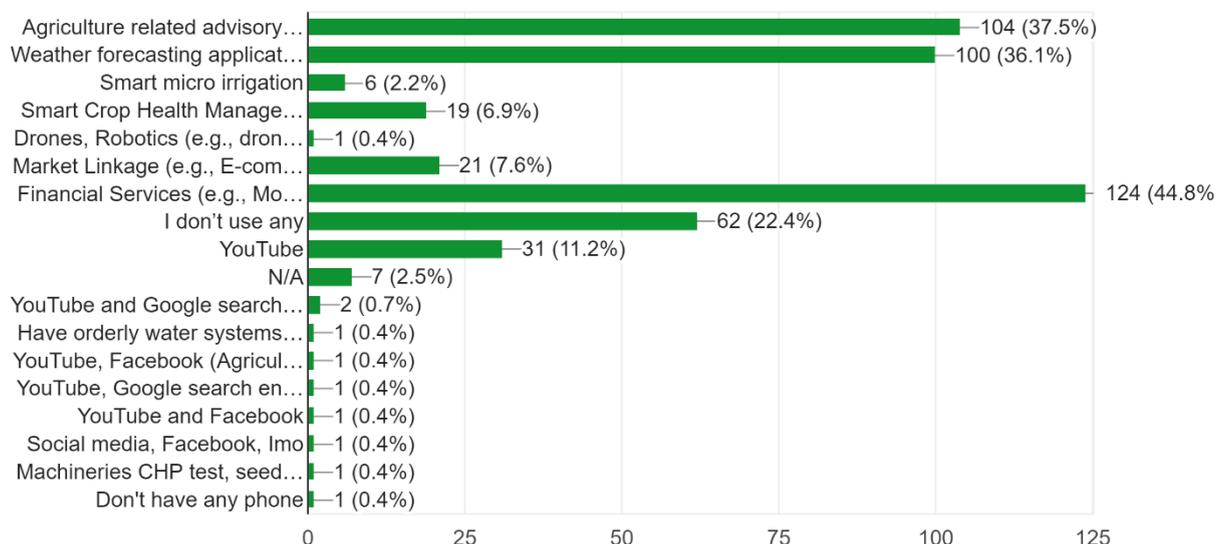
Figure 11: Digital services/technologies used by farmers

According to the survey results, the majority of farmers use agriculture-related advisory and information services on a weekly basis. These services provide information on product and input quality, environmental conditions, and market conditions that can lead to higher crop yields. On the other hand, information about digital market linkage solutions and marketplace, as well as digital financial services, is accessed on a monthly basis. These services include information on procurement of seeds, fertilizers, pesticides, and agricultural implements through mobile-commerce platforms, digital payments, savings, smallholder credit, and agricultural insurance.

However, the survey also indicates that farmers are hesitant to adopt digital supply chain management solutions. These solutions include digital quality assurance for farm inputs and produce, enterprise resource planning (ERP) platforms for smallholder farmer cooperatives, nucleus farms, outgrower schemes, and logistics management solutions for post-harvest cold chains, storage, and transport. The sample size response reveals the annual frequency of accessing such information.
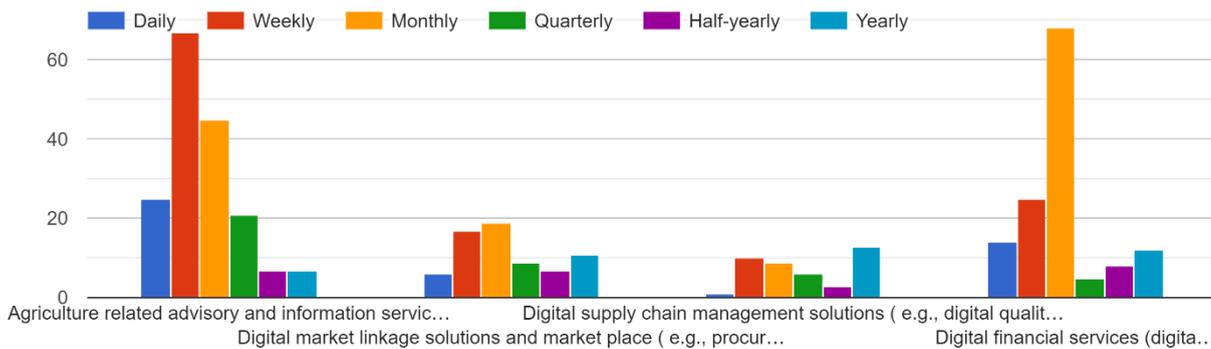
Figure 12: Frequency of use of digital services in last cropping seasons

Out of the 277 responses received, 70% of the farmers learned about improved agricultural practices from their family or through traditional means, while 53% of the farmers learned about good practices from their peers.

The majority of farmers (66%) gain access to improved agricultural practices and digital technologies are learned through training and group activities. Additionally, 46.6% of the of the polled farmers found online videos and courses to be effective, while for 45% of them relied on radio and TV programmes. About 35% were able to access information via printed education materials.
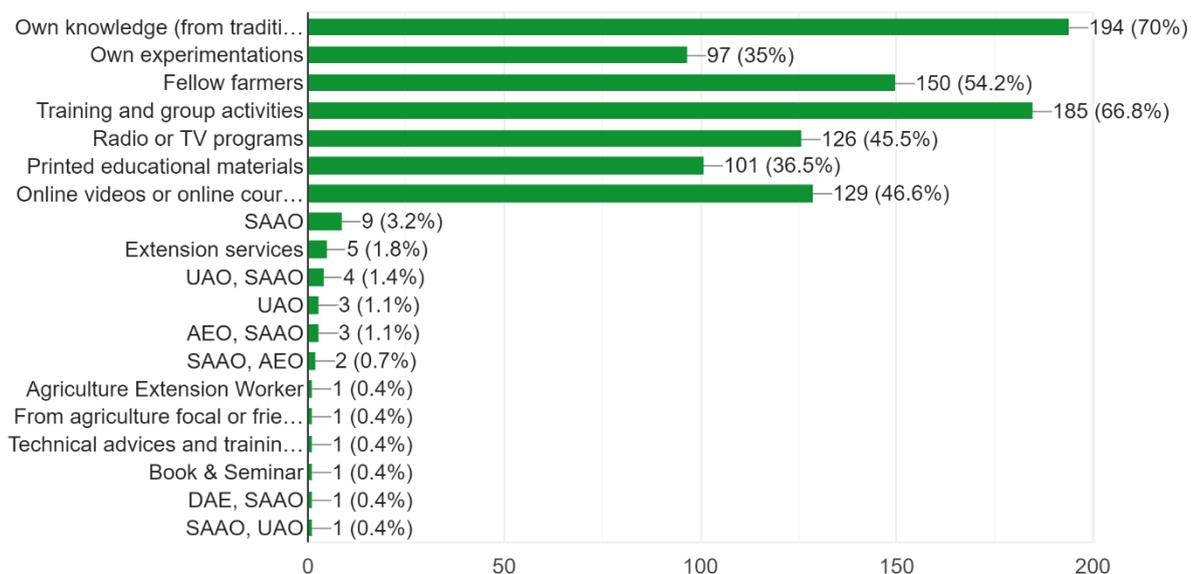
Figure 13: Sources of information related to improved agricultural practices and digital technologies

Challenges for the use of digital technologies

The survey found that there are various reasons why farmers are not using digital technologies. One of the main reasons is that farmers have not received adequate training on how to use digital services, or they may not be aware of the services available in their community (Refer fig 14). Another factor is that younger family members who have access to digital technology are less likely to help older farmers learn to use these technologies because they may not be interested or lack the necessary skills to assist.
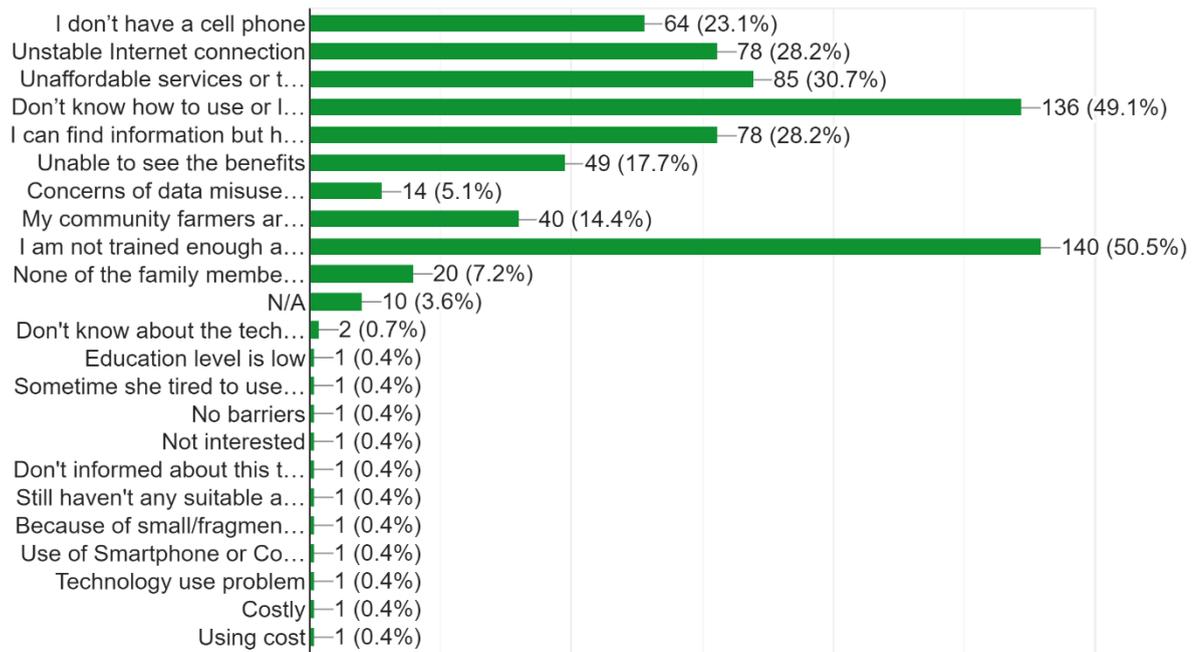
Figure 14: Barriers/ obstacles identified that farmers face in using digital technologies

Based on the graph it appears that about 73% of farmers think digital technologies can improve education and public knowledge of best practises 67% of farmers think that initiatives like disease detection can provide early warnings about climate change that will allow farmers to react and take measures on time.
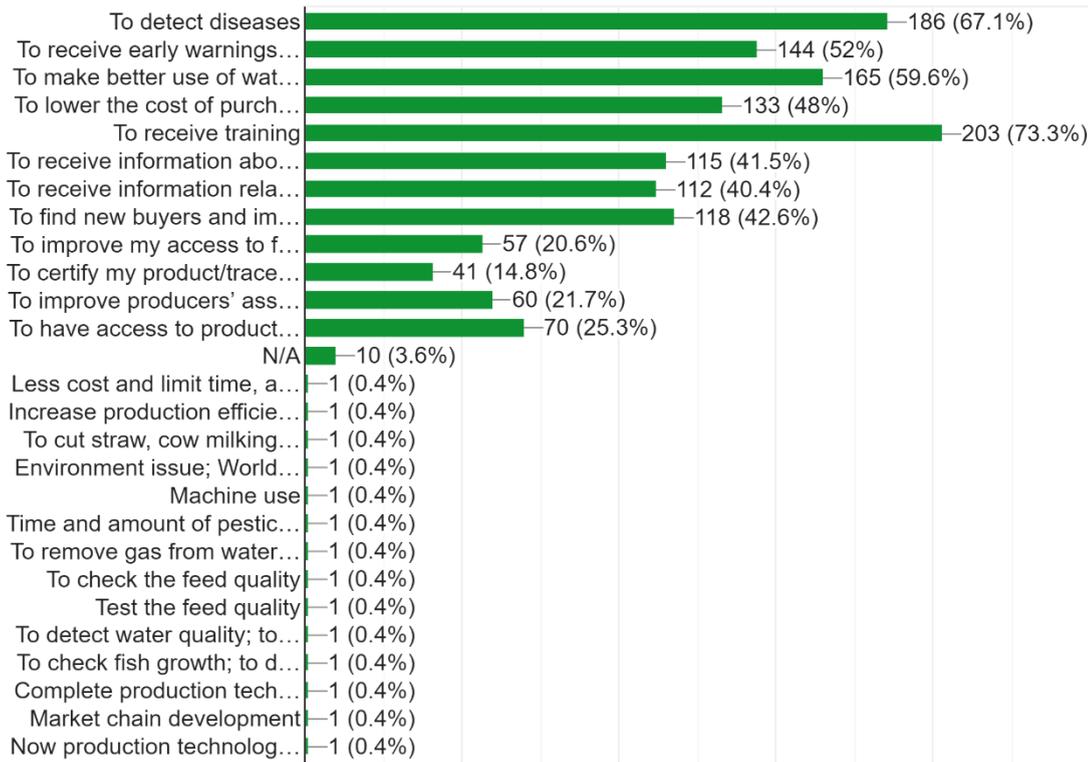
Figure 15: Activities that can be enhanced by digital agriculture technologies or digital tools

Approximately 60% of farmers believe that digital technologies can be used to benefit processes including better use of water, fertilisers, and agricultural inputs, as well as access to markets. In order to improve the use of digital agriculture instruments, farmers seek education and awareness programmes.

Adoption of digitally delivered services in Farmer Producer Organizations (FPO):

Out of 74 responses, 77% of farmers mentioned that agriculture-related advisory information services are being delivered in their farmer producer organizations.
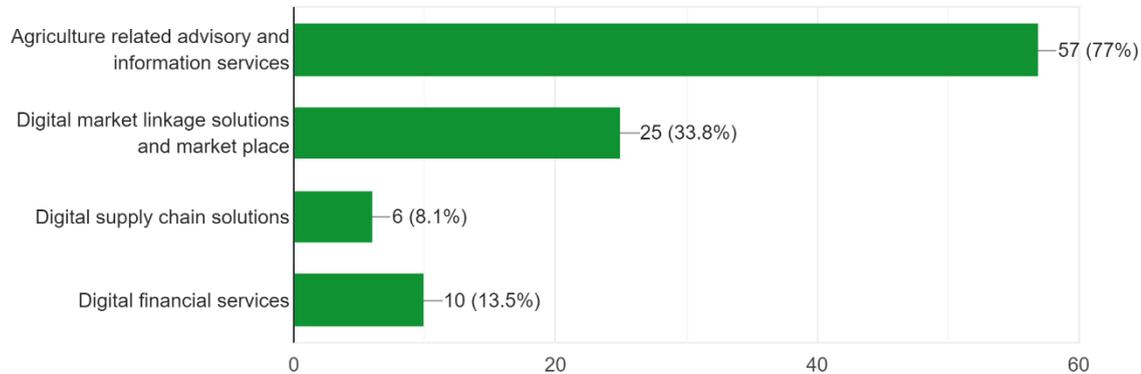
Figure 16: Digitally delivered services that the Farmer Producer Organizations are providing to the farmer members

According to the poll, 70.7% of the surveyed farmers mentioned that their farmer producer organisations do not have an e-commerce platform.Additionally, approximately 15% of them expressed uncertainty about the specific services provided by their farmer producer organizations.
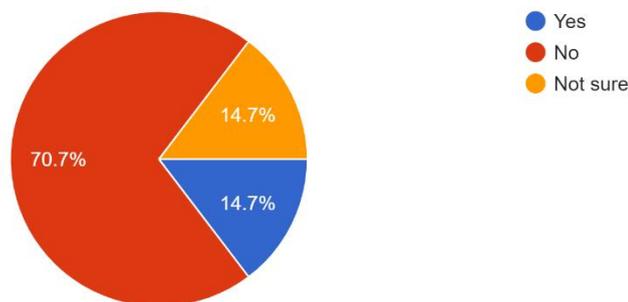
Figure 17: Farmers' opinion if the Farmer Producer Organizations having e-commerce platforms

The survey also showed that about 19% of the farmer producer organizations have digital access to certain financial services, while approximately 25% farmers are unsure about any such services being offered at their farmer producer organization.
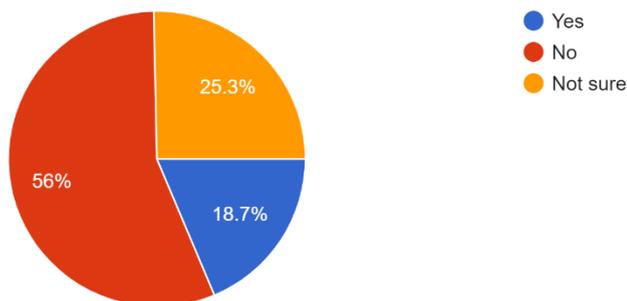
Figure 14: Farmers' opinion if the FPOs with digital access to certain financial services

Approximately 21% farmer producer organizations introduced digital farming technologies to their members, while 46.7% still have no such services delivered at their farmer organizations.
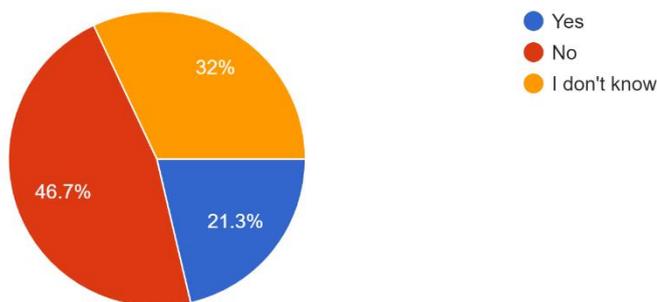
Figure 15: Farmers' opinion if the FPOs that introduced digital farming technologies to its members

About 42.3% of farmer producer organizations are planning to engage in promoting digital agriculture tools.
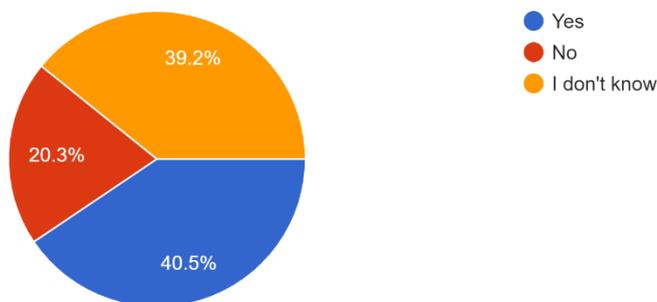
Figure 16: Farmers' opinion if the FPO is planning to engage in promoting digital agriculture tools

Observation and Findings from Farmer Survey:

According to a survey conducted by APAARI Members, the findings revealed that digital transformation in family farming can have various positive impacts. The respondents emphasized that implementing digital technologies in agriculture can lead to improved quality of agricultural products, increased productivity, enhanced profitability, and better income levels for farmers and agricultural workers.

Current uses of digital technologies are mainly concentrated in:

- Agriculture-related advisory and information services
- Consulting weather forecasts and market information
- Financial services including online payments, collections and access to public services.

However, women's participation in access to digital tools for agriculture is less than men as observed from the insights captured in the study.

Expected uses to increase in future:

- Risk management based on early warnings.
- Reduction of input costs and improvement in production efficiency.
- Expansion and improvement of marketing efficiency
- Smart crop health management

The main barriers/ obstacles that farmers face in using digital technologies are:

- Insufficient training to use digital services
- Lack of knowledge on how to utilize these services effectively

Gender lens in farmer survey: Understanding the roles and needs of women farmers, as well as their interactions with digital agriculture services, is crucial. The survey made a conscious effort to capture women's voices and collect data more systematically, recognizing that such data can reveal the unique opportunities and challenges faced by women farmers in accessing and utilizing digital tools in agriculture.

PART 3: Recommendations from the Multi stakeholder Consultation:

A multi-stakeholder consultation workshop was conducted with the aim of gathering diverse representatives from various sectors in the Asia Region. The primary objective was to identify key concerns and challenges within the agriculture value chain. The workshop specifically focused on exploring how emerging digital technologies could be leveraged during different stages of the crop life cycle, namely the pre-production phase, on-farm management phase, and post-production phase. The purpose was to determine potential opportunities and solutions to enhance agricultural practices and address the identified priority issues.

Given below are the recommendations from the **Stakeholder** Consultation:

1. **National Level Multi-Stakeholder Consultation**: To bridge the digital divide, it was recommended during the consultation workshop that national multi-stakeholder agendas be established. These agendas should be supported by public-private partnerships and involve organizations with common interests. This collaborative effort would ensure a comprehensive approach to addressing digital disparities in the agriculture sector.

2. **Training Programs for Building Farming Communities' Capacities:** To enable successful and inclusive digital transformation, smallholder farmers require assistance in organizing and accessing resources and training. Specifically, they need support in understanding and adopting recent technologies, especially those that utilize cell phones. Developing information and communication strategies aligned with the local context and utilizing accessible and user-friendly technological tools are crucial for empowering farming communities.

3. **Participation and Inclusion of Farmers:** Involving key stakeholders, including farmers, intermediaries, women, and youth, in the design of digital solutions is imperative. Developers should establish an iterative feedback loop with farmers throughout the design process, from conception to launch and beyond, to ensure the development of market-fit products. This participatory approach will lead to solutions that better meet the needs and preferences of the target audience.

4. **Good Practice to Increase Women's Participation in Digital Transformation:** While digitization of agricultural value chains has facilitated access to markets, inputs, and services for smallholder farmers, women's participation remains limited due to factors such as the mobile gender gap, social and structural barriers, and gender-blind approaches of digital interventions. To address these challenges, the framework for digital interventions should consider women's literacy levels, including their ability to read, write, and navigate digital tools. It is crucial to jointly develop and design gender-inclusive last-mile solutions that account for the diverse realities of women farmers, aiming to foster collective and associative mechanisms.

5. **Accessibility and Affordability**: Considering the varying infrastructural and economic conditions in different countries, it is important to address issues of accessibility and affordability in digital technologies. Such technologies can be costly, and not all farmers have access to reliable internet connections and smartphones. To ensure smallholder farmers can benefit from data-driven digital transformation tools, it is recommended to

bundle digital services into viable business models. This bundling approach would make the tools more affordable and scalable, as individual farmers are less likely to bear the cost of multiple or separate apps or digital services for each task.

PART 4: Digital Agriculture Use Cases

Below are the few of the following good practices and lessons learned that have been documented in this study.

Use Case 1:

Farmsio empowers the farming community to mitigate the risks of climate change and to act as a Net carbon sink. Farmsio solutions are made for all categories of farmers with major focus on small and marginal farmers. Overall livelihood development with better income is the ultimate motive behind our services. Market linkage, access to good quality inputs, climate smart advisory, traceability module, Carbon farming module will enhance the economic opportunities for the stakeholders.

Reference Link: Farmsio

Use Case 2:

Waycool Foods is India's leading food and agri-tech platform. Focussing on food development and distribution, the company leverages innovative technology to scale and operate a complex supply chain from "Soil to Sale" As of the last financial year, Waycool's farmer engagement program 'Outgrow' engaged with about 2500+ farmers in providing pre and post harvest supply chain support. This comprises farmers with diverse landholding profiles (about 30% small farmers and 9% marginal farmers) and gender profiles (about 32% women farmers)

Reference Link: Waycool

Use Case 3:

SourceTrace innovation is a digital technology platform called DATAGREEN which is built utilizing latest technologies such as mobile applications, remote sensing, block chain and Bluetooth etc.,to offer a comprehensive set of end-to-end solutions for digitization of agriculture/food value chain from farm-to-fork.

Reference Link: SourceTrace

Use Case 4:

TraceX's Enterprise Cloud platform can be configured to digitize the package of practices of any crop cycle and is capable of integrating with the existing digital infrastructure such as soil monitoring systems, satellite data, IoT devices and ERPs to provide end-to-end traceability. TraceX today caters to more than 45+ businesses across Agri, Dairy, Meat, and Seafood value chains.

Reference Link: Tracex

Use Case 5:

bhalo is Bangladesh's leading farm inputs marketplace and a social enterprise. bhalo uses a network of digitally-equipped sales agents to connect farmers to leading farm input suppliers and financial service providers, and offer curated high-quality farm inputs (seeds, fertilisers, chemicals, etc.), customised advisory and financial services (pay-later, insurance, etc.). This increases production and income of small farmers, and sales and market share of partner businesses

Reference Link: Ebhalo

PART 5: Annexure

Annexure 1: Agenda of Multi Stakeholder Consultation

APAARI-AFA - GFAR

Agenda for the Multi Stake Holder Consultation

(Regional Collective Action on Inclusive Digital Transformation of Agriculture in Asia Pacific)

Date: 21 – 22 Feb 2022   Mode: Virtual Mode

Agenda

Day 1 - 21st Feb

Bangkok Time	Topic	Session objectives	By
11:00	Welcoming Remarks	Welcome — 5 Min	Dr. Ravi Khetarpal
11:05		Introduction of Participants – 15 Min	Ms. Samitha
11:20	Opening Remarks	Journey of GFAR collection Action - Inclusive Digital Transformation of agriculture – 15 Min	Ms. Valeria
11.35	Multi-stakeholder Consultation	Overview ,Objectives and expectation setting of the consultation – 10 Min	Ms. Samitha
11:45	Partners Introduction	Introduction -- Asian Farmers Association – 10 Min	Ms. Estrella Penunia
11:55	GFAR Collective Action	Overview -Inclusive Digital Transformation Asia Chapter- 10 Min	Ms. Samitha
12:05	Setting the stage	Regional overview of the strategic engagement of APAARI members, partners, GFAR and other stakeholders in the collective action on digital transformation – 10 Min	Dr. Ravi Khetarpal
12:15	APAARI	1. Highlights of the farmer-centric survey process; list of the agencies/Member countries participated in survey; 2.Present results of survey conducted; 3. Recommendations and suggestions – 15 Min	APAARI
12:30		Q & A Session – 15 Min	

12:45	Asian Farmer Association	1.Highlights of the farmer-centric survey process; list of the agencies participated in survey; 2.Present results of survey conducted; 3.Recommendations and suggestions- 15 Min	Ms. Irish
1:00		Open forum – 30 Min	All Participants
1: 30	Closing Remarks of the day		Dr. Ravi Khetarpal & Ms Valeria

Day 2 – 22ⁿᵈ Feb

Bangkok Time	Topic	Session objectives	By
11:00	Presentation by Member Countries	1. Present initiatives of the member countries to enable and scale PPP for driving the innovation and accelerating the digital transformation across the agriculture eco systems; 2. To share experiences across the Strategic Digital Transformation Agricultural Programs undertaken. – 60 Min	1.Bangladesh – 10 Min 2.Bhutan – 10 Min 3. India -10 Min 4. Iran -10 Min 5. Lao PDR -10 Min 6.Pakistan -10 Min
12:00		Refreshment Break – 5 Min	
12:05	Presentation by Member Countries	1. Present initiatives of the member countries to enable and scale PPP for driving the innovation and accelerating the digital transformation across the agriculture eco systems; 2. To share experiences across the Strategic Digital Transformation Agricultural Programs undertaken - 60 Min	7.Papua New Guinea -10 Min 8.Srilanka -10 Min 9.Samoa -10 Min 10.Thailand -10 Min 11. Vietnam-10 Min
12:55	Presentation	Case Studies of Transformative Agri Tech Companies - Asia Pacific – 35 Min	1. Farmiso – 5min 2. Waycool - 5 Min 3. SourceTrace - 5 Min 4. Tracex -5 Min 5. Ebhalo -5 Min 6. Govi mithura -5 Min

			7. Govipola -5 Min
1:30	Q&A	Open forum – 15 Min	All Participants
1: 45	Closing Remarks of the day		Dr. Ravi Khetarpal & Ms Valeria

Annexure 2: List of participants of Multi Stakeholder Consultation

Name	Email	Organization	Designation	Country
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Annexure 3: Farmer Survey Schedule

S.N	Item	Timelines	Responsibility/Remarks
Farmer Survey Schedule			
1	Circulation of Survey Form to Participated Member countries	30th Aug	APAARI
2	Data collection Tool to be used – Google Survey Form	30th Aug	NARS
3	Identify data collection methods	1st Week of Sep	NARS (Note: Can be Direct reach by Farm Manager/ Extension agent , phone based etc.,,)
4	Identify agencies associated with NARS responsible to conduct survey	1st week of Sep	NARS
5	Sample Size selection	1st week of Sep	Depends on number of organization included by each NARS ; (Note: we recommend to include at least 50 -70 samples per organization)
6	Target type of samples		
	Category 1: Farmers practicing Agriculture	1st week of Sep	60% (out of which at least 20% to be women farmers)
	Category 2: Other Farmers		30% (Horticulture, Livestock , Fisheries, etc.,,)
	Category 3: Farmer Producer Organizations		10%
7	Geography distribution of samples	1st week of Sep	We recommend to Include different landscapes
8	Submission of the duly filled Google forms	1st week of Oct	NARS
9	Analysis of the Results from NARS and AFA	2nd week of Oct	APAARI
10	Results consolidation	3rd week of Oct	APAARI

List of Organization/ agencies included by Asian Farmer's Organization for executing the survey.

Cambodia	Farmer and Nature Net (FNN),Farmer and Water Net (FWN
Indonesia	Indonesia Aliansi Petani Indonesia (API)
Loa PDR	Lao Farmer Network (LFN)
Philippines	Pambansang Kilusan ng mga Samahang Magsasaka (PAKISAMA), Inc AgriCooPh
Vietnam	Vietnam Farmers' Union (VNFU)
Bangladesh	Bangladesh Kendrio Krishok Moitree (KKM)
India	Self-employed Women's Association
Nepal	Central Tea Cooperative Federation (CTCF) Ltd. National Land Rights Forum (NLRF)
South Korea	Korean Advanced Farmers' Federation (KAFF) Women Advanced Farmers' Federation (WAFF)
Japan	Ainoukai
Mongolia	National Association of Mongolian Agricultural Cooperatives (NAMAC)