

WORKING PAPER

Digital Innovations Supporting Women Agri-entrepreneurs in India: Mapping Good Practices

June 2024

The study is collaborative effort between the International Rice Research Institute (IRRI) and the Centre for Research on Innovation and Science Policy (CRISP), as part of the Evidence Module of the CGIAR GENDER Impact Platform.

The International Rice Research Institute (IRRI) is an independent, nonprofit, research and educational institute, dedicated to reducing poverty and hunger through rice science; improving the health and welfare of rice farmers and consumers; and protecting the rice-growing environment for future generations.

The Centre for Research on Innovation and Science Policy (CRISP) is a non-profit research organization established in March 2004. The aim of the organization is to promote research in the area of innovation policy in relation to agriculture and rural development.

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ACRONYMS

AI	Artificial intelligence
AWAKE	Association of Women Entrepreneurs of Karnataka
BFFCS	Bastar Food Firm & Consultancy Services
BOB	Business over Breakfast
CoE-IP	Centre of Excellence in Intellectual Property Rights
CSA	Community Supported Agriculture
FPOs	Farmer Producer Organizations
GEM	Global Entrepreneurship Monitoring
GSMA	Global System for Mobile Communications Association
IIMR	Indian Institute of Millets Research
IT	Information Technology
ibid	infrastructure, devices, and capacity development
ISM	India Semiconductor Mission
LMICs	Low- and Middle-Income Countries
MEM	Master of Environmental Management
MSH	Meity Startup Hub
MeitY	Ministry of Electronics and Information Technology
MFOT	Motion Free Optical Tracking
MANAGE	National Centre for Management of Agricultural Extension
NIESBUD	National Institute for Entrepreneurship and Small Business Development
NPSP	National Policy on Software Product
PJTSAU	Professor Jayashankar Telangana State Agricultural University
SEO	Search Engine Optimization
SKUAST	Sher-e-Kashmir University of Agricultural Sciences and Technology
SPST	Software Product Security Testing
SAUs	State Agriculture Universities
TNAU	Tamil Nadu Agricultural University
TIDE 2.0	Technology Incubation and Development of Entrepreneurs
MSMEs	The Micro, Small and Medium Enterprises
USP	Unique Selling Proposition

EXECUTIVE SUMMARY

Agribusiness startups are currently redefining the Indian agricultural sector, encouraging a more entrepreneurial mindset among the various stakeholders. This surge of interest coupled with advancements in the digital sector has led to a rapid expansion in the technology and digital solutions ecosystem within the sector. The process of creating a new enterprise is being greatly aided by technologies such as big data, Artificial Intelligence (AI), Internet of Things (IoT), and various digital platforms. These technologies are currently helping them with everything from conceptualization of ideas to recognition of opportunities for production, marketing, and distribution.

The proliferation of digital technologies is offering unprecedented opportunities for women to participate in, and lead, agricultural enterprises in India by helping them overcome the many longstanding barriers they once faced, including limited access to information, resources, and markets. However, despite these positive developments, challenges still exist and adoption of digital technologies varies significantly from one enterprise to another.

In the Indian context, there are very few studies on women's agripreneurship in the digital era. The current study maps the various digital tools used by women agri-entrepreneurs and explores how digital innovations are serving as enablers of enterprise-building processes among women agri-entrepreneurs. This study closely examined the intricate relationship between digitalization and the dynamics of women's agri-entrepreneurship.

The study is primarily based on insights from in-depth interviews conducted with 19 women agri-entrepreneurs across India. The primary observations made from the study is that there are mainly two types of enterprises in the digital ecosystem, viz., digitech enterprises and digitally-

enabled enterprises. It was found that women entrepreneurs with educational background in technology were the founders of the digitech enterprises. This can be attributed to the highly tech driven and digital skill demanding nature of digitech enterprises. However, the majority of women entrepreneurs belong to the digitally-enabled enterprises as they are using various digital technologies to promote their enterprises.

Furthermore, to assess the digital engagement of the enterprises, we mapped the number of Inter-organizational and Intra-organizational digital tools used by them, in accordance with Von Briel et al. (2018). It was found that Inter-organizational digital tools, which are internet-based solutions, were mostly used by enterprises for promoting their business activities and collaborating with external partners. Whereas Intra-organizational digital tools, which are the technical tools enabling the design, the functioning, and the integration of the startup's digital behaviors, were explored less by the enterprises as adopting these tools demand higher digital skills and technical knowledge than inter-organizational tools.

Further, based on digital engagement, enterprises were grouped into four categories: Digital Followers, Social Influencers, Technical Influencers, and Digital Leaders, as put forward by Centobelli et al. (2022). We found that nine out of the 19 enterprises were social influencers with high adoption of inter-organizational digital tools and low adoption of intra-organizational digital tools. Among the five digitech enterprises, three fell into the category of digital leaders with higher adoption of both intra- and inter-organizational digital tools, and two were technical leaders using few inter-organizational tools and many intra-organizational digital tools. This can be attributed to their technical knowledge and digital skills as the founders of these enterprises were mostly from a tech background. Four of the enterprises fell into the category of digital followers as their adoption of both inter-organizational and intra-organizational digital tools were low.

Further the study identified the enabling role played by digital tools in women's entrepreneurship such as networking, self-learning, upskilling and educating, e-commerce and sales, and enterprise management. The study also identified various challenges faced by women agri-entrepreneurs in the digital ecosystem. These include digital skill gap, lack of security in digital spaces, financial constraints, and lack of family support.

The findings of this study highlight the fact that women do face many challenges, but they can also seize several clear benefits by employing digital technologies. Although women agri-entrepreneurs acknowledged that digital technologies have created opportunities for them to advance in their careers, they also lack the capacity to fully realize the potential of several digital solutions.

The study, therefore, makes three specific recommendations to support women entrepreneurs in three pivotal areas. The first recommendation is on strengthening the focus of incubators and accelerators on providing digital skill training

for women agri-entrepreneurs as many women entrepreneurs lack necessary skills to use digital applications, other than social media.

The second recommendation is on enhancing the contribution of public-sector agricultural institutes in supporting digitech agri-entrepreneurs. Digitech agri-entrepreneurs need agricultural expertise to fine-tune their digital innovations and public sector agricultural research institutions should have a clear mandate to offer technical and infrastructural support to these digitech agripreneurs, right from development of solutions to final validation.

The final recommendation is on setting up specific funding support to women agri-entrepreneurs in establishing and enhancing the digital presence of their enterprises. Creating a digital footprint necessitates both technical expertise and financial support. Women, particularly those without a technology background, often rely on third-party services for website development, digital marketing, and social media management, and need financial support to cover these costs.

INTRODUCTION

Agriculture in India has undergone significant transformation due to various factors, including technological advances, economic fluctuations, and demographic shifts, presenting both new challenges and attractive opportunities. With over half of the nation's population engaged in agricultural activities, diminishing farm sizes and limited per capita output further exacerbate the distress, particularly in light of the anticipated population growth and the increasing demand for food in the foreseeable future. In response to these challenges, India's present public policy approach to agriculture is to support entrepreneurship and innovation in order to achieve sustainable growth and income security for the agricultural industry (Seth and Ganguly 2017; Rathore et al. 2022; NITI Aayog 2023).

The emergence of agribusiness startups has redefined the Indian agricultural sector, encouraging a more entrepreneurial mindset among those involved in agriculture (Adhikari, Bonney and Miles 2017). The agricultural industry in India has drawn the attention of major conglomerates, prominent IT firms, investors, and young innovators. This surge of interest has led to rapid expansion in the technology and digital solutions ecosystem within the sector (Dutta, Lanvin and Wunsch-Vincent 2017). The emergence of agri-entrepreneurship (commonly termed 'agripreneurship') has not only empowered some farmers to become more business savvy but has also attracted a new generation of entrepreneurs with fresh ideas and innovative solutions, fostering a dynamic and forward-thinking agricultural landscape that is better equipped to meet the challenges of the 21st century.

The flourishing startup ecosystem and the competitive global marketplace is creating a path for leveraging agribusiness into a vital instrument that can revitalize the Indian agriculture sector. Currently, there are more than 2500 agri-startups registered with Startup India. According to the

Economic Survey 2021-22, India has become the third largest startup ecosystem in the world after the USA and China. But as the global startup revolution continues to grow, fundamental shifts are also occurring due to the fast-evolving digital landscape. There is a new wave that is taking over the startup revolution with a deeper integration of technology, such as AI, Blockchain, and advanced data analytics, with heightened focus on sustainability and social impact (Bisht et al. 2022; Dal Mas et al. 2023).

An extensive body of research demonstrates how digitalization is becoming increasingly important to the global economy and creating exciting new avenues of innovation for entrepreneurs, inventors, and society as a whole (Decker and Gunther 2016; Gottschalck and Gunther 2017; Cohen et al. 2017; Nambisan 2017; Ramaswamy and Ozcan 2018). The process of creating a fresh enterprise is being greatly aided by technologies such as social media, analytics, and big data. These technologies lower the barriers between innovation and business development by helping with everything from conceptualization and opportunity recognition to production, marketing, and distribution (Steininger 2019). As compared to conventional economy, digital innovations have made entrepreneurship processes less restricted (Sahut et al. 2021), enhanced innovation efficiency, bolstered the elimination of invention-to-innovation challenges (Nambisan 2017), and made it possible to forge important partnerships (Elia et al. 2020), which have speeded up the development of innovative ventures (Huang et al. 2017). However, despite these positive developments, challenges still exist, and adoption of digital technologies varies significantly from one enterprise to another (OECD 2021). Carayannis and Stewart (2013) state that for building successful enterprises in tech-driven settings, proficiency in digital skills is very essential. Due to inadequate IT skills and knowledge, SMEs have a poor degree of digital readiness, which limit their ability to take advantage of these digital solutions (Eller et al. 2021; Markovic et al. 2021).

Moreover, the advent of the digital era has offered unprecedented opportunities for women to participate in, and lead, agricultural enterprises in India by helping them overcome the long-standing barriers that once held them back, including limited access to information, resources, and markets (Buteau 2021; Kumar and Shobana 2023). But it is important to note that along with IT capabilities and availability of complementary resources (Akpan et al. 2022; Tan and Ludwig 2016), gender dynamics is also found to be a crucial factor in adoption of digital innovations by enterprises (Orser and Riding 2018). According to Scuotto et al. (2019), women entrepreneurs are still treated differently from their male counterparts and gender inequality persists in online spaces. Experts also state that along with the anachronistic gender barriers and social expectations women entrepreneurs are also facing the added barrier of digital skill gap (Kamberidu 2020). When it comes to social media awareness and usage, women entrepreneurs must constantly acquire new skills to capitalize on the endless opportunities put forward by these digital platforms in order to stay competitive and build their businesses (Olsson and Benhard 2021). Research (Kalim 2012; Malik 2017) contends that women's entrepreneurial pathways are challenging, especially in the rapidly changing digital ecosystem, and it addresses the necessity of creating regulations that encourage practices that allow women to become digital entrepreneurs.

Thus, female agripreneurship in the digital era represents a dynamic and transformative movement where women in agriculture are leveraging digital technologies and innovative business models to drive economic growth, sustainability, and empowerment (Kovid, Kumari and Pandey 2021; Mishra and Mohanty 2022; Chakraborty and Biswal 2023). Even though there is growing research on digital innovation and women's entrepreneurship (Nsengimana Chux and Robertson 2018; Singh 2017; Rastogi 2015; Awan and Hashmi 2014; Anwar and Rashid 2012; Ndovela 2016; Nambiar 2016, Fatoki 2016), research in both these areas largely

exist in isolation from each other (Sundermeier, Wessel and Davidson 2018), and mostly focus on entrepreneurship in general rather than on agri-entrepreneurship (Suseno and Abbott 2021; Fauzi, Antoni and Suwarni 2021). Fang et al. (2018) argues that we are still in the early stages of understanding the impact of digital technologies in entrepreneurship. Further, there is a dearth of studies that link digital innovations and women agri-entrepreneurs in India. Hence, in the present study we aim to map the various digital tools used by women agripreneurs and understand how digital innovations are serving as enablers of enterprise building processes among women agripreneurs.

The report is structured as follows: Chapter 2 describes the methodology followed for the study; followed by Chapter 3 which presents insights from the review which covers various topics viz., the gender digital divide, entrepreneurship in the digital era, digital engagement of women entrepreneurs, and opportunities and barriers for women agripreneurs in the digital era. The major findings from the study are presented in Chapter 4. The report ends with Chapter 5 with the conclusion of the study along with recommendations on how to further support women agripreneurs in enhancing their digital engagement and capacity to leverage digital innovations for scaling their enterprises.

2. METHODOLOGY

The study adopted an exploratory research design with multiple qualitative case analyses to map good practices in digital innovations that support women agripreneurs in India. As an initial step, we undertook a detailed review of literature to understand the status of women's entrepreneurship in the current digital landscape. We then compiled a list of women agripreneurs who have digital presence (enterprise website, social media profiles, e-commerce site presence) as well as have digital innovations as their product. This was done mainly through web searches and by connecting with a few incubators viz., AgHub at Professor Jayashankar Telangana State Agricultural University

(PJ TSAU), Nutrihub of Indian Institute of Millets Research (IIMR), AgHub of the National Centre for Management of Agricultural Extension (MANAGE), Hyderabad, and the Association of Women Entrepreneurs of Karnataka (AWAKE) in Bengaluru. Search engines used for browsing were Google and LinkedIn, and the keywords used in web search were 'women agri-entrepreneurs, women-led agri startups, women-led agritech startups, women in

agribusiness, female agribusiness owners, women agri-innovators, women in food processing' etc. We also enlisted 41 agripreneurs and we contacted them via emails and phone calls to arrange personal or virtual interviews. Nineteen agri-entrepreneurs (Table 1) who accepted our invitation and expressed interest to be a part of the study were interviewed – three agri-entrepreneurs in person and 16 via Zoom meetings, as per their convenience.

Table 1: Profile of enterprises studied

No.	Enterprise name	Location	Product/Service	Year of initiation	No. of employees*
1.	Farm Fresh	Bengaluru, Karnataka	Procurement and distribution of organic products	2018	10 (5F/5M)
2.	Some More Foods	Coimbatore, Tamil Nadu	Millet-based food processing	2013	20 (15F/5M)
3.	Ladakh Mushroom	Leh, Ladakh	Mushroom cultivation and marketing	2018	2 (1F/1M)
4.	Bastar Food Firm and Consultancy Services	Bastar, Chhattisgarh	Forest minor produce processing and marketing	2019	10 (All women)
5.	Han Agrocare	Uttarakhand	Mushroom cultivation and marketing	2015	21 (17F/4M)
6.	Greenaura International	Thrissur, Kerala	Coconut-based processing	2012	13 (8F/5M)
7.	Newlook Herbs	Salem, Tamil Nadu	Herbal products	2021	2 (1F/1M)
8.	Aranyam Naturals	New Delhi	Lakadong Turmeric-based food blends	2017	4 (2F/2M)
9.	Aruvi Eco	Coimbatore, Tamil Nadu	Amla-based food processing	2022	5 (2F/3M)
10.	Fruits Technologies Pvt. Ltd.	Mumbai, Maharashtra	High oleic groundnut procurement, quality testing processing and marketing	2019	5 (4F/1M)
11.	KIWI Kisan Window and Evolve Foundation	Dehradun, Uttarakhand	Organic products procurement and marketing	2017	12 (NA)
12.	Nectar Fresh	Coorg, Karnataka	Honey and honey-based food products	2007	10 (NA)
13.	Agrighar	Hyderabad, Telangana	Food processing	2019	17 (10/7M)
14.	Nima Goos Goos	Leh, Ladakh	Himalayan food products	2021	6(All women)
15.	Farmizen	Bengaluru, Karnataka	Organic vegetables cultivation and marketing	2017	40(15F/25M)
16.	Proximal Soilsens	Mumbai, Maharashtra	Soil testing devices and IoT devices for farm management	2017	8 (3F/5M)
17.	Renkuba	Bengaluru, Karnataka	AI powered solar panels	2017	5 (3F/2M)
18.	Naturedots	New Delhi	IoT devices for aquaculture	2019	17 (5F/12M)
19.	Godaam Innovations	Nashik, Maharashtra	IoT devices for storage godowns	2019	8 (3F/5M)

*F – Female; M – Male; NA- Not Available.

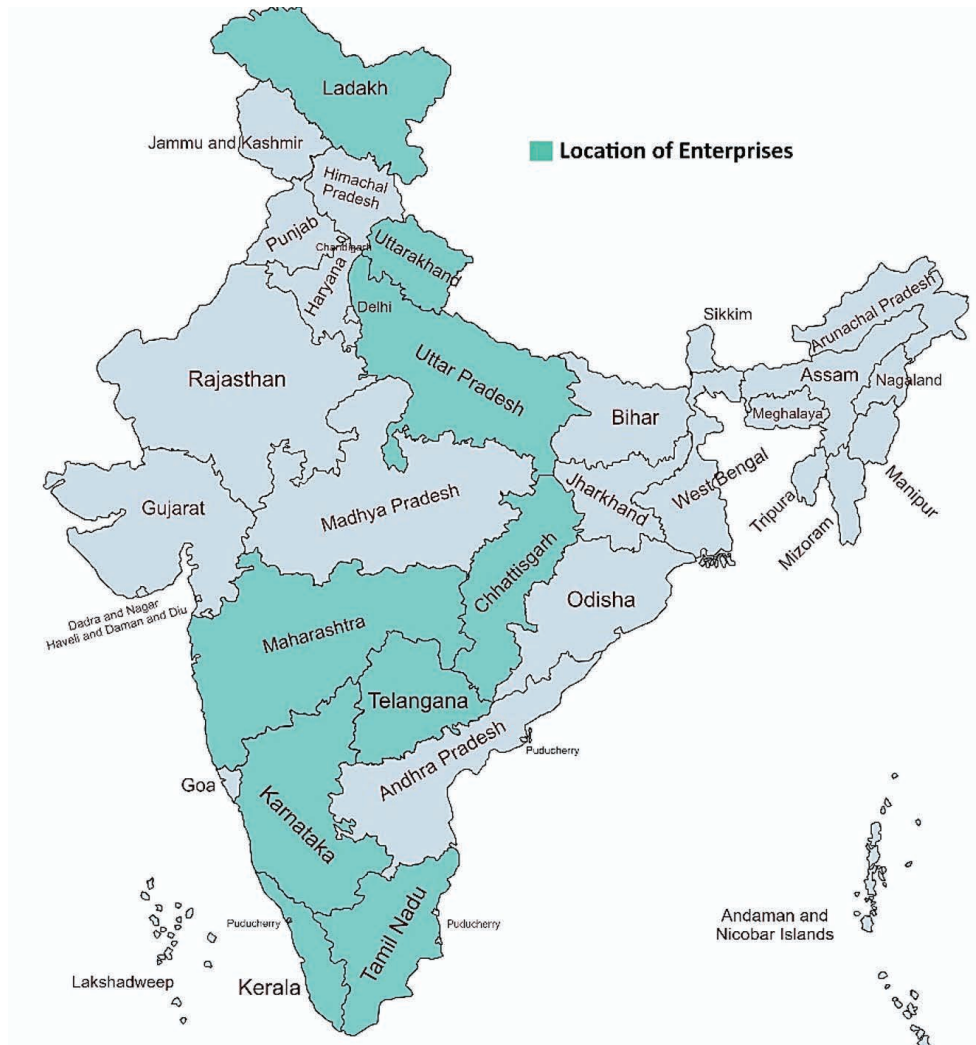


Figure 1: Location of enterprises studied

A semi-structured interview schedule was used to collect the data. The interviews – lasting approximately 1.5-2 hours – were audio-recorded and transcribed verbatim. The transcripts underwent a narrative analysis. This process allowed for the identification of codes and themes within the narratives, contributing to a rich understanding of the participants’ perspectives and experience with the digital tools that enabled the management and promotion of their enterprises. We identified six major enabling roles played by the digital tools, which is discussed with supporting narratives in the results section.

For mapping the digital innovations used by the women agri-entrepreneurs we categorized them into two categories: inter-organizational digital tools and intra-organizational digital tools, in accordance with the concepts laid by Von Briel et al. (2018). Inter-organizational digital tools

mean a set of internet-based solutions that allow enterprises to promote their business activities and collaborate with external partners. They are easily adaptable to new functions and can foster connections with a large number of users in the digital space (Von Briel et al. 2018). Intra-organizational digital tools are the technical tools enabling the design, the functioning and the integration of the startup’s digital behaviors (ibid). These tools are usually highly specific and thus rigid in terms of ability to be re-programmed to different functions. An exhaustive list of digital tools used by the women entrepreneurs was made and these tools were grouped under these two categories. Further, following Centobelli et al. (2022), based on the use of inter-organizational digital tools and intra-organizational digital tools we categorized the entrepreneurs into four categories viz, Digital followers, Social influencers, Technical influencers, and Digital leaders (See Box 1).

Box 1. Taxonomy of enterprises based on their digital engagement

Digital Followers are startups that use few intra- and inter-organizational digital infrastructures. They have to still acquire awareness of the strategic value of digital behavior. They have still not invested in intra- and inter-organizational digital infrastructures to support their enterprise.

Technical Influencers are startups that use few inter-organizational tools and many intra-organizational digital infrastructures. The fact that these startups do not adopt inter-organizational digital infrastructures highlights that they are investing in digital infrastructures or exploiting the technical potential they already have, but they do not actually leverage their social reputation. These startups need to acquire awareness on the importance of investing resources in the field of social media.

Social Influencers are the startups that use few intra-organizational and many inter-organizational digital infrastructures. Despite exploring the opportunity offered by a variety of inter-organizational tools, they are still not able to adopt many intra-organizational digital infrastructures. The startups are pursuing a digital strategy to achieve social influence. This means they are investing in the field of social media or exploiting the social potential that their founders must have already had.

Digital Leaders are startups that use many intra- and inter-organizational digital infrastructures. They understand the strategic value of a digital tool, and therefore, explore the potential of a variety of intra- and inter-organizational digital infrastructures. They improve their enterprise management and innovation processes through the adoption of all innovative digital infrastructures.

3. INSIGHTS FROM THE LITERATURE REVIEW

3.1 The Gender Digital Divide

In recent decades, digital technologies have significantly expanded, yet their impact hasn't been uniform. Women, in particular, have had limited access to resources and opportunities to effectively utilize these digital tools (Faugoo and Onaga 2022). Consequently, the crux of the digital revolution revolves around the issue of access to digital networks. Specifically, it raises questions about who gains empowerment and who faces informational marginalization due to the utilization of these new tools (Hilbert 2011). Groups that are sidelined, such as women, youth, and the elderly in developing nations, are less inclined to engage online if they don't perceive these platforms as inclusive for them (Van Deursen, Courtois and Van Dijk 2014; Brewer and Piper 2016).

There is a pervasive gender digital divide in countries with low incomes, in contrast to developed or industrialized nations where women's

internet access and usage frequently surpasses that of men (Bhandari 2020). Significant gender differences were observed in the context of the pandemic in rise in the use of digital platforms (to the benefit of women), with the discrepancies being particularly severe among micro-firms (Torres et al. 2023). One of the biggest disparities exacerbated by the digital revolution is the gender digital divide (Moolman 2007; Gurung 2018). It is highly plausible that the current general gender inequality will be mirrored in the digital sphere as well (David and Phillips 2022).

There is no dispute that having access to fundamental infrastructure, such as mobile phones and internet connectivity, is indispensable for reaping the advantages of the digital revolution. According to the estimates provided by the Alliance for Affordable Internet (2021), in 32 low- and middle-income countries (LMICs), the gender gap in internet use resulted in a staggering \$126 billion GDP loss in 2020. To comprehend disparities and inequalities rooted in digital technology, it's crucial

to consider not only access to devices but also how individuals employ these devices and their skill sets (Helsper 2021). Presently, the focus has shifted from mere digital divides to broader digital inequalities (Van Dijk 2019).

While access to technology is improving, the intrinsic challenge lies in connecting people with the necessary skills and competencies to effectively utilize and maximize the potential of these technologies. Empirical results from a study conducted in India revealed that women still lacked basic technical skills for internet use and technology adoption, a condition primarily due to norms involving family approval, societal restrictions, and beliefs around women's domestic responsibilities (Bala and Singhal 2018). The GSMA's 2022 Gender Gap Report provides a clear view of the gender-based digital divide in India. According to the report, progress in closing the gender gap in mobile internet use in India has stagnated. While men's mobile internet use increased from 45% to 51% between 2020 and 2021, women's usage has remained stagnant at 30%. Moreover, women in India lag behind men in terms of mobile ownership, with only 71% of women owning a mobile phone compared to 83% of men. The report further indicates that smartphone ownership among Indian women is merely 26%, in contrast to 49% among men, and 20% of women who own smartphones still do not use mobile internet, compared to 10% of men. Additionally, the report highlights a near 5% gender gap in the proportion of male and female mobile owners in India who report that mobile technology assists them in their daily activities.

Analysis shows that women are less likely to buy a mobile phone or utilize mobile internet even when they have the same levels of education, income, literacy, and employment as males. This suggests that other problems, such as bias and societal norms, may be at play (Butler and Shanahan 2020). A 2018 OECD analysis states that gender-based digital exclusion has numerous underlying factors (Borgonovi et al. 2018). The main causes include

ingrained gender biases and sociocultural norms, as well as limited access to digital technologies due to cost, lack of expertise or education, and technology illiteracy.

Although the underdeveloped world often struggles with connectivity, women are impacted by the aforementioned issues all over the world. The most frequently mentioned obstacles to using mobile internet in LMICs, even among those who are aware of it are still literacy and digital skills, affordability (mostly of handsets), and safety and security (GSMA 2022). Digital literacy is considered essential for underprivileged communities' social and economic growth (Choi and DiNitto 2013; Dillahunt et al. 2016). According to some research, women believe they are less skilled in digital skills than men (Vasilescu et al. 2020). From an entrepreneurial perspective, affordability could be another factor discouraging people from using ICT (Nazir and Roomi 2020) and this is especially true for small and medium-sized enterprises (SMEs) (Kirche and Srivastava 2017; Said 2020).

Gender disparities in access, coupled with factors such as unequal access to education and professional training, financing, asset ownership, etc., contribute to the gender digital divide and limit the transformative impact of digital innovations (Sinha 2018). The consequences of the digital divide that lead to gender differences in ICT use and availability, reduce the assets available to women-owned small and medium-sized enterprises (SMEs). This, in turn, may affect their competitive edge through lowering resource potential and capital (Benitez-Amado, Llorens-Montes and Perez-Arostegui 2010; Orser et al. 2019). Furthermore, findings show that women encounter hurdles with regard to partaking in more forward-thinking activities related to the digital economy such as skill acquisition, entrepreneurial chances and leadership positions, and these are the elements that have contributed to growing the digital gender divide (Marsan and Sey 2021). Hence, the digital economy's exclusion of a significant portion of the

workforce, with particular emphasis on women, suggests that we still have much work to do in addressing and reshaping the digital divide, as highlighted by Carayannis and Campbell (2018).

Women face both 'glass ceiling' and 'sticky floor' problems; whereas the glass ceiling is an obstacle for highly educated women, the sticky floor is a problem for less-educated women (Ahmad and Naseer 2015). In these circumstances, women entrepreneurs have more opportunity to grow their enterprises and themselves as well as to access equal business development opportunities with males through digitalization and ICT use (Afrah and Fabiha 2017; Pappas et al. 2017; Shah and Saurabh 2015). Women who work digitally have more opportunities to start their own businesses, work remotely and flexibly, connect with the global community, and easily access knowledge and resources. However, in order for this to occur, the gender gap in the digital sphere needs to be closed through swift, coordinated, inclusive, and practical global policy-level actions that enable women to participate meaningfully in the digital landscape (Faugoo and Onaga 2022). It is important to make a commitment to provide women with the same access to digital technologies and degree of digital competence as men (Sorgner 2020).

3.2 Entrepreneurship in the Digital Era

The digital arena is transitioning from Fourth to Fifth Industrial Revolution and this digital transformation is rapidly changing working conditions and how business is generally conducted (Schwab 2016; Saarikko et al. 2020; Schwarzmüller et al. 2018). The potential for billions of individuals linked through mobile devices, alongside unparalleled computing capabilities, storage potential, and knowledge accessibility through intelligent machines, presents immense prospects for entrepreneurs (Demirkan, Spohrer and Welsch 2016). According to Bogner et al. (2016), digitalization entails much more than merely converting analog to digital data; it also entails

improved interfaces, integrated data sharing, and administration, as well as a stronger correlation across business processes. Digital transformation undoubtedly relates to a company's capacity to absorb, use, adapt, create, develop, transfer, and disseminate technologies that arise from a combination of the organization's operational, relational, and organizational skills, resources, and learning mechanisms (De Mori et al. 2016). Being knowledgeable about digital advances and change makes it simple to acquire a competitive edge, but this has boosted the demand for tech-savvy future entrepreneurs (Larsson and Viitaoja 2019).

Technology and entrepreneurial skills and abilities are combined in digital entrepreneurship, which uses digital technologies to boost creativity and innovation while utilizing classic entrepreneurship techniques such as opportunity detection, resource acquisition, resource and financial management, and so on (Scuotto et al. 2019). Consequently, alongside the diverse array of responsibilities involved in establishing an enterprise – such as acquiring essential resources, establishing connections with mentors, and devising both short- and long-term strategies – modern entrepreneurs are facing mounting pressure to familiarize themselves with, and maneuver through, the intricate array of digital tools (Hui et al. 2018). Scholars and experts advocate a heightened emphasis on nurturing advanced digital competencies, including the ability to construct professional online networks and strategically utilize various tools (Van Deursen and Van Dijk 2011; Van Laar et al. 2017).

Despite the discourse on Industry 5.0, the agricultural sector's progression into the 4.0 revolution remains confined to a select few pioneering companies. Within this landscape of innovation, while the digital revolution offers advantages to larger enterprises, SMEs often encounter complexities in adopting such innovative processes due to the rapid evolution of technologies (Zambon et al. 2017). SMEs tend to

exhibit slower adoption rates of innovative Industry 4.0-related technologies, such as leveraging social media platforms for business objectives, in comparison to larger corporations (Ghobakhloo et al. 2022). However, albeit at a gradual pace, there's a discernible uptick among SMEs in incorporating information communication technologies (ICTs), for example social media, and shifting towards technology-centric management practices (de Mattos et al. 2023).

The advent of digital transformation enables organizations to respond to market needs with unprecedented speed, fostering heightened collaboration and rapid information sharing that surpasses previous capacities (Demirkan, Spohrer and Welser 2016). Digital technology significantly contributes to a firm's capacity for innovation and management (Foroudi et al. 2017), thereby enhancing overall performance (Gërguri-Rashiti et al. 2017). Within the agribusiness sector, digital transformation is fundamentally reshaping the entire value chain from production to consumption (Anastasiadis et al. 2018). Oswald and Kleinemeier (2017) contend that digitalization is not merely an option but a necessity for businesses today. However, there remains a notable shortage of both conceptual and empirical research addressing the actual processes through which organizations undergo digital transformation (Warner and Wäger 2019).

Technological improvements have yielded a plethora of both quantifiable and intangible benefits for businesses and consumers alike. But the manner in which startups increase the economic impact of technology at the local level is less evident. ICT use can improve business efficiency (Song and Wang 2017). ICT applications can enhance long-term viability of supply chain activities including inventory management and procurement, according to Adjei-Bamfo et al. (2019). ICT may also improve the food industry's supply chain effectiveness and logistics (Mohezar and Nor 2014; Pramatarı 2015; Akhtar et al. 2016).

In the long run, it will support startups and SMEs in managing resources sustainably (Tseng et al. 2017; Gong et al. 2018). However, it is clear that Indian food SMEs place minimal emphasis on ICT applications, which results in operational inefficiencies (Verdouw et al. 2016; Dandage et al. 2017).

Undoubtedly, one of the biggest issues facing businesses across all industries at the moment is integrating and utilizing new digital technology (Hess et al. 2016). Agribusinesses face challenges in implementing adept digital technology due to various factors, including stakeholder engagement, training, and ease of access (Anastasiadis et al. 2018). Digital technologies seem to have the ability to transform markets in ways that go beyond just modifying items, corporate procedures, sales channels, or supply chains. The question that businesses must now address is how to embrace digital transformation and turn it into a competitive advantage rather than when to make it an operational focus (Hess et al. 2016).

According to earlier research, people with pre-existing advantages, such as strong social capital, resources, and communication skills, benefit preferentially from digital tools for entrepreneurship development (Robinson et al. 2015). Furthermore, involvement on digital platforms is becoming increasingly complicated in terms of technology access, understanding algorithms, etc. (Bjørn and Boulus-Rødje 2018; Gray and Suri 2019; Lindtner 2017). Entrepreneurs who have limited access to information about these needs are therefore confronted with the challenge of not only understanding how to use these platforms, but also obtaining the numerous resources required in order to take part. Research indicates that among those at higher socioeconomic risk, perceptions of digital tools and engagement concerns discourage digital participation (Jack, Sovannaroth and Dell 2019).

The 'New Normal' of a digitally-oriented economy requires all businesses, especially SMEs, to be well-

equipped (Belitski et al. 2022). Consequently, digital transformation should be also discussed through a wider dialogue so as to encourage equitable innovation, particularly in agriculture and the agro-industry (Bronson and Cannas 2018; Stilgoe et al. 2013), as well as to foster responsible business development in farmers' markets (Ratten et al. 2017). The key reason why some SMEs haven't sped up digital adoption is not knowledge, expertise, or capacity, rather, they lack an understanding of how tools function in tandem within a digital strategy (Connected Commerce Council 2021). In order for SMEs that are currently heavily reliant on technology to expand and prosper, they also require access to funding, infrastructure, devices, and capacity development (ibid).

3.3 Digital Engagement of Women Entrepreneurs

Approximately one-third of growth-driven entrepreneurs operating worldwide are women (Elam et al. 2021). As digital technologies make it easier for women to access new market possibilities and market information, women entrepreneurs across all economies are rapidly moving towards a future that is digital according to the Global Entrepreneurship Monitoring Report, 2022 (GEM 2022). It's also important to remember that developing nations have a greater degree of female entrepreneurship than developed ones (Minniti 2017). However, SMEs led by women and small businesses suffer greater setbacks if they are not digitally driven, but gain enormous advantages in doing so (OECD 2017). Torres et al. (2023) found that while women-led small enterprises were less likely to invest in software, equipment, or digital solutions, they were significantly more likely to report growing their use of digital platforms. Digital literacy among female entrepreneurs benefit their companies (Fauzi, Antoni and Suwarni, 2020). Research has indicated that women are typically more frequent users of digital technologies than their male counterparts (Hilbert 2011; Twenge and Martin 2020).

According to some estimates, the pandemic hastened up digitization of enterprises by three to four years (LaBerge et al. 2020). Significantly, additional research on the effects of the pandemic has revealed that small businesses and businesses run by women were more likely to recoup income losses by using digital technologies during the epidemic (Lashitew 2023). Additionally, it was discovered that although female business owners were 65% more likely than male business owners to state their plans to utilize more digital tools in the not-too-distant future, they were likewise on par with their male peers with regard to the use of new digital technologies brought on by the pandemic (GEM 2022). Because of the pandemic, early-stage women entrepreneurs in lower-income nations are 17% more likely than males to report using new technology, and 9% more likely than men in developed countries (ibid). Ahmad et al. (2019) found that SMEs are driven, or in a sense compelled, to adopt social media due to stiff competition in their business environment. Idemudia et al. (2017) report that women have more significant perceptions of ease of use, compatibility, relative advantage, and risk when using social media than men. According to Chakraborty and Biswal (2023), female entrepreneurs' intentions to pursue digital entrepreneurship are significantly impacted by their social media engagement, which also has an impact on their sense of empowerment.

According to Larson and Vittaoja (2019), there are several opportunities for female empowerment and increased female involvement in the labor, financial, and entrepreneurial sectors as a result of digitalization and the digital revolution. Furthermore, digitalization should, in theory, make it simpler for workplaces to adopt higher levels of flexibility (Cijan et al. 2019; Trennery et al. 2021). This would make it simpler to integrate paid labor with different kinds of care-giving duties since these responsibilities continue to be typically carried out by women (OECD 2018). Online microbusinesses are therefore presented as a 'magical solution'

that offer a 'significant compromise between paid work and unpaid domestic responsibilities' for middle-class women of reproductive age (Luckman 2016). Meanwhile, digital entrepreneurship offers a blueprint for 'having it' for younger women (Duffy and Pruchniewska 2017).

According to Kawira, Mukulu, and Odhiambo's (2019) study on MSMEs in Kenya, a large proportion of MSME owners and managers in the study sample who employed digital marketing said their companies' performance was improving. For business activities, online marketing has become the new norm. Emails, phone calls, and social media are the primary means for undertaking digital marketing efforts. Entrepreneurs also frequently rely on social media sites as well as messaging applications such as Telegram and WhatsApp (Saleh 2020; UN Women 2020). In India, 73% of women-led enterprises were adversely affected by COVID and the revenue of 20% of these enterprises were nearly zero (Bain and Company 2021). But it is also reported that post-COVID, many female business owners began engaging in internet marketing and utilizing social media platforms to promote their businesses as a recovery approach, and this resulted in significant sales growth (Sorrentino, Leone and Caporuscio 2022).

3.4 Opportunities and Barriers for Women Agripreneurs in the Digital Era

Numerous researchers have begun to demonstrate the benefits and opportunities that digital technologies bring to small and medium-sized enterprises (SMEs), particularly women-led SMEs that struggle with issues of weaker networks and difficult to access capital. Research indicates that digital technologies are highly valuable to female entrepreneurs, and that pursuing entrepreneurship without digital media tools and social platforms would be both 'very pricey' and extremely challenging (Tran 2014). Apart from highlighting the advantages provided by front-end digital infrastructures, such as websites as well as online

order and payment management systems, studies have indicated that making deliberate use of the internet may assist SMEs in finding new clients and suppliers (Rosenbaum 2017). Studies from the global south, where basic technology access and expertise are significantly limited, (Medhi and Toyama 2007; Wyche et al. 2016) report that people mainly use technology to connect with others online rather than perform 'professional' activities. This makes it all the more imperative for entrepreneurs to understand the benefits digital tools can provide in building their enterprise (Burrell 2012).

A 2020 United Nations survey found that 54% of women running small businesses utilized the internet to promote and market products in order to speed up transactions and improve their access to both domestic and foreign markets (Shamim 2022). Because they can reach clients worldwide and circumvent cultural constraints, digital enterprises may therefore help equalize opportunities for men and women (Soto 2020). Experts predict that women's status in the workforce will improve as a result of the continuing digital revolution (Yilmaz and Ünlü 2022). More flexible work arrangements might make it simpler to balance paid employment with care-giving duties, which are currently mostly carried out by women (OECD 2017).

Research indicates that advances in technology have generally increased job flexibility and dissolved the distinction between work and leisure time (Grönlund and Öun 2018). For women, this indicates both possibilities and problems in terms of juggling career and family obligations. Additionally, it fosters entrepreneurship by assisting a company in seizing a fresh chance for financial gain (Mozas-Moral et al. 2016). Digital technology affects company operations directly and also makes it possible for entrepreneurs to grow their networks and obtain financial and information services (Cesaroni, Demartini and Paoloni 2017). ICTs were utilized for informal learning as well as the acquisition of material and immaterial resources (Sharifazad

2016). Much of recent research emphasize how women are launching enterprises in the digital economy (Golmohammadi 2011; Kamberidou and Pascall 2019; Alao et al. 2022; Scuotto et al. 2019).

Additionally, several studies have emphasized how crucial social media usage is for female business owners (Cesaroni, Demartini and Paoloni 2017; Jiménez-Zarco et al. 2021). Social media give SMEs a platform to execute their marketing campaigns. Social media is a tool used by women-owned SMEs to communicate and educate their clientele directly (De Vita 2023). In addition to being helpful for information sharing (Lee et al. 2016), social media also play a vital role in shaping customer views and purchasing habits (Smith et al. 2015; Hollebeek and Macky 2019), raising brand recognition, and boosting revenue. These channels have been shown to be successful in fostering new consumer types that are more cognizant of, and sensitive to, a variety of unique product attributes, as well as in preserving existing long-term connections with consumers (Smith et al. 2015).

Digital technology provides MSMEs in established and emerging countries with expanded market access, global supply chain connectivity, and improved management and operations (Mazzarol 2015). According to research, women entrepreneurs may benefit from digital technology and the internet by gaining access to partners as well as knowledge of the global market while also saving money and promoting a work-life balance (Rosenbaum 2017). According to Hagsten and Kotnik (2016), front-end digital infrastructure such as websites and online ordering/payment systems are crucial for globalization because they make it easier to process transactions, provide details about products and services, and keep an eye on the behavior and preferences of international consumers (Pergelova et al. 2019).

However, gender, racial, and socioeconomic structural disparities are mirrored in the online environment even for digital-only businesses

(Dy et al. 2017, 2018). As a result, instability of 'conventional gender differences' is not always seen in a digital environment (Ignatow and Robinson 2017; Marwick 2014; Boyd 2009). But, inequality in digital resources is mirrored in offline resources (Wajeman 2010). Nonetheless, the primary challenges encountered by companies when implementing digital solutions stem from their own competencies. For instance, an individual may lack the abilities required to maintain their website or effectively target digital marketing to the appropriate client segments (Räisänen and Tuovinen 2020). Gender disparities are a major factor in driving digital capabilities, which is one of the factors that drive a company's success, according to Oggero, Rossi and Ughetto (2020). However, women entrepreneurs face barriers when it comes to utilizing digital networks (Olsson and Barnhard 2021).

Suwana (2017) finds that inadequate education, lack of opportunities, and the patriarchal system contribute to women's lower digital literacy. Lack of digital skills is a major constraint to digital participation for older women (and men) due to their limited levels of education. Illiteracy (digital illiteracy) was reported by women as a major hindrance to the effective use of digital technologies (Afenyo-Agbe 2021). Consequently, they mostly fail to identify job and business opportunities in the current digital era (Krieger-Boden and Sorgner 2018). Thus, research indicates that women entrepreneurs experience both challenges (Rajahonka and Villman 2019) as well as clear benefits of digital transformation on their businesses (Sharafizad 2016; Popović-Pantić, Semenčenko and Vasilić 2019).

4. FINDINGS

These findings are synthesized from the cases of 19 agripreneurs. The section starts with the major distinctions of enterprises operating in the digital realm, mapping of the tools used by these women entrepreneurs, and categorizing them according

to their digital engagement, followed by a short description about the enabling roles of these tools in women's entrepreneurship.

4.1. Digitally-Enabled Enterprises vs. Digitech Enterprises

From the in-depth interviews conducted we could classify the enterprises into two categories based on their use of digital innovations viz., Digitally-Enabled Enterprises and Digitech Enterprises. The former incorporate digital technologies and tools to improve their existing operations and processes. They focus on enhancing efficiency, productivity, and customer engagement through the integration of technology. The latter enterprises are businesses focused on developing digital technologies and solutions, with a unique value proposition and these entrepreneurs can be called 'digital innovators. In summary, while both digitally enabled and digitech enterprises embrace digital technologies, the key distinction lies in their purpose and product. Digitally-enabled enterprises incorporate digital tools to enhance existing operations, while Digitech enterprises are fundamentally based on a digital product.

Digitally Enabled Enterprises

Fourteen of the 19 enterprises in our study fall into the category of digitally-enabled enterprises. Here, the entrepreneurs leverage digital tools to improve their current business models and operations, often without fundamental transformation of the core business itself. For example, most of the sales in these enterprises are done through social media platforms or e-commerce sites. Enterprises use social media, such as WhatsApp and Instagram, as enablers of innovative marketing activities as in the case of the Mushroom entrepreneur from Leh, who keeps her customers informed on the availability of mushrooms. This helps her to sell her highly perishable product within a short span of time within a radius of 30 km. Another example is of Bastar Food Firm and Consultancy Services, that uses digital tools – WhatsApp and videos – to

reach out to farmers in tribal belts that are hard to reach and uses e-commerce sites and their websites to attract customers at a global level. Thus, it is found that digital tools are used for enabling a wide array of entrepreneurial activities that help women overcome the traditional barriers they face to build an enterprise, such as time and resource constraints, mobility constraints, etc. A detailed description of how digital tools are enabling women's entrepreneurship is given in Section 4.3.

Digitech Enterprises

Out of the 19 entrepreneurs we interviewed, only five belong to the category of digitech enterprises, viz., Naturedots, Godaam Innovations, Proximal Soilsens, Renkuba and FROOTS Technologies Pvt. Ltd. The core business model, products, and services of these enterprises are digitally driven and rely heavily on emerging technologies such as sensors, AI, IoT, or other digital innovations. Godaam Innovations provides IoT sensors for detecting moisture level in storage godowns, Naturedots provides deep-tech tools for enabling climate resilient aquaculture, Renkuba provides AI-powered solar panels, Soilsens provides sensor-based soil testing solutions as well as IoT devices for agriculture, and FROOTS Technologies provide computer vision-based, AI-powered Quality Management Solution for the groundnut value chain. The primary focus of these Digitech Enterprises is to create and deliver digital solutions or products that cater to specific problems in the agriculture sector or cater to the specific needs of consumers. The founders of Godaam Innovations, Renkuba, Proximal Soilsens and Naturedots have bachelor's degrees in Technology. The founders of FROOTS Technologies have bachelor's degrees in Agriculture with experience in agribusiness.

4.2. Mapping Digital Tools Used by Women Agripreneurs

All the agri-entrepreneurs we interviewed have a certain level of digital engagement and most of them believe that without the use of digital

tools it is difficult to manage an enterprise. To understand the digital engagement of the women entrepreneurs, we categorized the digital tools they use into inter-organizational digital tools and intra-organizational digital infrastructure (Tables 2 and 3).

Some of the inter-organizational digital tools used are social media tools such as WhatsApp, Instagram, Facebook, LinkedIn, Clubhouse and Youtube, e-commerce sites, online meeting tools, enterprise website, Search Engine Optimization, Google Ads and Fintech Apps. Intra-organizational digital tools used are webserver, mobile application for the enterprise, analytics, enterprise management software, operating system, programming language and, AI-based tools.

Based on the median values of the inter- and intra-organizational digital tools used by the enterprises we have categorized the enterprises into four categories viz., Technical influencer, Digital follower, Social influencer, and Digital leader (See Box 1 and Figure 2) in keeping with Centobelli et al. 2022. Nine out of the 19 enterprises came under the category of Social influencer, where the adoption of inter-organizational digital tools especially social media platforms was more and adoption of intra-organizational digital tools was low. This indicates that despite being avid users of digital tools, these firms lack a digital strategy to tap into the full potential of these. For instance, these enterprises' use of analytics, enterprise management software,

and other intra-organizational digital infrastructure that can help in strategizing the enterprise management activities are low. It is important to note that all the enterprises in this category are digitally-enabled enterprises. But these social influencer enterprises, if given proper support and guidance in the form of digital skill training, financial assistance, etc., can evolve into digital leaders. There are very few enterprises in the other categories; four enterprises in the Digital follower category, two in the Technical influencer category, and four in the Digital leader category. Digital followers are companies that are yet to invest in any digital tools and demonstrate a lack of understanding regarding the strategic benefits of incorporating digital tools into their enterprise management and promotional efforts while three enterprises in this category, Greennut International, Nima Goos Goos and Nectar Fresh have their own websites, Ladakh Mushrooms is a microbusiness targeting local customers without a website. It mainly uses social media to attract customers in the local area and use content designing tools to design social media posts. The other two enterprises viz., Greennut International and Nectar Fresh are well-established firms that engage in e-commerce and export marketing, but they are not strategizing their business activities using digital tools in both inter-organizational and intra-organizational categories. These enterprises need to be targeted so as to increase their awareness about the potential of digital tools in enterprise management.

Table 2: Mapping of inter-organizational digital tools used by enterprises

	Enterprise Name	WhatsApp	Instagram	Facebook	LinkedIn	YouTube	Clubhouse	e-commerce sites	Online meeting tools	SEO/Google Ads	Website
Digitally-enabled enterprises											
1.	Farm Fresh	✓	✓	✓	✓				✓	✓	✓
2.	Some More Foods	✓	✓	✓	✓	✓		✓	✓		✓
3.	Ladakh Mushroom	✓	✓						✓		
4.	Bastar Food Firm and Consultancy Services	✓	✓	✓	✓	✓		✓	✓	✓	✓
5.	Han Agrocare	✓	✓	✓	✓	✓			✓		✓
6.	Greenaura International	✓	✓						✓	✓	✓
7.	Newlook Herbs	✓	✓			✓	✓		✓		✓
8.	Aranyam Naturals	✓	✓	✓	✓			✓	✓		✓
9.	Aruvi Eco	✓	✓	✓	✓		✓		✓		✓
10.	Farmizen	✓	✓	✓	✓	✓			✓		✓
11.	KIWI Kisan Window	✓	✓	✓	✓			✓	✓		✓
12.	Nectar Fresh	✓	✓						✓		✓
13.	Agrighar	✓	✓	✓	✓	✓		✓	✓		✓
14.	Nima Goos Goos	✓	✓						✓		✓
Digitech Enterprises											
15.	FROOTS	✓	✓						✓	✓	✓
16.	Proximal Soilsens	✓			✓	✓			✓		✓
17.	Renkube	✓			✓				✓		✓
18.	Naturedots	✓	✓		✓				✓	✓	✓
19.	Godaam Innovations	✓			✓				✓		✓

Table 3: Mapping of intra-organizational digital tools used by the enterprises

Enterprise Name	Webserver hosting	Mobile application	Analytics	Content design tools	Enterprise Management software/tools	Fintech apps	Operating system	Programming language	AI and sesor-based tools
Digitally-enabled enterprises									
1.	Farm Fresh			✓	✓	✓			✓
2.	Some More Foods			✓					
3.	Ladakh Mushroom			✓		✓			
4.	Bastar Food Firm and Consultancy Services			✓		✓			
5.	Han Agrocare				✓	✓			
6.	Greenaura International					✓			
7.	Newlook Herbs			✓	✓	✓			
8.	Aranyam Naturals			✓		✓			
9.	Aruvi Eco			✓	✓	✓			
10.	Farmizen	✓	✓				✓	✓	✓
11.	KIWI Kisan Window					✓			
12.	Nectar Fresh					✓			
13.	Agrighar			✓	✓	✓			✓
14.	Nima Goos Goos			✓		✓			
Digitech Enterprises									
15.	FROOTS	✓	✓		✓	✓	✓	✓	
16.	Proximal Soilsens	✓		✓	✓		✓	✓	✓
17.	Renkube			✓	✓		✓	✓	✓
18.	Naturedots		✓		✓	✓	✓	✓	✓
19.	Godaam Innovations		✓	✓	✓	✓			✓

From Figure 2, we can say that the technical influencer category has two digitech enterprises. These are the enterprises which have high adoption of intra-organizational digital tools and low adoption of inter-organizational digital infrastructure. It is clearly evident that as these enterprises are digitech ventures, with the product/service of the enterprise being a digital innovation, their use of intra-organizational digital tools is inevitable in a way. But these organizations' use of inter-organizational tools like social media promotion is low. The few uses of

inter-organizational digital tools are for fostering business networks through LinkedIn and online meeting tools and using own website for visibility of the enterprise. A main feature of these enterprises is that the founders of both the enterprises have bachelor's degrees in computer engineering which make them technologically strong to develop digital innovations. But they need to be investing more resources in inter-organizational digital tools that can help in enhancing their social reputation and branding.

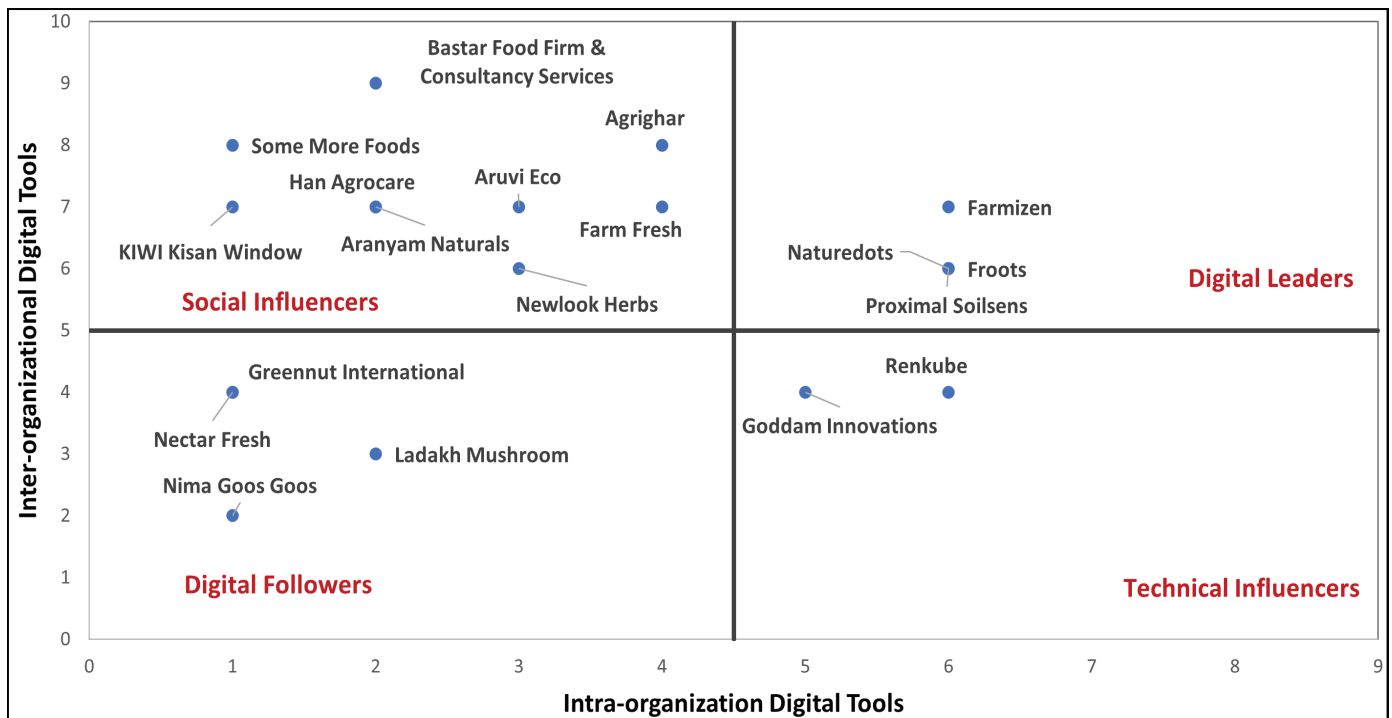


Figure 2: Classification of enterprises based on the use of digital tools

Digital leader category has four enterprises, these are the enterprises with high adoption of both inter-organizational and intra-organizational digital tools. They are more aware and skilled to leverage the potential of both inter and intra-organizational digital tools in strategizing their enterprise management activities. This makes these enterprises both technically and socially strong. Founders of the three enterprises (Naturedots, Proximal Soilsens and Farmizen) in this category have bachelor's degrees in technology. The founders of FROOTS technologies have a bachelor's degree in Agriculture Sciences and post-graduation in agribusiness management and horticulture, which makes them well aware of the nuances in

the agriculture value chain and the importance of digital intervention in quality assurance and traceability. From this small sample, the educational background and experience of the women entrepreneurs seems to influence their positioning as digital leaders.

The aim of categorizing enterprises into four groups is to position them along a spectrum of digital engagement. It's crucial to recognize that not every enterprise must aspire to be a digital leader, as this depends on factors such as their scale of operations, the nature of the product or service they offer, and the stage of enterprise development. For instance, a small-scale enterprise

like Ladakh Mushrooms may find it practical to be a digital follower. However, for enterprises aspiring to grow in the era of digital advancement, active digital engagement becomes imperative. Therefore, if Ladakh Mushrooms aims to expand, it must enhance its digital engagement. Thus, enterprises looking to scale up must undergo digital evolution and progress along the spectrum to emerge as digital leaders. When comparing similar enterprises operating at a comparable scale, such as two food processing firms with similar product portfolios and scale, the one positioned further along the digital engagement spectrum enjoys a more advantageous position and is likely to be more successful. This implies that a food processing firm functioning as a digital leader might outperform a digital follower in the same industry. Hence, the study's objective is not to draw comparisons between the digital engagement of a tech-oriented enterprise and that of a digitally enabled herbal product-based enterprise. Instead, the goal is to position these diverse enterprises within the diverse spectrums of digital engagement, allowing future studies to provide insights into factors that either facilitate or hinder their progression toward increased digital engagement.

4.3. Enabling Roles of Digital Tools in Women Agripreneurship

The current study focused on identifying the enabling roles of digital tools in the entrepreneurial activities of the women entrepreneurs. From the interviews conducted we noted recurring themes mentioned by the entrepreneurs and could delineate these into five major enabling roles namely Networking, Promoting the enterprise and increasing customer base, e-commerce and sales, Self-Learning, upskilling and educating and Enterprise management.

Networking

Digital tools have greatly facilitated networking for women entrepreneurs, offering them opportunities to connect, collaborate, and build

valuable relationships with peers, mentors, and potential partners. From our interviews with women agripreneurs who commonly use digital tools we were able to understand that it was for networking. Both formal and informal network building is done using digital tools, especially social media such as WhatsApp, LinkedIn, Clubhouse, etc. WhatsApp groups were the main platform used by women entrepreneurs to connect with fellow entrepreneurs and mentors. This can be attributed to access to smart phones and ease in use of the platform. Mostly these groups were formed by incubators such as Periyakulam Horti-Business Incubation Forum, AgHub of PJTSAU, etc. Agripreneurs are also members of Facebook and Instagram groups related to their agribusiness.

An agri-entrepreneur we interacted with said, *"I am a member of WhatsApp groups associated with two distinct incubators, each comprising a diverse community of entrepreneurs engaged in various agri-business ventures. Whenever I encounter a question or some uncertainty, I post it in the group, and I promptly connect with individuals possessing the expertise to assist me with these inquiries. These groups also serve as an effective means to stay informed about forthcoming incubator cohorts. Moreover, being part of these communities fosters a strong sense of belonging and support."*

We found that the challenges induced by COVID-19, such as restricted physical interactions, has enhanced the use of social media tools by the entrepreneurs we interacted with. This was in alignment with the results of other studies (Salam et al. 2021; Saleh 2021; Susanto et al. 2021). They turned to platforms – Facebook, Instagram, LinkedIn, Clubhouse – to maintain and even expand their professional networks connecting with mentors, peers, and potential collaborators, fostering a sense of community and support during uncertain times.

According to another agri-entrepreneur, *“During the lockdown, I began utilizing Clubhouse as a means to keep me engaged and connected. I connected with approximately 5,000 individuals who expressed interest in listening to my discussions about my products and herbal remedies. I gained valuable insights for improving my business from the connections I made here, and I even built a substantial customer base through Clubhouse. Interestingly, people now recognize me from Clubhouse when they encounter me elsewhere. I was genuinely amazed that a single platform allowed me to connect with such a vast audience.”*

Another entrepreneur says, *“We have a WhatsApp group of producers, consumers, and incubatees of agri startups. These are great platforms to share our product offerings, exchange ideas, views, put forth a new proposal, seek mutual help, etc.”*

Interestingly, one entrepreneur said, *“I had a regular customer and we used to chat on Instagram. Then I came to know she is teaching classes on digital marketing. I enrolled for her online classes, and it helped me a lot. Now I am my customer’s student.”*

Thus, digital platforms are helping women agri-entrepreneurs in creating, enlarging and strengthening networks (Quinton and Wilson 2016; Ahmad et al. 2018). In line with Barnes and Mattsson (2016), we found that digital tools, especially social media, allow entrepreneurs to expand their network and accrue social capital. Social media approaches such as posting, liking, sharing, commenting, direct messaging, etc., is what makes networking easy for entrepreneurs (Smith et al. 2017).

Promoting the enterprise and increasing customer base

Based on our interviews with the entrepreneurs,

it became evident that they use digital tools to promote their businesses and expand their customer base. Women use online marketing strategies to reach a global audience. They are using exclusive business websites and social media platforms, such as Instagram, Facebook, YouTube and WhatsApp, to showcase their products and services, engage with potential customers, and build a loyal following.

Even though none of the agricultural entrepreneurs we interviewed actively use YouTube – apparently due to time constraints – a few of them have recognized its potential as a powerful tool for promoting their businesses.

One such entrepreneur shared her experience, *“Once I met a person at an exhibition, he found my work interesting and requested to shoot our work as a video for posting on his YouTube channel. He visited our farm and shot the video; when the video was out, it was a big leap for me. I got lots of views and comments, many people contacted me for my products. That’s when I realized my target audiences were more on YouTube and Facebook, than on Instagram.”*

Similarly, another entrepreneur tapped into customers across the globe through a YouTube video.

She says, *“A few YouTube channels had interviewed me and documented my work, and it was only then that I really became aware of the power of digital tools. A few of the videos got lakhs of views and I got calls from people around the world who had watched them. It astonished me when my products – from this small town in Kerala – got the attention of people from countries like Ghana.”*

Through creative marketing strategies, engaging content, and effective online advertising, they are establishing a strong online presence that resonates with their target customers. For instance, an agri-entrepreneur we interviewed uses a social media campaign to promote her enterprise.

She said, "By initiating the hashtag campaign on Instagram, we encouraged customers to share their personal experiences with us. The response was heartening. Many customers, including celebrities, shared their experience of using our products on Instagram by using hashtags. Remarkably, this initiative was a big success, and our customer base grew by 133%."

Further, entrepreneurs are increasingly recognizing the value of promoting their businesses through their own websites and blogs. By establishing a well-crafted online presence, they are effectively engaging with their target audience, sharing their expertise, and building trust with potential customers. Through their websites, entrepreneurs are showcasing their products or services, providing detailed information and a seamless user experience.

Simultaneously, they are using blogs as a dynamic platform for sharing valuable insights, industry knowledge, and personal experiences, positioning themselves as authorities in their respective fields. Furthermore, the Search Engine Optimization (SEO) benefits of maintaining an active blog are improving their website's search engine ranking, attracting traffic and expanding their customer base.

Here, an entrepreneur's voice:

"I have partnered with a company to market and promote our products on various platforms such as WhatsApp, Facebook, Instagram, YouTube and LinkedIn. For B2B deals, I expanded my presence on LinkedIn. And in addition to these, I created a website and included a blog feature on our website. The idea of including blogs on the website came from what I learnt from digital marketing courses. I learnt that people generally tend to use Google to ask any question that comes to their minds. So, we have started writing blogs on most frequently asked questions around our products and their ingredients. This way I am attracting traffic to our website.

For a strong digital presence, I make it a point to post regularly in my social media accounts. I create content that is attractive and informative for posting, using tools such as Videomaker and Canva. This free design software is easily available and is the most inexpensive and easy way to develop promotional content."

Also, digital tools such as mobile applications, enterprise websites and e-commerce websites, are helping in gaining trust among consumers by ensuring traceability.

"To assure customers that they are getting farmer produce that is genuinely organic and grown without any chemicals or fertilizers, their organic certification certificate is uploaded on our website. Similarly, farmers can also get the margin we make in the business by tracing the prices quoted for the produce through the website."

Another entrepreneur states,

"With the aid of technology, both consumers and farmers can easily trace the details of the produce. Through our mobile app, customers can place orders, access information about the farm's location, and gain insights into the cultivation process."

Thus, promotion of both enterprise and products is much easier and affordable for the entrepreneurs who adopt digital technologies. By adopting these digital tools, enterprises not only enhance the efficiency of their promotional efforts but also tap into the opportunity for substantial expansion and a broader customer reach.

E-commerce and sales

We found that e-commerce platforms play a vital role in leveling the entrepreneurial landscape and creating opportunities for women to thrive in the business world. E-commerce platforms and digital marketing tools have expanded the market reach for women entrepreneurs, allowing them to reach customers globally without the

need for a brick-and-mortar store. These digital marketplaces provide women with a level playing field to showcase their products and services to a global audience, irrespective of their geographical location.

The women entrepreneurs who have listed their products in e-commerce websites said that these sites have helped them in reaching customers far beyond their local markets, thereby increasing their customer base and revenue potential. Moreover, they state that e-commerce platforms offer user-friendly interfaces and integrated payment solutions, simplifying the selling process.

E-commerce has increased after COVID and here the words of an entrepreneur are pertinent:

“People are more into online shopping after COVID, and convenience is something customers look for nowadays apart from quality. A strong digital footprint is the only way to win a good customer base. We need to remind people about our brand every now and then. For this, digital marketing is very important.

I got my first export order from an e-commerce platform called IndiaMART. I can say that e-commerce sites offer greater opportunity to reach out to many more customers, especially in far off places, and it has enhanced the visibility of our products. Many queries come from customers across India and abroad on how they can purchase my products. So, even if an enterprise is having high quality products, if they are not able to develop a digital foot print it is impossible to expand their customer base and scale up.”

Another entrepreneur from a remote village in Salem remarked,

“My enterprise is a one-woman venture. Earlier when I was not selling through Amazon, I had very few sales and I had to carry the products by myself and sell it in nearby areas. But now, I just have to pack it in bulk and send it with delivery agents. My sales have also gone up.”

E-commerce sites are also allowing entrepreneurs to make informed decisions about their products and marketing strategies by analysing the valuable insights given by these e-commerce sites on both customer profiles and sales profiles. Thus, e-commerce sites are helping entrepreneurs tailor their offerings to meet the specific needs and preferences of their target audience.

In the words of the co-founder of an enterprise delivering organic vegetables produced by local farmers to urban consumers,

“The insights from our e-commerce website have enabled us to accurately predict demand and supply. By leveraging data collected over time, we estimate customer preferences based on choices, seasonal variations, and festivals. We are now able to project the required quantity of specific crops and approach farmers accordingly. This data-driven approach minimizes wastage and reduces food losses.”

When it comes to the very small-scale enterprise of perishable foods such as mushrooms, digital tools like WhatsApp and other social media platforms are a boon, as it makes the sales more easier and faster. For example, the mushroom entrepreneur from Leh says,

“Through WhatsApp I get orders as I put availability of mushrooms on harvest days on my status. When my first spawn lot was ready, I had put it on my status and within 2-3 days I could sell all of it. So, in a place like Ladakh where villages are scattered, social media platforms enable excellent connectivity. Today I have customers from the remotest of villages in Leh and I am able to reach fellow farmers. Also, I am able to sell my highly perishable product faster – this is possible only because of these digital tools.”

By embracing technology and engaging in e-commerce, women entrepreneurs are breaking down traditional barriers to market access and achieving remarkable success in the business world.

Self-Learning, upskilling and educating

Women entrepreneurs are harnessing the power of digital tools such as Clubhouse, YouTube, and LinkedIn, for self-learning and upskilling. Clubhouse provides a unique audio-based platform where they can join discussions, participate in industry-related conversations, and learn from experts in real time.

"I am in Clubhouse, and I regularly listen to a program called 'Business over Breakfast' (BOB). This program has helped me a lot to gain the confidence to work on the idea of my venture. Being from a tech background and a first-generation entrepreneur, this show educated me on many aspects of enterprise management which I did not know before."

YouTube serves as a treasure trove of video content, offering a vast array of tutorials, webinars, and educational videos on various topics, allowing people to acquire new skills and knowledge at their own pace.

An entrepreneur making herbal products said,
"I had the idea of starting an enterprise of herbal-based cosmetic products. But I was stuck because I did not know recipes for any herbal products, and I did not have the money to invest in any classes. So, I started learning about herbal product making from YouTube. Later I improvised on the recipes I got from YouTube and came up with my unique products. So, I would say, YouTube is my first teacher."

LinkedIn, on the other hand, is enabling women entrepreneurs to network with professionals, follow industry influencers, access relevant articles and courses, and stay up to date on the latest trends, schemes and webinars in their respective fields.

"I get updates about webinars, expos and other recent advances in my field through LinkedIn mostly. I keep myself informed about new schemes and grants through various digital platforms, WhatsApp groups, and web portals of various ministries and organizations. As an entrepreneur

I cannot miss out on new opportunities, and I would say digital platforms help in this regard to an extent."

Online meeting platforms, like Zoom, MS Teams and even WhatsApp, are also used by women entrepreneurs in supporting other aspiring entrepreneurs.

"I am conducting online classes for aspiring entrepreneurs who want to establish their enterprise in my domain. I teach them my product recipes. I take only selected candidates for my classes, who really have passion. I conduct classes through both Zoom and WhatsApp video calls."

Another entrepreneur from the tribal belt of Chattisgarh says,

"I conduct offline classes for women from the tribal community on food processing and whenever it is not possible to go directly I send videos on WhatsApp to our resource person in those areas, who show it to the women."

The women agri-entrepreneurs we interviewed were also keen on attending webinars, online courses and other events online during the COVID time and this trend has continued post-pandemic too. One of the entrepreneurs says,

"During COVID, sales were low, and I was stressed, but I made it a point to keep my spirits up and upskill myself for the post-COVID time. I attended entrepreneurship-related webinars and I enrolled myself for a digital marketing course on an e-learning platform. I could gain a lot of ideas and knowledge from these activities."

By proactively utilizing these digital tools, women entrepreneurs are embracing lifelong learning, staying competitive, and continuously enhancing their skills to drive their businesses to new heights.

Enterprise Management

It was found that digital tools play a significant role in empowering women entrepreneurs on various aspects of their businesses, including financial

management, human resource management and logistics management.

We observed adoption of digital financial tools such as UPI, online banking, fintech apps, and so on. Beyond just being convenient, the utilization of these digital tools brings about a more organized approach to financial management for agri-entrepreneurs.

Many entrepreneurs have much to say on these topics.

"About 98% of our financial transactions with producers and consumers are through digital payment gateways, online wallets, UPIs, and net banking. We collect cash only when senior citizens fail to use digital tools. We have tied up with Razorpay gateway for secure payment processes."

"Digital Financial transactions have made life a lot easier as everything is recorded. Any discrepancies in the accounts can be traced back with the use of Fintech applications. Earlier I used to have a logbook which I updated every night. It was hard work, but now I save a lot of time and effort with the use of fintech apps."

The women agripreneurs we interviewed, particularly those who were involved in aggregation and distribution of farm produce, stated that digital tools are helping them with the coordination of logistics.

"By leveraging technology, we have streamlined our delivery mechanism, optimized routes, and ensured efficient transportation. By incorporating features such as route planning for pick-ups and delivery, we have been able to effectively monitor and control our costs."

Digital tools are easing the way entrepreneurs manage human resources, providing numerous benefits in terms of efficiency, communication, and overall workforce optimization. In general entrepreneurs mentioned that with the use of digital tools human resource management has

become much easier. An entrepreneur says, *"I have focused on making my enterprise smart by using AI tools to monitor staff, conduct evaluations, and moderate management activities. To be specific, every employee has to go through Key Performance Indicators (KPI), Key Result Areas (KRA) online. The whole organizational system has been made very systematic where they get general orientation, company orientation, and they have to undergo their personal KPI, KRA."*

4.4. Challenges to Digital Engagement of Women Agri-Entrepreneurs

Digital Skill Gap

To have a strong online presence with a well-designed website optimised for search engines and buzzing social media handles, digital literacy becomes an essential skill. While many entrepreneurs are adept at handling social media for product promotion, a significant number lack expertise in areas such as SEO, digital marketing, analytics, CRM, unless they have a background in technology or IT. Thus, most of them possess basic digital skills, but they often lack the specialized knowledge required to harness the full potential of digital tools for the growth of their enterprises.

With the exception of two entrepreneurs, the majority of them have not received any digital skills training. Although all have participated in various incubation and accelerator programs, none of these programs included sessions on digital skills, such as digital marketing. Through a mapping of digital tools, it was observed that women with a technology/IT background were more informed about the potential of digital tools like analytics, SEO, CRM, etc. They were skilled in utilizing these tools to promote entrepreneurship, despite not having received specific training in digital aspects. On the other hand, women from non-IT backgrounds expressed a desire for digital skill development sessions, and two of them have taken online courses as the incubation programs did not cover these aspects.

"I am trying my best to be active in social media accounts and post on these platforms regularly. But I know there is much more that digital platforms and tools can offer in promoting my enterprise, for example Google Ads, analytics, etc. But I don't know anything about it and don't know where to start. I have undergone two incubation programs but they also didn't cover any of these aspects. Now I am trying to find an online course to learn about digital marketing, though these courses are costly."

Safety and Security in Digital Spaces

Another significant challenge women entrepreneurs faced was safety in the digital spaces. When it is known that a woman is on the other side of the digital platform, unsolicited messages and images are often common in the inboxes.

"Many customers sent me pictures of their skin where they have allergy and ask for product recommendations. But some people take this in a negative way and send me unsolicited images and even messages. Sometimes, I feel if I were a man I would not get such derogatory messages and most of these messages are sent by men."

Financial Constraints

Creating social media accounts and making a digital presence is cost effective. But for promoting an enterprise much more is needed and this calls for more investment. Targeting the customer base and using enterprise management software, together with other activities such as creating a website, doing Search Engine Optimization, gaining insights from analytics etc., are needed, all of which demand investment.

"When we applied for one of the grants offered by a private company, they told us having a website is mandatory. We didn't have the budget to build a website at that time and we missed the grant. Financial assistance for website development is very essential as having a website increases the credibility and chances of getting grants."

Lack of Family Support

All the entrepreneurs had access to mobile phones and most of them managed their online activities through phone, rather than through personal computers. Some of the entrepreneurs stated that still some of the elderly family members feel that they are simply obsessed with their phones and passing time when these women are actually working on their online entrepreneurial activities.

"There is a popular belief that social media and other digital platforms are only for entertainment, and it is hard to make the family understand sometimes that I am working on the mobile phone rather than enjoying entertainment."

"Whenever I am managing my social media accounts or interacting with customers, one of the elderly members in my family gets offended and tells me that I am always on the phone without doing any work."

5. CONCLUSION

As discussed above, this study keenly examined the intricate relationship between digitalization and the dynamics of female agripreneurship. The findings of this study underscore that women certainly have challenges, but also clear benefits in employing digital technologies. Although women agripreneurs acknowledged that digital technologies had created opportunities for them to advance in their careers, they lack the capacity to fully realize the potential of several digital solutions.

For instance, the use of AI is vast in entrepreneurship development but only one non-digitally enabled enterprise quoted its use. Also, it was found that women with an academic background in science and technology had greater advantage in the digital space as they were more digitally skilled and aware. Presently, the use of digital tools among women agripreneurs is predominantly confined to social media platforms due to their cost effectiveness, flexibility, and minimal technical requirements.

This observation is underscored by the fact that a majority of the interviewed women agripreneurs fall into the category of social influencers, leveraging inter-organizational digital tools such as social media and e-commerce websites. In light of the study's findings, it becomes clearly evident that further support is warranted in three pivotal areas to empower women agri-entrepreneurs in translating the language of digital technologies into the language of enterprises.

1. Strengthen the focus of incubators and accelerators on providing digital skill training for women agri-entrepreneurs.

Incorporating digital skills training is essential within the enterprise development programs of incubators. The training should specifically target enhancing the awareness of women agri-entrepreneurs regarding various digital initiatives and schemes promoting entrepreneurship, such as Digital MSME, UdyamDisha, TIDE 2.0, Digital Bhashini, Digital GENESIS, etc. (Refer to the Annexure for details.) Moreover, the training programs should extend beyond social media marketing, encompassing aspects such as managing digital backends, utilizing data analytics, navigating fintech apps, understanding emerging technologies like AI, and addressing cybersecurity concerns.

2. Enhance the collaborative capabilities of public-sector agricultural institutes to support digitech agri-entrepreneurs.

Digitech agri-entrepreneurs, lacking field-level agricultural expertise, require assistance from public-sector entities, such as research institutes and State Agriculture Universities (SAUs), to develop and validate their digital innovations. It is essential for public-sector organizations to have a clear mandate to offer technical and infrastructural support to these agripreneurs. The collaborative capacity of these organizations is often impeded due to the absence of strict mandates, emphasizing the critical need to cultivate an environment conducive to collaboration.

3. Set up specific funding to support women agri-entrepreneurs in establishing their digital presence.

Creating a digital footprint necessitates both technical expertise and financial support. Women, particularly those without a technology background, often rely on third-party services for website development, digital marketing, and social media management. These services entail expenses that can be challenging for women agri-entrepreneurs, who are typically operating with limited resources. Moreover, having an enterprise website is crucial for securing grants and other funding, as funding organizations and investors associate the credibility of the enterprise with its digital presence, such as a website. Therefore, there is a need for exclusive financial assistance to be provided to women agri-entrepreneurs, at the very least for developing and managing their websites.

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Brief descriptions of the enterprises interviewed for this study

FarmFreshBangalore: FarmFreshBangalore is a Customer-Supported Agricultural (CSA) social enterprise connecting farmers and consumers to provide nutrition-rich, natural farm produce to consumers and ensure sustainable and fair income to small and marginal farmers. The company has more than 2000 active customers, over 350 farmers, 12,000 subscribers, and an annual turnover of INR 1.2 crores. The founder of this enterprise is Ms. Nalini Murthy who has a Bachelor's degree in Agriculture (2001), and a Master's degree in Agricultural Extension from Tamil Nadu Agricultural University (TNAU), Coimbatore (2004). They connect farmers and consumers with a vision of providing chemical-free, nutritionally rich natural farm fresh produce to consumers while enabling farmers to prosper through need-based agriculture. To achieve this Farm Fresh has designed innovative, 'Doctor-Recommended Whole Food Plant-Based' packages. These packages are designed based on per person consumption ratio and recommendations given by a registered naturopath, by following Dr. Greger Michaels' daily dozen framework. They give priority to food that is locally-grown and seasonal. They have designed packages starting from a single person up to 10 members in a family or community. Personal customisation is possible for special needs. They have weekly, monthly and yearly subscription options. They do door-delivery across Bengaluru. Package quantities and rates are fixed for one season and as the quantities are fixed, it helps to achieve need-based production in agriculture. This reduces marketing stress on farmers.

Read more about FarmFresh: <https://farmfreshbangalore.com/>

Some More Foods: Some More Foods is a health food brand based in Tirupur, Tamil Nadu, that was started in 2013. It aims to reinstate traditional food ingredients backed by scientific principles of nutrition and bring them back into today's food culture and thus promote wholesome nutrition. The brand has a strong presence in Tamil Nadu currently, and they are expanding swiftly in other states as well as exporting to a few other countries – Qatar, Dubai, Bahrain, USA. The founder of Some More Foods is Deepa Muthukumarasamy, who has an MPhil in Food and Nutrition. They have a diverse portfolio of millet-based products, including millet pasta, millet noodles, cookies and millet vermicelli. They are planning to launch millet-based RTE products and expand via chain stores in domestic markets, and also start exporting to around 10+ countries by 2026.

Read more about Some More Foods: <https://www.aesanetwork.org/journey-from-motherhood-to-entrepreneurship/>

Farmizen: Farmizen, a startup company based in Bengaluru, has set out to build a food ecosystem that's better for consumers, farmers and the planet. Ms. Gitanjalai Rajamaani is the co-founder and COO of Farmizen, who is also a computer engineer by education. Its theme, 'Your plants, Your food, Our Future' is realized by the values of trust, collaboration, empowerment, and sustainability, all of which are engrained in its operations. It delivers organic produce grown by local farmers via the Farmizen e-shop and also via its Farmizen app. They are mainly present in Bengaluru and have a small presence in Hyderabad now. They currently have more than 35,000 customers and are connected with more than 8,000 farmers across India. Farmizen distinguishes itself through its unique selling proposition (USP), which is the provision of detailed information about the farm and farmer for each agricultural product it offers. This approach gives farmers the recognition they deserve for producing high quality produce and fosters trust and accountability between farmers and consumers.

Read More about Farmizen: <https://www.aesanetwork.org/fostering-traceability-and-trust-in-the-organic-produce-value-chain/>

Ladakh Agritech: Ladakh Agritech is an enterprise established in 2021, having its registered office at Likir, Leh, Ladakh. It is engaged in the production and marketing of fresh mushrooms grown in the pristine environment of Ladakh under the brand name of Ladakh Mushrooms. Ms. Sonam Angmo is the founder of Ladakh Mushrooms; she has a BSc (Agriculture) from Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST), and a Master's in Agriculture Biotechnology from UAS-Dharwad. She cultivates mushrooms and sells them to nearby towns in her area. She also provides training to women farmers on mushroom cultivation. It is a nano enterprise managed by her and one helper.

Read more about Ladakh Mushrooms: <https://www.aesanetwork.org/the-mushroom-maverick-a-conversation-with-ladakhs-inspiring-young-woman-entrepreneur/>

Bastar Food Firm and Consultancy Services: Bastar Food Firm & Consultancy Services (BFFCS) is a start-up venture started in 2017 in Bastar district of Chhattisgarh State, India. It is a private venture started by Shaikh Raziya to bring food technologies through Research & Development to the tribal belt of Bastar and surrounding areas of Chhattisgarh. She is a post-graduate in Microbiology. The major objective of setting up BFFCS was to create livelihood opportunities for tribal people and youth from insurgency-prone areas and underprivileged backgrounds. It was thus designed as a platform where youth/women can showcase their ideas/skills and receive support in working on it. They have a diverse product portfolio of 20 plus mahua-based food products and other minor forest produce. They also provide consultancy services to food processing firms and skill training for rural women and youth.

Read more about Bastar Foods: <https://www.aesanetwork.org/the-tenacious-woman-entrepreneur-of-bastar/>

Han Agrocare: Han Agrocare is a social-business enterprise, a blend of social good, innovative technology, hard work, women power and love, which results in healthy mushrooms round the year. Their mission is to cultivate and promote chemical free, hygienic, organic, exotic and medicinal mushrooms while conserving the environment and providing employment to women, landless farmers, and tribals so as to meet the United Nation's sustainability goals of gender equality, poverty alleviation, and health and well-being. Ms. Hiresha Verma is the founder and chairperson of Han Agrocare and has an MBA in International Business. Through Han Agrocare she has empowered 5000 plus women as mushroom entrepreneurs in Uttarakhand, Himachal Pradesh, Madhya Pradesh, Jammu & Kashmir, and Maharashtra by giving training and handholding.

Read more about Han Agrocare: <https://www.aesanetwork.org/himalayan-mushroom-queen-empowering-women-in-medicinal-mushrooms-cultivation-across-india/>

Greenaura International: Greenaura International is an integrated coconut processing unit in Thrissur, Kerala, founded by Sumila Jayaraj in 2012 who is a graduate in English Literature. The mission of the enterprise is to develop and produce value-added products from coconut, support local coconut farmers, and make the goodness of coconut available to the whole world. They have diverse coconut-based products viz., coconut milk, cold pressed extra virgin oil, desiccated coconut powder, coconut chutney, coconut water vinegar, hair cream, low fat desiccated coconut, and coconut pickle which is sold in domestic markets as well as exported.

Read more about Greenaura: <https://www.aesanetwork.org/coconut-magic-from-homemaker-to-entrepreneur/>

Newlook Herbs: Newlook Herbs is an authentic traditional skin and hair care brand, deeply grounded in the ancient principles of Ayurveda, founded by Jeevitha Kandasamy in 2020 at Salem, Tamil Nadu. The brand's unwavering commitment is directed towards creating top-notch skin and hair care solutions, meticulously formulated from the finest herbal elements. They have around 13 products which include eight types of herbal soaps, one herbal shampoo, two herbal creams and two types of oils.

Read more about Newlook Herbs: <https://www.aesanetwork.org/newlook-herbs-crafting-herbal-success-from-home/>

Aranyam Naturals: Aranyam Natural Options, popularly known as Aranyam Naturals is a Delhi-based social startup founded by Meenakshi Bhardwaj. It sells diverse organic products and food blends made from Lakadong turmeric sourced from tribal women farmers in North-East India. The organization's focus is twofold: supporting tribal farmers and providing customers with a healthy, organic way of living through products sourced from farmers.

Read more about Aranyam Naturals: <https://www.aesanetwork.org/enriching-the-lives-of-marginal-tribal-farmers-of-meghalaya/>

Aruvi Eco: Aruvi Eco brings you organically grown produce sourced from local farmers committed to sustainability. They believe in the power of nature to nourish our bodies and promote wellness. They have a diverse range of products under various categories, such as amla delights, dip tea sensations, mango marvels, and tropical temptations. It was founded by Ms. Kalaiselvi who is a computer engineer by education.

Read more about Aruvi Eco: <https://www.aesanetwork.org/aruvi-eco-inspired-by-a-fathers-farming-legacy/>

Agrighar Services Pvt. Ltd: Agrighar Services Pvt. Ltd, established in 2019, is a social enterprise dedicated to promoting entrepreneurship and employment in agriculture and allied sectors, with particular emphasis on engaging youth, women, farmers, and Farmer Producer Organizations (FPOs). Their overarching mission is to minimize rural-to-urban migration by tapping into untapped rural potential. Agrighar serves as a one-stop platform, offering skill training, consulting, warehousing, job works, food processing, FPO/farm management services, and entrepreneurship development programs to bolster India's rural economy. Dr. Sowmini Sunkara who is an agricultural biotechnologist by education is the founder of Agrighar

Read more about Agrighar: <https://www.aesanetwork.org/learning-leading-and-empowering-a-biotechnologists-path-to-entrepreneurship-for-socio-economic-change/>

Godaam Innovations Pvt. Ltd: Godaam Innovations Pvt. Ltd., based in Nashik, Maharashtra, revolutionizes agri-tech, empowering farmers and enhancing crop shelf life. They bridge the gap between farmers and consumers, creating a structured, accountable value chain. Their mission is to upgrade the agricultural ecosystem through innovation and technology. Ms. Kalyani Shinde, with a B.Tech. in Computer Science is the founder and director of the enterprise. Godaam Sense is their main product, which is an IoT-based sensing hardware device that will do real-time micro-climate monitoring. This helps with monitoring the gases that are being released from the onions when they start rotting, thus helping to identify early

wastage in the storage. Then farmers are informed which help them to take an informed decision on the crop. Godaam also provide other services such as Remote monitoring of warehouse every storage season, Consultancy in warehouse construction and crop storage methodologies for onion, Remote network connect for onion crop procurement, Controlled climate structure development, Large capacity warehouse management platform for easy monitoring and tracking of the crop.

Read more about Godaam Innovations: <https://www.aesanetwork.org/driving-change-the-story-of-an-iot-agri-industry-influencer/>

Proximal Soilsens: SoilSens© empowers farmers by providing them with an integrated platform solution to understand their soil better and apply water, fertilizer, and pesticides precisely to optimize input costs and crop productivity. It was founded by Dr. Rajul Patkar an Electronics and Communication engineer with a PhD from IIT Bombay. Technologies innovation started at IIT Bombay and continued at Proximal SoilSens. Soilsens' vision is to make technology accessible to every farmer regardless of their farm size. They have built indigenous technologies focusing on 'Made in India, Made for World'. In its multiple deployments, SoilSens has proven that its technologies are robust, affordable, accurate, and beneficial for farmers to improve yield and overall income, as well as save the environment. Currently, the world's smallest soil testing device, Nutrisens, is making waves and has reached the global market quickly.

Read more about Soilsens: <https://www.aesanetwork.org/from-scholar-to-innovator-revolutionizing-agriculture-through-technology/>

NatureDots: NatureDots combines nature-based science with DeepTech tools for a climate-resilient, nature-positive economy. Their AquaNurch® System, an intelligent think machine, unravels the interconnections between complex ecosystems using technology and science. Beyond conventional approaches, NatureDots transforms aquaculture, promotes healthy fisheries, and restores ecosystem health through innovative solutions. Ms. Snehal Verma is the co-founder of NatureDots and she has a B.E in Computer Science and a Master of Environmental Management (MEM) in Water and Coastal Resource Management.

Read more about NatureDots: <https://www.aesanetwork.org/digital-innovations-beneath-the-waves-rise-of-an-aquapreneur/>

Renkuba: RenKube is a renewable energy-focused company that is a pioneer in Motion Free Optical Tracking (MFOT) of solar panels. It has a research and development site in Bengaluru, India. Set up in 2017, the company is led by a group of passionate individuals committed to contributing to a sustainable future by producing cutting edge products in the area of renewable energy. Today, their focus is on developing and commercializing MFOT-based solar technology. Dr. Lakshmi Santhanam is the co-founder and COO of Renkuba, she is a software engineer with a PhD in network security.

Read more about Renkuba: <https://www.aesanetwork.org/solar-dreams-and-agriculture-revival-the-renkuba-way/>

FROOTS: FROOTS – Food with Good Roots is driven by a passion to tackle global food safety and quality concerns. They strongly believe that 'Eating Right' is only possible by 'Selling Right' and 'Growing Right'. Their constant endeavour is to incentivize the farmer to Grow Right. Quality-backed price discovery is a fair way to incentivize the grower. Their goal is to digitize quality management practices across the value chain, harnessing digital advancements to ensure top quality, safe, and traceable products. FROOTS envisions a world where everyone enjoys access to high-quality safe food. Ms. Shefali and Ms. Shefalika are the co-founders of FROOTS and they have BSc in Agriculture.

Read more about FROOTS: <https://www.aesanetwork.org/besties-and-business-the-foots-approach-to-food-safety/>

Nima Goos Goos: Nima Goos Goos was conceived by three enterprising women, Rigzin Angmo, Padma Angmo and Padma Angmo, of Ladakh with the idea of promoting the unique and distinct medicinal herbs and crops that grow in that area through working with traditional knowledge. They have a few select products unique to Ladakh, that are considered premium, i.e., various variants of tisane like stinging nettle, buckwheat, barley and sea buckthorn, all of which are native to the remote valleys of Ladakh. They aim to awaken the community to the nutritional and economic value of local herbs and agriculture, empowering farmers and foragers, and customers seeking the finest quality tisanes from the mountains of Ladakh.

KIWI Kisan Window: KiWi Kisan Window is a window of opportunity and a platform for local farmers across India to present the world with health-conscious foods. KIWI is an initiative to encourage a responsible, healthy and better lifestyle around the world by promoting organic and conscious food collected from farmers across India. They work sincerely to bring the freshest and finest quality products to customers. Their objective is to provide the best sensory experience. Ms. Nupur Agarwal is the founder of KIWI Kisan Window; she has a bachelor's in Business Administration.

Nectar Fresh: Nectar Fresh made its start from Khadi and Village Board-backed Women Entrepreneurial social undertaking for collecting and managing honey and other products. Nectar Fresh established its presence worldwide as the best quality honey producer and supplier. The company is also a champion in empowering the local folk and small farmers. Nectar Fresh has contributed to the lives of many Indians over the past few years. Ms. Chaaya Nanjappa is the founder of Nectar Fresh and it is based in Kodagu, Karnataka.

Digital initiatives and schemes supporting digital engagement of women entrepreneurs

Digital MSME

Objectives

The main objective of this scheme is to make MSMEs digitally empowered and motivate them to adopt ICT tools and applications in their production and business processes with a view to improve their competitiveness in national and international markets.

The expected outcomes of the scheme:

1. Empower and enable MSMEs to harness IT as a medium of communication to revamp access to markets to update their managerial and technical knowledge through online content – both static and dynamic;
2. Evolve internal efficiencies by way of intense ICT intake and automating procedures for cost reduction and capacity enhancement for better information access, processing, collaboration and dissemination.

Under this scheme, a large number of MSMEs are expected to be benefited in terms of standardization of their business processes, improvement in delivery time, reduction in inventory carrying cost, improvement in productivity and quality of production, controlling cost and time, improved customer satisfaction, etc.

Udyam Disha

Udyam Disha is a mentor platform created by National Institute for Entrepreneurship and Small Business Development (NIESBUD) to facilitate a one-stop solution to aspiring/existing entrepreneurs offering a wide coverage with information and a support eco system, required for setting up or scaling up of an enterprise. The idea here is to provide a virtual network that not only connects aspiring and existing entrepreneurs with experts from across the country but also delivers multifaceted services through mentoring and handholding support to entrepreneurs, in order to drive entrepreneurship development in India.

Vision

Accelerate job creation by providing end-to-end entrepreneurship education, handholding and mentoring support to potential and existing entrepreneurs who aspire to start or scale-up their existing enterprises.

Objectives

Standardize and systematize the processes of selection, training, support and sustenance of potential and existing entrepreneurs. Support and motivate institutions/organizations in carrying out training and other entrepreneurship development related activities. Provide vital information and support to trainers, promoters and entrepreneurs by organizing research and documentation activities relevant to entrepreneurship and skill development.

GENESIS (Gen-Next Support for Innovative Startups)

In 2022 the Ministry of Electronics and Information Technology (MeitY), Government of India, launched an umbrella program called Digital India-GENESIS, to discover, support, grow and make successful startups in Tier-II and Tier-III cities with emphasis on collaborative engagement among startups, government and corporates for promoting digitisation based on the principles of inclusivity, accessibility, affordability, leading to growth in employment and economic outputs.

Objectives

- Consolidate and strengthen the existing startup-centric schemes and programs of MeitY. Build Tier-II and Tier-III cities-focused funding to critically support
- Pilot/Investment, Early stage and deep-tech startups.
- Put in place Community Building Initiatives, including workshops, boot camps, conferences, etc., to strengthen the ecosystem and build brand and recognition of MeitY Startups-related Initiatives. All the activities under GENESIS shall be aligned to MeitY's major initiatives including India AI, ISM, and India Stack, etc.

SAMRIDH Scheme

The GoI has launched the 'Startup Accelerator Programme of MeitY for Product Innovation, Development and Growth (SAMRIDH)' in August 2021, with an aim to support existing and upcoming accelerators to further select and accelerate potential software product-based startups to scale. The total cost of the scheme is INR 99 crore for a duration of three years. A total of 300 startups are to be supported under the SAMRIDH Scheme.

The aim is to provide startups which already have brilliant solutions and proof of concept for their products with more facilities to enhance their products using innovative technologies for the market, along with a solid business plan. This will enable them to easily obtain investments from venture capitalists and angel investors.

Objectives

The SAMRIDH scheme will support existing and upcoming Accelerators to select and accelerate potential product-based startups to scale. The program will focus on accelerating the startups by providing customer connect, investor connect, and internationalization connect services.

Next Generation Incubation Scheme (NGIS)

The NGIS has been approved to support software product ecosystem and to address a significant portion of National Policy on Software Product (NPSP), 2019. The Scheme is proposed to be launched from 12 locations i.e., Agartala, Bhilai, Bhopal, Bhubaneswar, Dehradun, Guwahati, Jaipur, Lucknow, Prayagraj, Mohali/ Chandigarh, Patna and Vijayawada. The Scheme has solution-oriented architecture and aims to handhold 300 Tech startups in Tier-2/3 cities over the period of three years with a total budget outlay of INR 95.03 crore.

NGIS' offerings encompass the following:

Physical Incentives

Ready to work P&P incubation within the constraint of lockdown and thereafter;

Full-fledged security and vulnerability testing of Software Products through the dedicated Software Product Security Testing (SPST) facility;

Additional facilities and services of the pan-India domain-specific CoEs of STPI may be leveraged.

Soft Support

- Mentoring support;
- Access to VCs for funding support;
- Networking opportunities/Industry connect and Go-to market support for exhibiting/showcasing products/solutions through various National/International events/workshops/exhibitions;
- Advisory services such as HR, Legal, Accounting, IPR/Patenting and others.

Financial Incentives

- Cloud Credits from leading third-party service providers;
- Startups who are in ideation stage may be selected under pre-incubation program and mentored for up to six months to evolve their business plan and solution around the proposed idea. Each intern (startup under pre-incubation) will be paid INR 10,000/month for a period of six months;
- Seed funding of up to INR 25.00 lakhs will be provided to each beneficiary/supported startup based on innovativeness of idea, novelty of solutions, strength of team and soundness of business proposal.

TIDE 2.0 Scheme

Technology Incubation and Development of Entrepreneurs (TIDE 2.0) Scheme was initiated in 2019 to promote tech entrepreneurship through financial and technical support to incubators engaged in supporting ICT startups using emerging technologies such as IoT, AI, Block chain, Robotics, etc. The scheme is being implemented through 51 incubators via a three-tiered structure with an overarching objective to promote incubation activities at institutes of higher learning and premier R&D organisations. The scheme is expected to provide incubation support to approximately 2,000 tech startups with an overall outlay of INR 264 crore over a period of five years.

Features of TIDE 2.0 Scheme:

- For leveraging diversity, inclusion and participation, TIDE 2.0 is to be implemented in a layered approach with group-wise classification of 51 TIDE Centres at institutes of higher learning and R&D institutions pan India;
- Meity Startup Hub (MSH) will manage the network of incubation centres and other collaborating platforms so as to facilitate crisscrossing of technology across various stakeholders;
- Provide IPR Protection/Legal Compliance Services through Centre of Excellence in Intellectual Property Rights (CoE-IP);
- Incubator support services to be provided to startups;
- Year-round engagement programs – Low & Deep Engagement Programs, Challenge Grants, Hackathons, IPR Sensitization and an Annual Global Startup Event;
- Holistic Mentorship Programs, typically composed of startup executives, venture capitalists, industry experts, academia and other investors;
- Robust corporate startup Business Connect Platform for startups;
- Linkages to VC/Angel funding for emerging startups;
- Financial assistance up to INR 192.8 crores for startups;
- Augmenting capacity building programs for TIDE incubators;
- Support to TIDE Centres up to INR 27.2 crores.

