Research report

Forum:	UNEP
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Introduction

In view of the major global demographic and environmental changes expected in the coming decades, **agri-tech** will play a crucial role in making farming ready for the challenges to come. Such solutions already exist, but they are not yet being adopted at the speed required to achieve a fundamental transformation of the sector.

By 2050, humanity will need to produce 60 percent more food in order to feed the over nine billion people who will populate the planet by then. The agriculture sector, which provides the bulk of our food supply, will need to operate at unprecedented levels of efficiency in order to meet this demand while mitigating climate change in the process. Many think that the way to increase food output significantly while preserving and protecting the environment is to harness more smart technology. Innovations in **agri-tech** aim to improve yield, reduce or eliminate harmful practices, and explore alternative sources of food. But is technology a solution for everyone? Big agricultural companies can certainly afford autonomous robots or analyse satellite imagery in order to improve their operations, but how about the smallholder farmers? While the use of various technologies in agriculture is gradually increasing all over the world, their global adoption is slow due to a number of reasons, such as high implementation costs or a lack of knowledge among farmers regarding the requirements for integrating them into their businesses.

Smallholder farmers, which include most of the world's farmers, are underserved from a technology perspective. They operate about 570 million farms and represent maybe a quarter to a third of the world's population. In terms of productivity and the potential for improving it, these are very different from your typical European or North American farms, which are slowly being bought up by large firms. **Smallholder farms** produce 60 or 70 percent of the world's produce and foods and tend to consume a large percentage of what they produce. Farmers in Africa, for example, depend on their crops as they can consume 70 percent or more of the products that they create and sell maybe only 25 to 30 percent of their produce on the market. By providing good information and use of modern technology, there are many areas where we can help them increase yields, reduce their costs, and mitigate risks. In doing so, we can help them play a different role in the community. After all, farming has been a community event for hundreds and maybe thousands of years.

Definitions of key terms

Smallholder farms

A smallholding or smallholder farm is a small farm operating under a small-scale agriculture model. Definitions vary widely for what constitutes a smallholder or small-scale farm, including factors such as size, food production technique or technology, involvement of family in labour and economic impact. Smallholdings are usually farms supporting a single family with a mixture of cash crops and subsistence farming.

Agri-tech

Agri-tech is the use of technology for farming that is developed to improve efficiency and profitability. While most commonly used in horticulture and agriculture, agri-tech is also found in forestry, aquaculture and viticulture.

Large-scale farms

Large-scale farmers produce more than smallholders because they have access to a wide variety of inputs, equipment, and machines.
These farmers utilise their transportation to fulfil orders to the digital agricultural marketplace or end client, reducing logistical obstacles.

Cooperative

Cooperatives organise large groups of smallholder farmers to improve their collective negotiating power. The digital platform will enable cooperatives to directly engage with smallholders, allowing digital agricultural firms to reduce farmer acquisition costs. To build awareness of its service among smallholders, the digital agricultural marketplace uses cooperatives, including e-commerce services and the organisation of workshops and training activities.

General overview

There are two main challenges that digital Agriculture market faces:

Lack of Digital Agricultural Knowledge

The greatest challenge for digital agriculture enterprises is to educate farmers on how to use digital agricultural services. This problem arises in third-world nations where digital literacy is generally low and farmers have little experience with e-commerce services. Digital agricultural enterprises must hire local field agents to teach farmers critical chores such as packing, uploading, grading, and the specifics of the food farmers want to sell. Raising awareness may entail sending field agents to farmers to explain the business model and the benefits of collaborating with other groups such as cooperatives, farmer societies, or government agencies. Because of the absence of internet connections in rural regions, digital agricultural firms find it difficult to utilise marketing to generate awareness and promote the adoption of their platform. It is also difficult for suppliers to persuade farmers that the medium can help them minimise post-harvest waste and meet prospective customers for their commodities, particularly perishable ones.

Poor access to network and internet connectivity

The internet has enabled increased insight into the worldwide supply chain in the agriculture sector. Various consumer paths in purchasing items now begin online via search engines, online reviews or digital marketing, and social media recommendations. Mobile data has

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grown more inexpensive in all areas; nonetheless, the cost of devices continues to be a significant barrier to mobile internet access, particularly in low-to-middle-income countries (LMICs). Mobile is the most common means for individuals in LMICs to access the internet; yet, around 60% remain disconnected, with farmers in rural regions bearing the brunt of the burden. Rural residents are almost 40% less likely than urban residents to utilise mobile internet. To summarise in a few words, a digital agriculture marketplace is a platform where people may purchase and trade agricultural products online. It is a new approach for farmers to sell their products to purchasers, including stores, restaurants, agribusinesses, and consumers. It enables farmers to avoid many mediators, resulting in better income, the ability to provide fresh products to clients, and less waste. Agriculture is rapidly evolving, and the rapid growth of digital interfaces is not dependent on supply and demand on production. Along with markets, collaborative platforms such as banking, renting farms, trading services, and producing goods such as seeds, fruits, vegetables, and others have emerged.

Supertrends discussed these issues with Jon Trask, CEO at Dimitra.io, an international company on a mission to deliver agritech to farmers everywhere. He said the following;

"I think as we grow as a company and get adoption around the world, language is the first and simplest one. In India alone, for example, our customers speak three or four languages, and that may cover only a percentage of the population. We've got the same issues in Africa and South America. The language issue is not difficult to overcome, but it does take time, effort, and money to publish the software in a number of languages and make it accessible. The second challenge is the varying literacy levels in different areas of the world. How do you help those in need if their reading skills are lower than the typical average that we're used to dealing with? We have to work with literacy experts to find different ways of helping farmers. How do you do this AND train all of those farmers? The solution we found is to outsource to knowledge partners, like, for instance with governments, NGOs, and nonprofits. We train them so they can train the farmers, and allow them to play a role in distributing the software and helping people be effective with that. In some of our projects, we need technology like sensors or DNA tests, and we get ecosystem partners who can go out and take a soil sensor reading on a farm, because a farmer may not be able to afford a soil sensor. We train that individual to show the farmer how to upload a soil sensor reading, and maybe show them a couple of tricks within the system to get more benefit for their farm in a very farm-specific analysis. I think the human aspect in software in general, at least in my career, has been the hardest part. Developing the software is relatively easy. Communicating to thousands or millions of people who all have different communication styles, languages, and levels of literacy requires a certain touch."

Major parties involved

LEDC's with a large dependency on agriculture

LEDC's with a large dependency on agriculture are the nations who have a large percentage of the working population working in the primary sector. Many of these farmers are small-holder farms with limited access to technology. Because of this, these member states are key members in creating a solution for this issue. They can express their needs and think of solutions from experiences in their own nation.

MEDC's with an efficient and productive agricultural system

MEDC's with a good working agricultural system have the knowledge on the most highly productive agricultural technology. They have the resources to share this technology with LEDC's. This makes these states a vital part in creating solutions for this issue.

Previous attempts to solve the issue

East Africa – Digitalisation represents a unique opportunity to deliver much needed, one-to-one smallholder farmer extension and cost-effective and real-time AEAS. GreenDreams TECH Ltd. sought to harness this opportunity in 2010 by developing the award- winning mobile-phone agricultural platform called iCow. This platform was designed to support smallholder farmers to address their individual farming priorities across livestock and crops through a virtual platform. It focuses on the most basic feature phones andis currently available in English, Kiswahili, Amharic, Tifygna and Oromiffa. iCowis at the forefront of building tools to enable smallholders to become globally competitive by integrating their production data into global datasets, with resulting value delivered to the farmers in real-time. Thereby, it closes the opportunity gap between farmers in developing and developed countries. In addition to providing e-AREAS on livestock and crop production, iCow also connects farmers to input providers, agricultural financial service providers, veterinary experts, agricultural extension service providers, NGOs, governmental and other value chain actors. Since 2010, over 1.6 million smallholder farmers have benefited from the application, with the majority in Kenya and including 21thousand Ethiopian and 19 thousand Tanzanian farmers. Dairy farmers saw an increase in milk production by two to three litres per day, and an increase in their incomes of USD 25 per month. Recent data have shown that farmers using the maize calendar, a newly launched product by iCow, have almost doubled their yields and those following sustainable soil conservation and regeneration have improved their soil fertility and earning potential.

Latin America and the Caribbean – In Latin America and the Caribbean, the Plantwiseplatform led by the Centre for Agriculture and Bioscience International (CABI) usedaseries of digital tools to reach smallholder farmers with timely diagnosis of crop problems and recommendations to reduce the impact of pests and diseases on yields. For example, live online plant clinic sessions on Facebook were launched by the Extension, Training andInformation Services Division (ETISD) of the Ministry of Agriculture of Trinidad andTobago to reach farmers during the lockdown caused by COVID-19 pandemic. SMS messages were used in Jamaica by the Rural Agricultural Development Authority (RADA) to quickly reach 2 553 farmers throughout the island with information to control the lettuce pest complex. Social media such as Facebook, YouTube and WhatsApp have been widely used in Latin America and the Caribbean in order to increase farmers' reach, especially during the COVID-19 restrictions. Village video screening on FAW control techniques. ©CABI ©iCow 6 Short videos teaching how to recognise and control crop problems have also been extensively used in what the Plantwise programme calls "mass extension campaigns" focused on a key crop problem and timely delivered when farmers should start monitoring it. Thousands of smallholder farmers have started to follow the programme publications led by local implementing organisations in each country. In Peru, the Ministry of Agriculture (INIA) established an advisory YouTube Channel transferring technical information on key crops to farmers in the whole country, reaching around 3.5million farmers in 2020. WhatsApp support groups for diagnosis and recommendations have been one of the digital-based tools most highly appreciated by user countries inLatin America. Originally created for remotely supporting plant doctors with photo-based diagnosis, new groups were created to bring together plant doctors and farmers to maintain remote assistance during the COVID-19 pandemic. The use of social media and internet-based official platforms has continued to grow within the Plantwise countries for sharing information relevant to farmers.

China – Pinduoduo.com operates China's biggest agricultural platform, connecting more than 12 million farmers to its user base of 788 million consumers. In 2020, the company handled CNY 270 billion (USD 42 billion) worth of agriculture-related orders. Working Jointly with local governments and agronomic research and extension institutes, Pinduoduo has created integrated programmes that address the value chain from upstream to downstream, beginning with the organisation of smallholder farmers, what and how farmers plant, and how they sell to the end market. Training plays an important role in Pinduoduo promoting digital inclusion and accelerating the digitalisation of the agricultural system. To help more smallholder farmers sell online, Pinduoduo has trained more than 100 thousand smallholder farmers who became digitally competent throughits Duo Duo University programmes on e-commerce business operation. The training programmes teach skills in an array of topics ranging from accounting, marketing to store operation. Pinduoduo training new young smallholder farmers through its Duo Duo University programmes on how to run an ecommerce business. Many of these new farmers are rural youth who left the countryside to seek livelihoods in big cities. Armed with new e-commerce skills, many have returned to their hometown and set up online businesses to help market local agricultural products to a national market. This has helped widen the market access and consumer demand for their products, giving©Pinduoduo 7 these farmers more security in selling what they have grown. Beyond training people how to sell their products, Pinduoduo also works with agronomic research and extension institutes and local authorities to improve the agricultural practices of local farmers. Trainers from the

China Agricultural University have worked with Pinduoduo to impart agronomic knowledge on various crops, from planting to crop management, to benefit smallholder farmers.

Possible solutions

A possible solution to this issue could be to have MEDC's share knowledge on efficient agricultural methods with LEDC's and help fund the renovations of their agricultural systems.

Another possible solution is to improve the educational system in rural agricultural areas which will improve illiteracy rates and with that, help the smallholder farmers to learn more efficient agricultural methods.

Further reading/bibliography

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