Asia-Pacific
Economic Cooperation

HANDBOOK
ON DIGITAL RURAL COMMUNITIES
BEST PRACTICES

APEC Policy Partnership on Food Security

February 2026

Asia-Pacific
Economic Cooperation

Handbook on Digital Rural Communities Best Practices

APEC Policy Partnership on Food Security

February 2026

APEC Project: PPFS 201 2023A

Produced by
Nguyen Anh Phong

For
Asia-Pacific Economic Cooperation Secretariat
35 Heng Mui Keng Terrace
Singapore 119616
Tel: (65) 68919 600
Fax: (65) 68919 690
Email: info@apec.org
Website: www.apec.org

APEC#226-PP-03.1

Table of Contents

ACKNOWLEDGEMENTS

This Handbook on Digital Rural Communities (DRC) Best Practices was prepared by a team led by **Ho Thu Le** and **Quach Dai Vuong** as the Research Team. This handbook is the result of the Project within the Policy Partnership on Food Security (PPFS), titled Promoting APEC cooperation for scaling up best practices on digital rural community (DRC) models toward sustainable and inclusive rural transformation (PPFS 201 2023A). The Project was implemented by the Institute of Strategy and Policy on Agriculture and Environment (ISPAE) under the Ministry of Agriculture and Environment (MAE) of Viet Nam, with oversight by Project Overseer **Nguyen Anh Phong**.

The team wishes to express its appreciation for the support and guidance of the APEC Secretariat. We are also grateful to the ISPAE team and the numerous stakeholders from across the APEC region for their valuable time and expertise in providing helpful advice and comments to finalize the handbook.

INTRODUCTION

The Handbook on Digital Rural Communities (DRC) Best Practices is a key deliverable designed to serve as a practical guide for promoting the development of DRC across APEC economies, with a particular focus on Viet Nam. This handbook is developed based on comprehensive research, including the findings of an in-depth technical report, stakeholder consultations, and a comparative analysis of DRC models in various agricultural sub-sectors and socio-economic contexts. Covering a diverse range of approaches, the handbook will highlight 10 best practice models, including seven detailed case studies from Viet Nam and three additional case studies from other APEC member economies.

The handbook will offer a detailed exploration of innovative digitalization practices in rural communities, highlighting the benefits and impacts of these models, while also addressing key enabling factors such as policy frameworks, institutional support, funding mechanisms, and gender inclusivity. It will provide practical insights into overcoming barriers to the adoption and scaling up of DRC practices, making it a valuable resource for policymakers, government agencies, enterprises, cooperatives, and small-scale producers. By summarizing lessons learned, best practices, and replicable approaches, the handbook will offer actionable recommendations aimed at fostering inclusive, sustainable, and resilient rural development, ensuring that the benefits of the digital transformation are shared by all, particularly women and smallholder farmers.

In line with broader APEC goals, the Handbook on Digital Rural Communities Best Practices will help guide the implementation of the APEC Putrajaya Vision 2040 and the Food Security Roadmap Towards 2030. It contributes directly to APEC's work on bridging the digital divide, promoting inclusive growth, enhancing food security, and fostering innovative solutions to build resilient and sustainable rural economies across the region.

I. INNOVATIVE DIGITALIZATION PRACTICES IN RURAL COMMUNITIES

1.1. Taobao Villages, China - A Public-Private Partnership Model for E-Commerce-Driven Rural Development

Summary

The "Taobao Village" model is one of the world's most prominent and successful examples of a Digital Rural Community, born from a strategic, large-scale partnership between the Government of China and the e-commerce giant, Alibaba Group. Confronted with a vast rural population (over 40%) and the dual economy-wide imperatives of poverty alleviation and curbing urban migration, the "Rural Taobao" initiative was launched in 2014. It aimed to systematically leverage the power of e-commerce to revitalize rural economies. A "Taobao Village" is officially defined as an administrative village where at least 10% of households are engaged in e-commerce, or there are at least 100 active online stores, with a total annual e-commerce transaction volume exceeding CNY 10 million. This case demonstrates a powerful, replicable model for transforming traditional, isolated rural economies into dynamic nodes within the domestic and global digital economy.

Innovative digital applications

The innovation of the Taobao Village model is not a single application, but the creation of a comprehensive and integrated e-commerce ecosystem meticulously designed and deployed for rural areas. This ecosystem is built upon Alibaba's mature digital platforms (Taobao and Tmall) but is supported by a massive, targeted investment in both physical and digital "last-mile" infrastructure. The key components of this innovative application framework include:

- Rural taobao service centers: At the heart of the initiative, Alibaba, in partnership with local governments, established tens of thousands of physical service centers in villages. These centers are not merely internet cafes; they are operational hubs equipped with computers and trained staff ("partners") who provide intensive, hands-on assistance to villagers. They help residents navigate the complexities of setting up online stores, product photography, digital payment systems, and order processing, effectively bridging the critical digital literacy gap at the most grassroots level.

- An integrated rural logistics network: Recognizing that logistics is the lifeline of e-commerce, Alibaba's logistics arm, Cainiao, worked with a network of partners to build out a sophisticated rural logistics network. This solved the immense physical challenge of transporting goods from thousands of remote villages to urban consumers and delivering consumer goods back to the rural area, creating a two-way flow of commerce.
- Accessible rural finance (FinTech): Alibaba's financial affiliate, Ant Group, provided a suite of digital financial services, including micro-loans and accessible digital payment solutions (Alipay). This gave rural entrepreneurs—who often lack the collateral for traditional bank loans—the crucial access to capital needed to start and scale their businesses. By 2017, this had amounted to over CNY 58 billion in credit provided to the Taobao Village ecosystem.
- Big data for market intelligence: Alibaba provided rural merchants with access to its powerful data analytics tools. This allowed small, often isolated, producers to gain unprecedented insights into domestic consumer trends, optimize their product offerings, manage inventory more effectively, and adapt their production to meet real-time market demand.

Figure 1 A local service center for a Taobao Village, facilitating rural e-commerce logistics.

Source: China Daily

Benefits and impacts

The economic and social impacts of the Taobao Village model have been transformative and well-documented. By 2019, the model had created approximately 6.8 million jobs, and the number of Taobao Villages had surpassed 4,000 across China. The annual e-commerce revenue generated from these villages reached CNY 700 billion. The model proved to be a powerful tool for poverty alleviation, with 63 Taobao Villages located in the most officially designated impoverished counties generating around CNY 2 billion in revenue. This economic dynamism led to a significant increase in rural per capita income, which grew by 8.6% in 2017 alone, helping to narrow the urban-rural income gap.

Inclusivity and gender impact

The Taobao Village model has had profound and widely recognized inclusive and gender-specific impacts. In the context of rural China, where traditional gender norms can be restrictive and opportunities for women are often limited, e-commerce has created a new, powerful pathway for women's economic empowerment. The flexibility of running an online business from home is highly compatible with women's traditional, and often disproportionate, share of

household and caregiving responsibilities. This has allowed a large number of rural women to become successful entrepreneurs, gaining financial independence and an elevated status within their families and communities. The model has also been instrumental in reversing the "brain drain" by making rural life economically viable and attractive for educated youth, encouraging them to return to their hometowns to start businesses and bring new skills and innovation back to their communities.

Lesson learned

The Taobao Village model offers several powerful, replicable lessons for APEC economies. First, it provides a masterclass in the effectiveness of a large-scale public-private partnership (PPP) for driving rural digitalization. The success was built on a clear and strategic division of labor: the government focused on enabling "hard" infrastructure (roads, broadband) and supportive policies (low-interest loans, tax incentives), while the private sector (Alibaba) provided the "soft" infrastructure (platforms, logistics, finance, and training). Second, the model proves that e-commerce can be a powerful catalyst for poverty alleviation and inclusive growth, creating millions of jobs and providing significant opportunities for women and youth. Finally, the role of both the government and the private sector as a business incubator—providing intensive training, reducing initial costs, and creating a supportive ecosystem—is a critical factor for nurturing and scaling grassroots entrepreneurship in rural areas.

1.2. Sangju Smart Farm Innovation Valley, Republic of Korea - An Ecosystem for Next-Generation Farmers

Summary

Republic of Korea is addressing the critical economy-wide challenge of its aging farm population and the difficulty of recruiting a new generation into agriculture through the Smart Farm Innovation Valley project. The cluster in Sangju, Gyeongsangbuk-do, serves as a prime example. It is a large-scale, government-led initiative designed as a comprehensive hub to mentor and equip a new generation of young farmers with the skills, capital, and resources needed to succeed in advanced, data-driven agriculture. This case provides a strategic blueprint for human capital development in modern agriculture.

Innovative digital applications

The innovation of Sangju is not a single piece of technology, but the creation of an integrated ecosystem for human capital development. The core of this ecosystem is the Startup Incubation Centre (SIC), which provides a structured, 20-month hands-on training program. Trainees learn in state-of-the-art greenhouse complexes and have access to "rental smart farms" to apply their skills. This is supported by test centers where private companies and research institutions can develop and showcase new technologies. Critically, the program integrates this training with a Smart Farm Big Data Platform, which aggregates data for R&D, and provides tangible business support, including assistance with exporting high-value products like strawberries.

Figure 2 Bird's-eye view of Smart Farm Innovation Valley.

Source: MAFRA

Benefits and impacts

The program has successfully trained hundreds of young farmers, providing a clear and attractive pathway into a modern agricultural career and directly addressing the succession crisis in Republic of Korea’s agriculture. By focusing on high-value crops and integrating the entire value chain from production to export, it ensures the economic viability of its graduates. This model fosters a new generation of tech-savvy agricultural entrepreneurs who are equipped to

lead the future of Republic of Korea's agriculture, enhancing both overall food security and export competitiveness.

Inclusivity and gender impact

The Sangju model provides a powerful pathway for promoting gender inclusivity in a traditionally male-dominated sector. By framing agriculture as a high-tech, knowledge-based profession, it breaks down traditional barriers related to physical strength and land inheritance customs. The structured training and clear pathway to establishing a business create a more level playing field, making agriculture a more attractive and accessible career choice for young women. The focus on business management, data analytics, and marketing skills further empowers women to take on leadership roles as farm owners and managers.

Lesson learned

The most critical lesson from Sangju is that addressing the long-term challenge of agricultural labor shortages requires more than just deploying labor-saving technology; it demands a strategic, holistic investment in building the next generation of human capital. Creating dedicated innovation hubs that integrate practical training, R&D, and tangible business support is an essential long-term strategy for ensuring the future sustainability and competitiveness of the agriculture sector.

1.3. Village 9, Thailand - A Collaborative Drone Model for Agricultural Productivity

Summary

Village 9, located in the Bang Yai District of Nonthaburi province, is an agriculturally rich community specializing in rice, vegetable, and flower cultivation. The village faced a critical economic challenge that threatened the profitability of its farming community: a severe shortage of agricultural labor and the consequently high cost of manual work. This case study offers a practical example of how a specific, targeted digital technology—agricultural drones—can be deployed through a collaborative, community-based business model to directly address this challenge. The initiative, supported by Thailand's Digital Economy Promotion Agency (DEPA), provides a blueprint for how technology can enhance productivity and sustainability for smallholder farmer groups.

Innovative digital applications

The key innovation in Village 9 is not merely the use of drones, but the implementation of a collaborative usage and business model that makes this high-cost technology accessible to smallholder farmers. The initiative was built upon a robust foundational ecosystem, including reliable mobile connectivity (up to 5G) and the government-led "Net Pracharat" free internet service.

The innovative application itself was driven by a public-private-community partnership. With partial financial support from DEPA, the local Ban Mai Rice Center Community Enterprise (a farmer cooperative) acquired the drones. DEPA then facilitated a partnership with a private technology company to provide crucial, hands-on training on drone operation. The most innovative aspect is the business model: members of the farmer group can rent and use the drone for a service fee that is significantly lower than the commercial market price. This "shared access" or "equipment-as-a-service" model effectively removes the barrier of high upfront capital investment, which would have made the technology inaccessible to individual farmers.

Figure 3 An agricultural drone in operation, a key technology for enhancing productivity in Village 9

Source: FAO (2025)

Benefits and impacts

The adoption of the collaborative drone model has yielded multiple, tangible benefits for the farming community. Economically, it directly reduces expenses on manual labor, a primary production cost. Technologically, the drones provide increased precision in sowing, fertilizer application, and pesticide spraying, which leads to optimized input use and potentially higher yields. Socially and in terms of health, the process is not only faster but also significantly safer, as it crucially prevents farmers' direct physical exposure to harmful chemicals during spraying. This has a direct positive impact on the long-term health and well-being of the community.

Inclusivity and gender impact

While the original text does not specify gender impacts, a logical inference can be made. Agricultural labor, particularly spraying, is often physically demanding work undertaken by men. By automating this task, the drone technology reduces the reliance on physical strength, creating a more level playing field. It opens up opportunities for **women and older farmers** to be more involved in the management and operational aspects of crop protection without undertaking the physically hazardous tasks. Furthermore, the model is built around a community enterprise, a structure that often sees active participation from women in decision-making and management roles, ensuring the benefits of the technology are distributed more equitably within the community.

Lesson learned

The primary lesson from Village 9 is that the successful adoption of advanced agricultural technology by smallholders often depends less on the technology itself and more on the innovation of the business model. A collaborative, shared-access model, facilitated by a public agency like DEPA, can be a highly effective strategy for overcoming the critical barrier of high upfront capital costs. This case demonstrates that by organizing as a collective and leveraging public support, smallholder communities can gain access to the benefits of high-tech digital agriculture, enhancing both their economic profitability and their occupational health and safety.

II. GOOD PRACTICE MODELS IN DIGITAL RURAL COMMUNITIES IN VIET NAM

2.1 Yen Hoa Commune - Digital Healthcare as a Pillar for a Smart Village

Summary of the practice

Yen Hoa, a mountainous commune in Ninh Binh Province with 7,500 residents and a high smartphone ownership rate of 90%, was strategically selected as one of the Viet Nam's first pilot sites for digital transformation in 2020. Guided by the Ministry of Information and Communications, the project was structured around three core pillars: Digital Government, Digital Economy, and Digital Society. The case demonstrates how a top-down strategic push, combined with strong local execution and community readiness, can accelerate the adoption of a comprehensive suite of digital solutions. The commune's success, particularly in the critical social sectors of healthcare and in boosting local e-commerce, has been so significant that it was featured by the Food and Agriculture Organization (FAO) as an exemplary model in its Digital Villages Initiative, showcasing its relevance for the wider Asia-Pacific region.

Innovative digital applications

The innovation in Yen Hoa is not a single piece of technology but a holistic and systematic implementation of a multi-pillar DRC framework. The approach was highly structured:

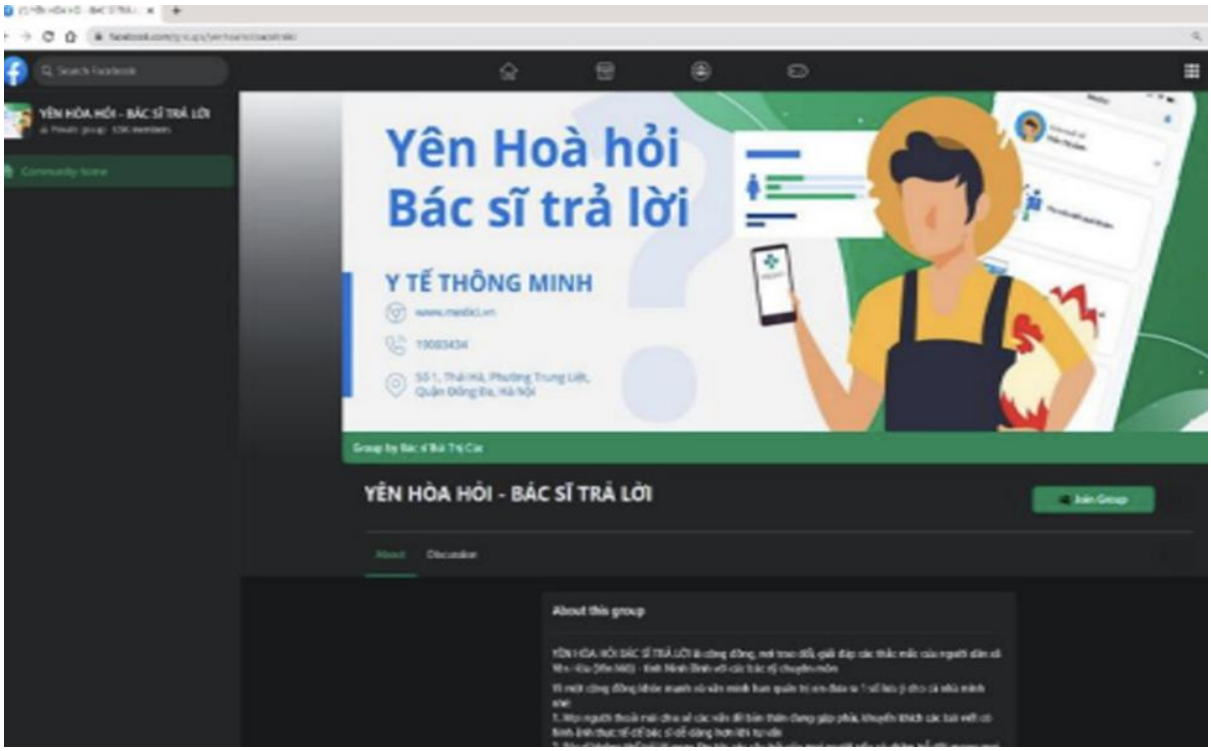
- Digital government: The commune implemented a full suite of digital tools for internal management, including the iOffice document management system and universal adoption of digital signatures by officials. Citizen communication was revolutionized by replacing traditional radio broadcasts with an AI-powered text-to-speech platform, allowing for faster and more diverse public announcements.
- Digital society (Healthcare focus): A sophisticated, two-pronged approach to digital healthcare was deployed. It skillfully blended informal, community-focused platforms (the Medici app and the Zalo group "Yen Hoa Asks, Doctors Reply") with a formal Telehealth system, connecting the local health station to upper-level hospitals for remote consultations.
- Digital economy (E-commerce focus): The project targeted the commune's specialty agricultural products, such as the "chach sun" fish, which were previously sold only through traditional channels. The Ninh

Binh Provincial Post Office facilitated the onboarding of local cooperatives onto the PostMart.vn e-commerce platform operated by Viet Nam Post, providing a complete ecosystem of support from product branding to logistics.

Figure 4 The health station in Yen Hoa commune, a hub for the digital health initiative

Source: Ministry of Science and Technology (2023)

Figure 5 The "Yen Hoa Asks, Doctors Reply" group, an informal digital platform for community health advice



Source: FAO (2025)

Achievements: Benefits and impacts

The impacts have been transformative across all pillars. In governance, 100% of official documents are now digitally signed, and the volume of online public service applications has increased significantly, enhancing administrative efficiency. The AI-powered radio system and SMS/Zalo alerts have made public communication more timely and effective.

The most profound impacts are seen in the digital society and economy. The Telehealth initiative saved the community an estimated VND 200 million in travel and medical costs in its first year, with nearly 2,500 remote consultations. This initiative particularly benefits women, who, as primary caregivers, save significant time and resources. In the digital economy, the results were dramatic. The local cooperative, after joining the PostMart.vn platform, saw its sales volume increase by 4.5 times in just 10 months. This directly translated into a near threefold increase in monthly income for cooperative members, rising from approximately VND 1.5 million to over VND 4 million per person. The success

has spurred local authorities to plan for dedicated production zones to ensure a stable supply for the growing e-commerce demand.

Inclusivity and gender impact

The Yen Hoa model provides a powerful example of how digital services can generate significant gender-specific benefits. In the context of rural Viet Nam, women are traditionally the primary caregivers for children and elderly family members. The Telehealth system directly addresses this by significantly reducing the need for costly and time-consuming travel to urban hospitals. This disproportionately benefits women, freeing up their time for other economic or personal activities and reducing the financial burden on the family. Furthermore, the promotion of e-commerce lowers the barriers to entry for entrepreneurship, creating flexible, home-based business opportunities that are particularly accessible to women, allowing them to earn an income while managing household responsibilities.

Lesson learned

The Yen Hoa model offers several critical lessons. First, a structured, multi-pillar framework (Digital Government, Economy, Society) provides a clear and comprehensive roadmap for implementation. Second, focusing on a critical social need like healthcare can be a powerful strategy to build a foundation of digital trust, which then accelerates the adoption of economic tools like e-commerce. Finally, the success in e-commerce demonstrates that a full ecosystem approach is required: it is not enough to simply create a website; success depends on an integrated system that includes training, branding, quality control (e.g., traceability), and strong partnerships with logistics providers (like Viettel Post and VNPost).

2.2 Dong Rui Commune - A Government-Led Smart Aquaculture Model

Summary of the practice

Dong Rui, a coastal commune in Tien Yen District with nearly 3,000 residents, has a local economy fundamentally tied to aquaculture. Facing challenges in productivity and sustainability, the commune was strategically selected as a government-led pilot for a "smart village" model. The initiative leverages a strong public investment in digital infrastructure to introduce high-tech shrimp farming models, improve the delivery of public services, and enhance overall

economic resilience in the face of environmental and market pressures. This case provides a clear example of a top-down, state-catalyzed approach to rural digital transformation, focusing on a sector of high economic importance.

Innovative digital applications

The core innovation in Dong Rui lies not in a single technology, but in the development of a socio-technical system that strategically integrates public infrastructure with private sector aquaculture technology. The Commune People's Committee, acting as the key state actor, first drove the development of a robust digital foundation—including universal 4G mobile signals and fibre-optic internet across all villages—which served as an essential enabling layer. This public good created the necessary preconditions for the piloting of a high-tech shrimp farming model by private developers. This model's application layer is an integrated suite of technologies designed to de-risk and intensify shrimp production. It includes net house systems to mitigate the impacts of adverse weather, advanced water recirculation technology to ensure environmental sustainability by reducing pollution, and a network of IoT-based sensors for real-time monitoring of critical water quality parameters. This data is fed into a management system that allows for automated adjustments to the pond environment, enabling a data-driven, precision aquaculture approach that was previously impossible. This symbiotic relationship, where public investment in foundational infrastructure directly enables and de-risks private sector innovation in a key local industry, is the central innovative feature of the Dong Rui model.

Achievements: Benefits and impacts

The model has yielded significant multi-dimensional benefits. Economically, the technology has led to higher productivity, better disease control, and increased profitability for farmers. Socially, the digital infrastructure has transformed public service delivery, with fifteen essential services now available online, enhancing the efficiency and transparency of local administration. The promotion of e-commerce for local OCOP (One Commune One Product) specialties has created new market channels, diversifying the local economy. These platforms provide accessible entry points for all community members, including women-led households who are often active in local commerce, to participate in and benefit from local value chains, thereby fostering inclusive economic growth.

The availability of electronic health records and digital social insurance applications further improves the social safety net for all residents.

Figure 6 A high-tech shrimp farming model in Dong Rui commune, featuring a covered, controlled environment

Source: FAO (2025)

Inclusivity and gender impact

While not explicitly focused on gender, the Dong Rui model promotes inclusivity by universalizing access to essential services. The digitalization of 15 public services and the creation of e-commerce platforms for local products lower the barriers of distance and mobility, which disproportionately affect the elderly, persons with disabilities, and women responsible for household duties. By making administrative procedures and market access possible from home, the model creates a more equitable environment for all residents to participate in civic and economic life.

Lesson learned

The primary lesson from Dong Rui is the critical role of the state as a foundational catalyst. Strategic public investment in non-commercial but essential "digital public goods"—such as connectivity infrastructure and foundational digital literacy for officials—is crucial to de-risk and unlock private sector innovation in high-impact areas like sustainable agriculture. This model

demonstrates that a public-led push can effectively create a fertile ground for market-based and community-driven solutions to flourish.

2.3 Tuong Son Commune - QR-Code Traceability for a Trusted Local Brand

Summary of the practice

Tuong Son, a suburban commune in Ha Tinh Province specializing in organic vegetable production, showcases how a grassroots digital innovation can be implemented to boost transparency, food safety, and local governance. The initiative highlights the power of QR-code systems in directly connecting organic producers with consumers and building a trusted local brand. This case is a prime example of a market-oriented approach where technology is used to solve the problem of information asymmetry and help smallholders move up the value chain.

Innovative digital applications

The cornerstone of Tuong Son's digital transformation is a socio-technical traceability system that integrates a simple, low-cost technology with a strong social-organizational structure. The technological application itself is a QR code system, where each of the 20 pilot organic vegetable households was assigned a unique code. Farmers use this code to regularly update information on their farming practices and production status via a simple interface. However, the innovation is not just the QR code, but its integration into the formal value chain managed by the Hoang Ha Cooperative. The cooperative provides qualified inputs, monitors production to ensure compliance with organic standards, and manages collective sales. This creates a closed-loop system where the QR code is not just a label, but a verifiable link in a chain of trust guaranteed by a formal local institution. This combination of simple technology with robust social organization is what makes the innovation both effective and highly scalable.

Figure 7 A resident using a digital information kiosk, part of the public service infrastructure in Tuong Son

Source: FAO (2025)

Achievements: Benefits and impacts

Economically, the system has significantly enhanced consumer confidence, which has boosted demand for the commune's organic vegetables and raised incomes for participating households. The transparency builds a trusted local brand, allowing producers to command a premium price. Socially, the digital data entry component creates a valuable role for younger, more tech-savvy family members, including young women and daughters, fostering inter-generational collaboration and building practical digital skills within the household. The residential management software and digitalized commune database also improve local governance and planning.

Inclusivity and gender impact

The Tuong Son model has a nuanced impact on inter-generational and gender dynamics. The primary challenge identified was the low digital literacy among the middle-aged and older labor force, which is predominantly female. However, the digital solution—updating production data via QR code—creates a new, non-strenuous, and valuable role within the family farm. This role is often taken

up by younger, more tech-savvy family members, including daughters or daughters-in-law. This fosters inter-generational collaboration and provides young women with a meaningful and recognized contribution to the family business, building their skills and status within the household.

Lesson learned

Simple, accessible, and low-cost technologies like QR codes can be extraordinarily powerful when integrated into a well-organized institutional structure like a cooperative. The success of this model is not just in the technology itself, but in the combination of simple tech with strong social organization. Together, they create a system of trust and shared value that benefits both producers and consumers, demonstrating a scalable model for other agricultural communities.

2.4 Bach Dang Commune - A Comprehensive, Planned DRC Model for a Smart Ecosystem

Summary of the practice

Bach Dang Commune, located in Tan Uyen Town, Binh Duong Province, represents one of Viet Nam's most ambitious and comprehensively planned pilot projects for a Digital Rural Community. Learning from international experiences, the provincial government initiated this multi-phase project (2021-2030) with the vision of creating a holistic model that integrates industrial, agricultural, and construction innovations with deep community engagement. The project's scope extends beyond agriculture to encompass healthcare, education, energy, waste management, and environmental protection, aiming to establish a benchmark for sustainable rural development in the context of a "smart city" ecosystem.

Innovative digital applications

The innovation of the Bach Dang model lies in its phased, multi-dimensional, and integrated planning process. Unlike initiatives that focus on a single technology, this project is structured as a long-term roadmap. Phase 1 (2021-2023) focused on foundational infrastructure (social services, water, waste systems). Phase 2 (2023-2025) concentrates on deploying IT applications for public administration, infrastructure management, and production management.

The final phase (to 2030) aims for deep integration and the application of Artificial Intelligence across all sectors.

A key aspect of this innovation is the development of a single, integrated mobile application for residents. This app serves as a central hub for multiple functions: accessing public services, receiving community information, participating in production planning for cooperatives, and accessing market data. This user-centric approach aims to simplify the digital experience and drive widespread adoption by creating a single, indispensable tool for daily life and work.

Figure 8 The public administrative management software deployed in Bach Dang commune.

Source: VNA (2024)

Achievements: Benefits and impacts

Although still in its early stages, the project has already laid a strong foundation for transformative impacts. In governance, the push for high-level online public services and the establishment of a comprehensive local database are enhancing transparency and administrative efficiency. In infrastructure, the deployment of free public Wi-Fi, smart LED lighting, and security cameras is improving connectivity and public safety.

In the economic sphere, the project is profoundly reshaping the commune's key agricultural value chains (pomelo, rice, hydroponic vegetables). Smart farm management systems are being introduced to optimize production, while cooperative management is being digitized to coordinate production plans and

connect members to market information. The project explicitly links production with eco-tourism, creating diversified income streams. For women and youth, the focus on training and developing new skills for high-tech agriculture and tourism provides new and more attractive employment opportunities beyond traditional farming. The project's strong emphasis on community consultation and co-creation through contests and feedback channels fosters a high degree of social inclusion and ownership.

Inclusivity and gender impact

The inclusivity of the Bach Dang model is embedded in its participatory planning process. The emphasis on community consultation and the development of an integrated mobile app for citizen feedback are designed to give a voice to all residents. Digital feedback channels can be particularly empowering for women and other groups who may be less likely to speak up in traditional, in-person public meetings. By ensuring that the design of the DRC reflects the needs of the entire community from the outset, the model lays a strong foundation for equitable development.

Lesson learned

The Bach Dang model offers a critical lesson in the importance of comprehensive, long-term strategic planning for DRC development. A successful DRC is not an ad-hoc collection of technologies but a systematically planned ecosystem that requires phased investment in both physical and digital infrastructure. Furthermore, the model underscores that a user-centric approach, exemplified by the development of a single integrated application, can be a powerful strategy to overcome fragmentation and drive community-wide adoption. Finally, it highlights the necessity of embedding DRC initiatives within broader regional development goals, such as building a "smart city," to ensure synergy and long-term sustainability.

2.5 Vi Huong Commune (Thai Nguyen) - A DRC Pilot Integrating Public-Private Partnerships in a Mountainous Region

Summary of the practice

Vi Huong, a commune in the mountainous commune of Thai Nguyen province (formerly Bac Kan), was designated as one of only seven communes across Viet Nam to pilot a Digital Rural Community model under Viet Nam's National

Digital Transformation Program. This case is particularly significant as it demonstrates the application of a top-down, multi-stakeholder partnership model in a region facing significant geographical and infrastructural challenges. The project's core objective was to test the viability of a comprehensive DRC framework, focusing on six key pillars: Smart Governance, Online Citizen Communication, E-commerce, Social Services (Health & Education), and Digital Tourism/Branding. The case offers critical insights into both the opportunities and the persistent barriers of implementing a digital strategy at the grassroots level in a disadvantaged area.

Innovative digital applications

The primary innovation of the Vi Huong model lies in its multi-stakeholder partnership and execution structure. The project was not implemented by a single entity but was a coordinated effort led by the Ministry of Information and Communications (Department of Informatization) and the provincial Department of Information and Communications. Critically, it involved the direct participation of major domestic technology and telecommunications corporations, including CMC Technology Group, Viettel, Hanoi Telecom, and VNPT, alongside specialized startups like VBee.

This partnership enabled the deployment of an integrated suite of technological solutions that a single commune could never achieve on its own. Key technological innovations included:

- Smart citizen communication: The traditional public loudspeaker system was upgraded into a "smart" system powered by AI-based text-to-speech technology. This allowed local officials to quickly convert written announcements into audio broadcasts without needing a dedicated announcer, dramatically increasing the speed and volume of information dissemination.
- Integrated E-commerce ecosystem: Rather than relying on a single platform, the project built a complete support ecosystem for local cooperatives like Thien An Cooperative. This included website and social media development, training on digital marketing, and integration with the Viet Nam’s AgriConnect platform, which aggregates products onto major e-commerce sites like Postmart and Shopee. Critically, it also

incorporated QR code and blockchain technology for traceability, enhancing product value and consumer trust.

- Telehealth infrastructure: The project went beyond simple apps to install dedicated telemedicine equipment (Telehealth) at the local health station, creating a physical and digital bridge to the wider healthcare network for remote consultations.

Figure 9 A member of the Thien An Cooperative in Vi Huong commune managing e-commerce orders and digital marketing

Source: Journal of Science and Technology (2021)

Achievements: Benefits and impacts

Despite its challenging context, the pilot has delivered tangible benefits across its target pillars. In governance, the commune has successfully processed nearly 700 online public service applications and maintains an active, updated official website, enhancing administrative transparency. The smart loudspeaker system and Zalo groups have fundamentally changed citizen communication, making it faster, more direct, and fostering greater trust between the government and the people.

The most significant economic impact has been in e-commerce. The integrated support has enabled Thien An Cooperative to establish a professional online

presence, use advanced traceability to build a trusted brand for its agricultural products, and leverage domestic logistics partners like Viettel Post and VNPost to reach wider markets, thereby increasing local incomes. In social services, the Telehealth system has provided residents with unprecedented access to specialized medical expertise, while the digitalization of school administration through SMAS electronic contact books and online fee payments has modernized the education sector. These initiatives have a particularly strong gender impact, as women in rural areas often bear the primary responsibility for both healthcare and children's education, and these digital services significantly reduce their time and travel burdens.

Inclusivity and gender impact

Similar to the Yen Hoa case, the Telehealth system in Vi Huong provides a direct benefit to women as primary caregivers. Additionally, the public-private partnership model offers a critical opportunity for inclusive skills development. The involvement of major tech corporations in providing digital literacy training presents a chance to design programs that are explicitly gender-sensitive. By ensuring these training sessions are accessible, relevant, and welcoming to female participants, the partnership can serve as a powerful tool for closing the digital gender gap in a disadvantaged region.

Lesson learned

The Vi Huong case offers two critical lessons. First, a public-private partnership model is essential for implementing comprehensive DRC in disadvantaged regions. The technical expertise and resources of large corporations are necessary to overcome foundational infrastructure and technology gaps that local governments cannot address alone. Second, the case starkly highlights that infrastructure is a necessary but insufficient condition for success. Despite the deployment of advanced technology, the project's long-term impact is constrained by persistent challenges in digital literacy among citizens and even local officials, and the lack of integrated, shared databases at the district and provincial levels. This underscores that any DRC initiative must be accompanied by a parallel, intensive, and sustained investment in human capital development to be truly sustainable.

2.6 Tien Giang (formerly Dong Thap) Farmers' Clubhouses - A Community-Led, Bottom-Up DRC

Summary of the practice

Tien Giang (formerly Dong Thap) province's "Farmers' Clubhouse" (Hoi Quan) model represents a unique and innovative pathway to developing Digital Rural Communities in Viet Nam. Unlike top-down, government-led initiatives, this model is fundamentally a bottom-up, community-driven approach that builds upon a pre-existing, voluntary social institution. Originating from the first "Canh Tan Clubhouse" in 2016, the network has organically grown to 84 clubhouses with nearly 4,800 members. These clubhouses serve as trusted spaces for social interaction, knowledge sharing, and economic cooperation. Recognizing this powerful social foundation, the provincial government, in partnership with Ho Chi Minh City University of Technology and the Ministry of Science and Technology, is now piloting a project to transform these social hubs into full-fledged DRC, starting with Tan Thuan Tay commune.

Innovative digital applications

The core innovation of this model is its "social-first, technology-second" sequencing. The foundation of the DRC is not the digital infrastructure, but the strong social capital and trust already embedded within the network of 84 voluntary and self-governing Farmers' Clubhouses. The innovation is the current pilot project's goal to overlay a comprehensive digital layer onto this powerful social foundation. This planned digital layer is meticulously designed and includes 12 integrated components, featuring a central data analytics system, a dedicated Clubhouse web portal and mobile application, a network of IoT-based environmental monitoring sensors for agriculture, solar-powered automated irrigation systems, and an electronic farming diary for members. This approach ensures that technology is introduced not as a foreign element imposed from the outside, but as a set of tools designed to enhance the existing collaborative activities of a trusted community institution.

Figure 10 The launch ceremony of a Farmers' Clubhouse, the foundational social institution for DRC development in the region

Source: Viet Nam's National Agricultural Extension Center

Achievements: Benefits and impacts

While the full-scale digital pilot is still in its early stages (delayed by the COVID-19 pandemic), the Clubhouse model itself has already generated significant socio-economic benefits. It has successfully shifted farmers' mindsets from subsistence production to a more market-oriented "agricultural economy" mindset. Several clubhouses have established formal cooperatives and secured supply contracts with major supermarket chains like Coopmart and Vinmart, demonstrating their capacity for economic organization. The planned digital layer is expected to amplify these impacts dramatically by providing farmers with tools for precision agriculture (automated irrigation), enhanced security (smart surveillance), and efficient resource management (smart electricity/water monitoring). For members, especially women who are active participants in these community networks, the mobile app and information portal will provide unprecedented access to market data, technical knowledge, and a platform for collective decision-making.

Inclusivity and gender impact

This model is inherently inclusive due to its community-led nature. Social and community organizations in rural Viet Nam often have very high rates of female participation. The Clubhouse, as a pre-existing, trusted social space, is an environment where women feel comfortable, have a strong voice, and often hold leadership roles. By digitalizing this existing institution, the model brings technology to a place where women are already active and empowered. This ensures that women are not just passive recipients of technology, but are central actors in shaping how it is used for community development.

Lesson learned

The Tien Giang (formerly Dong Thap) model offers a profoundly important lesson: strong social capital can be a powerful substitute for, or precursor to, large-scale state investment in building DRC. A bottom-up approach that identifies and builds upon existing, trusted community institutions can be a highly effective and sustainable pathway for digital transformation. By empowering these local institutions with the right digital tools, governments and development partners can foster a model of DRC development that is not only technologically advanced but also deeply rooted in the local community, ensuring a high degree of ownership, relevance, and long-term success

2.7 Quang Tho Commune (Hue City): A DRC Model Built on a Smart City Platform

Summary of the practice

In 2021, Hue City (formerly Thua Thien Hue province), a leader in digital governance in Viet Nam, initiated a pilot program to build "Smart Communes," selecting Quang Tho commune in Quang Dien district as a key site. This case is distinct as it represents a model where the development of a DRC is strategically built upon the technological foundation and operational experience of a pre-existing, award-winning provincial-level Smart City Operations and Monitoring Center (HueIOC). The project is structured around three core pillars: Smart Institutions (infrastructure and e-government), Smart People (digital literacy for officials and citizens), and Technology (user-friendly applications). The overarching goal is to test a replicable, top-down model for extending the province's successful digital transformation agenda from its urban centers to its

rural areas, creating a seamless, data-driven digital governance and service ecosystem.

Innovative digital applications

The key innovation in this model is its "hub-and-spike" architecture, where the provincial Smart City Center (HueIOC) acts as the central technology and data hub, and the pilot communes are the "spikes" that both receive data and services from, and feed data back to, the central hub. This allows the commune to leverage sophisticated provincial-level systems without needing to build them from scratch. The core digital applications implemented under this model include:

- **The commune smart operations and monitoring room:** This is the physical and digital heart of the local DRC. It is not an isolated unit but a command center designed to integrate data feeds from various systems, including provincial-level environmental monitoring data, local security cameras, and the centralized public service processing system. This allows local leaders to have a real-time, data-driven overview of the commune's security, administrative performance, and environmental conditions.
- **The Hue-S super app integration:** Rather than creating multiple new apps, the model focuses on integrating its services into the existing provincial "super app," **Hue-S**. This platform serves as a single point of access for citizens to interact with the government, receive official information, report incidents, and, in the future, access digital payment services.
- **The "Digital Cooperative" model:** The project specifically targets the Quang Tho II Agricultural Cooperative to pilot a digital management system. This is supported by a dedicated public web portal (htxquangtho1.huecit.com) which will be integrated with e-commerce functionalities, creating a complete digital solution for cooperative governance, production management, and market access for key local products like Centella tea.

Figure 11 The smart operations and monitoring room in Quang Tho commune, integrating data for local governance

Source: Thua Thien Hue New Rural Development Office (2023)

Achievements: Benefits and impacts

Although the pilot is relatively new, it has already delivered significant and diverse impacts. In governance and public safety, the smart operations room and the network of 31 connected security cameras have demonstrably improved social order and security. The provision of free public Wi-Fi at 9 community hubs has increased digital access for residents. The digitalization of public administration has been comprehensive, with 100% of officials using digital signatures and over 85% of households having accounts for non-cash payments.

Crucially, the integrated data system has proven highly effective for disaster management and environmental monitoring. Farmers can now access real-time monitoring data to better prepare for typhoons and floods, and to support aquaculture operations, directly improving their resilience to climate risks. During the COVID-19 pandemic, the system was also instrumental in monitoring and managing the situation effectively. Economically, the new Digital Cooperative web portal and the planned e-commerce integration are creating a foundation for local producers, such as those of the renowned Quang Tho Centella tea, to access wider markets and build a stronger brand.

Inclusivity and gender impact

The model promotes inclusivity by universalizing access to information and public services. The Hue-S app provides a single, accessible channel for all citizens, regardless of their social standing, to interact with the government. The establishment of Community Digital Technology Teams is a key inclusive mechanism. These teams are tasked with providing hands-on support to all residents, including the elderly and women, to install and use digital applications like Hue-S, ensuring that no one is left behind. The push for non-cash payments, with training provided to all households, also helps to improve financial inclusion, which is particularly beneficial for women who may have had limited access to formal banking services in the past.

Lesson learned

Hue city's model provides a powerful lesson for provinces and regions that have already invested in smart city infrastructure. It demonstrates that these urban-centric platforms can and should be leveraged as a foundational asset to accelerate rural digital transformation. By extending the technical capacity, data platforms, and a unified application (like Hue-S) from a central IOC to rural communes, local governments can achieve significant economies of scale, ensure technical standards are consistent, and create a truly integrated digital ecosystem that bridges the urban-rural divide. This "hub-and-spike" approach represents a highly efficient and scalable model for regional DRC development, moving from isolated pilots to a system-wide transformation.

III. ENABLING FACTORS AND BARRIERS FOR DRC DEVELOPMENT

The analysis of the 10 best practice models from across Viet Nam and other APEC economies reveals that the success of a Digital Rural Community is not a matter of technological determinism. Rather, it is shaped by a complex interplay of foundational conditions, strategic choices, and the institutional environment. A successful DRC requires both the necessary technological and data foundations to be in place, and a sufficient set of socio-economic and institutional factors to translate that potential into sustainable impact. This section synthesizes these key enabling factors and the common barriers that impede progress.

3.1. Key enabling factors for success

3.1.1. Robust and accessible digital infrastructure

A core finding across all analyzed cases is that high-quality, reliable, and affordable digital infrastructure is the non-negotiable foundation for a DRC. This infrastructure consists of both "hard" and "soft" components. Hard infrastructure includes the physical networks, such as fiber-optic cables and 4G/5G mobile towers that provide last-mile connectivity to villages, as well as the end-user devices like smartphones and computers that enable access. Soft infrastructure comprises the digital platforms and systems that run on this physical layer, including cloud computing services, data storage, and the e-commerce, FinTech, and e-governance platforms that deliver value. The case of Vi Huong, a mountainous commune in Viet Nam, starkly illustrates this: despite a strong partnership, its progress was constrained by pre-existing infrastructural weaknesses, demonstrating that even the best applications fail without a solid foundation.

3.1.2. A coherent and accessible data strategy

Digital transformation is fundamentally a process of leveraging data to drive decision-making and service delivery. Therefore, a second critical factor is the availability of and access to high-quality digital data. This requires a strategic approach to data governance at both the central and local levels. A key principle is the "once-only" rule, where data collected by one government agency should be made shareable across others to reduce the burden on citizens and businesses. The development of a local data ecosystem involves several steps: digitizing existing records, establishing interoperability protocols (like Local and

National Government Service Platforms - LGSP/NGSP), and creating a shared local data repository. The "Digital Village on One Map" in Wusi, China, exemplifies this, where the integration of disparate data sources into a single platform was the key to its success in transforming local governance. Without a coherent strategy for data creation, management, and sharing, digital initiatives will remain fragmented in isolated "data silos," severely limiting their potential impact.

3.1.3. Political will and institutional leadership

The case studies unequivocally demonstrate that strong and unwavering political will is the primary driver of successful DRC initiatives. This is not merely a high-level policy statement but a deep commitment from leadership at all levels—from central to local—to champion the transformation. This leadership is critical for driving institutional reform, which is often the most challenging aspect of digitalization. As seen in Viet Nam's pilot communes, the active involvement of provincial and district leaders was essential for coordinating ministries, mobilizing resources, and overcoming bureaucratic inertia. This political leadership must manifest in a shift from a traditional administrative mindset to a service-oriented one, placing citizens at the center. The success of digital government, which often serves as the initial pillar of a DRC, is a litmus test for this political will.

3.1.4. A collaborative multi-stakeholder ecosystem

The complexity of DRC development transcends the capacity of any single actor. A robust and collaborative ecosystem is a prerequisite for success. This involves establishing effective Public-Private-Community Partnerships (PPCPs). The Taobao Village model in China provides a masterclass in this, with a clear division of labor: the government provided the enabling policies and "hard" infrastructure, while Alibaba (the private sector) provided the platforms, logistics, and training. The case of Vi Huong further underscores this, showing how the technical expertise of large corporations is essential in disadvantaged regions. The role of local enterprises and cooperatives is particularly crucial as they act as key nodes in the ecosystem, aggregating production, driving technology adoption among members, and creating local employment.

3.1.5. Human capital and inclusive skills development

Ultimately, the success of a DRC is determined by its people. The most sophisticated technology is rendered useless if citizens lack the skills or confidence to use it. A sustained investment in **human capital** is therefore a critical factor. This requires more than just one-off training workshops; it demands a continuous and accessible learning ecosystem. Critically, this training must be inclusive and tailored. As the challenge in Tuong Son commune highlights, there is often a significant digital literacy gap among the middle-aged and older farmers who form the backbone of agricultural production. Therefore, training programs must be designed to be user-friendly, context-specific, and explicitly target women, the elderly, and other marginalized groups to ensure that the digital transformation does not inadvertently create a new class of "digital have-nots."

3.1.6. Diversified and sustainable financial resources

Building and sustaining a DRC requires significant and long-term financial investment in infrastructure, technology, and human capital. Relying on a single source of funding, particularly short-term government budgets, is a high-risk strategy. Sustainable financing requires the mobilization of diversified resources, including central and local government budgets, private sector investment, credit from financial institutions, international development aid, and even community contributions. The success of Alibaba's model in China was significantly fueled by its ability to provide over CNY 58 billion in micro-loans through its FinTech arm, demonstrating the powerful role of private capital.

3.1.7. A focus on local economic strengths and value chains

A DRC cannot be a generic, one-size-fits-all model. Its economic success depends on its ability to leverage and enhance the unique strengths and existing value chains of the local economy. A successful DRC often focuses on a few key specialty products (like pomelo in Bach Dang, or organic vegetables in Tuong Son) and uses digital technology to improve quality, enhance branding, and connect these products to higher-value markets. This involves the application of precision agriculture technologies (e.g., smart greenhouses, automated irrigation) to boost productivity, and digital tools like e-commerce and traceability systems to improve market access and consumer trust.

3.1.8. Integration of local culture and agri-tourism

A key lesson from a number of cases is that a DRC can create significant value by integrating its economic activities with its unique cultural identity. Digital tools can be a powerful medium for this. E-commerce platforms and social media can be used not just to sell products, but to tell the "story" of the village, its culture, and its people. This can be a powerful driver for agri-tourism, attracting visitors who are interested in authentic rural experiences. This creates diversified income streams, provides new employment opportunities (especially for women and youth in the service sector), and fosters a sense of local pride, as seen in the planning for Bach Dang and Xuan Tho communes.

3.2. Common barriers and challenges in implementation

3.2.1. The foundational infrastructure and affordability divide

Despite progress, a significant gap in high-quality, affordable digital infrastructure between urban and rural areas remains a primary structural constraint across the APEC region. Even when basic connectivity is available, the cost of data plans and digitally-enabled devices can be prohibitive for low-income rural households, effectively excluding them from the benefits of the digital economy. This barrier was explicitly noted as a challenge in several Viet Nam’s cases, limiting the reach of otherwise successful programs and reinforcing existing inequalities.

3.2.2. The human capital and skills divide

A lack of digital literacy is arguably the most persistent and difficult barrier to overcome. As highlighted in the Tuong Son commune in Viet Nam, this challenge is particularly acute among the middle-aged and older farmers who form the backbone of agricultural production. This skills gap prevents them from effectively utilizing e-commerce platforms, traceability systems, and other digital tools, thereby limiting the scalability and impact of these innovations. Without sustained, long-term investment in accessible, practical, and context-specific training programs, the digital divide will widen, turning access to technology into a new driver of inequality.

3.2.3. The economic viability and scalability divide

Many promising DRC initiatives face the "pilot trap," where they succeed on a small scale with the support of public subsidies but struggle to develop a

financially sustainable business model for scaling up. The high upfront cost of many technologies, coupled with the difficulty in demonstrating a clear and short-term return on investment for smallholder farmers, makes it challenging to attract private investment. The case of Village 16 in Thailand, where the farmers excelled at production using IoT but struggled with the commercialization and marketing of their produce, highlights that a successful DRC requires a viable end-to-end business model, not just effective technology.

3.2.4. The institutional and gender-inclusion divide

At the institutional level, a lack of coordination between different government ministries (e.g., Agriculture, ICT, Commerce, Finance) can lead to fragmented policies, duplicated efforts, and regulatory gaps, hindering the development of a coherent digital ecosystem. Furthermore, many digital transformation initiatives are designed with a "gender-blind" approach. As analyzed in several Viet Nam’s cases, while benefits for women are often a positive side effect, the lack of a proactive, gender-sensitive design in policies, technologies, and training programs means that opportunities to address the specific barriers women face (e.g., time poverty, lower access to finance, restrictive social norms) and to maximize their economic empowerment are often missed.

IV. EXPERIENCE, LESSONS LEARNED, AND POLICY RECOMMENDATIONS FOR VIET NAM

Viet Nam's journey towards digital rural transformation is characterized by strong political will, a diversity of innovative local practices, and a clear recognition of the remaining challenges. The case studies from Viet Nam and its APEC peers offer a rich set of experiences that can be distilled into strategic lessons and actionable recommendations to guide the next phase of the Viet Nam's DRC development.

4.1. Synthesis of strategic lessons and solutions for Viet Nam

Lesson 1: Prioritize social needs to build digital trust. The rapid and successful adoption of the Telehealth program in Yen Hoa commune demonstrates that focusing on critical social services is the most effective way to build community trust in digital solutions. This trust is a vital form of social capital that can then be leveraged to introduce more complex economic applications.

Strategic solution: Viet Nam should consider launching a domestic "Digital Health for Rural Communes" initiative as a flagship program, using it as a strategic entry point to build a foundation of digital trust and familiarity.

Lesson 2: Leverage social capital as a foundation for technology adoption. The Tien Giang (formerly Dong Thap) Farmers' Clubhouse model proves that strong, pre-existing social institutions are an invaluable asset. A bottom-up approach that empowers these trusted local organizations can be more sustainable and cost-effective than purely top-down initiatives.

Strategic solution: The government should create a specific funding and support mechanism designed to help existing, well-functioning cooperatives and community groups to "digitalize" their operations. This would involve providing them with grants, technical assistance, and training to integrate digital tools into their existing, trusted social structures.

Lesson 3: Adopt a full ecosystem approach for economic impact. The Vi Huong case, with its partnership between government, tech corporations, and local cooperatives, shows that e-commerce success requires a full ecosystem of support—from digital literacy training and product branding to logistics and traceability. A single platform is insufficient.

Strategic solution: Viet Nam's OCOP program should be enhanced with a dedicated "OCOP Digital Ecosystem Support Package," providing cooperatives with integrated, end-to-end services covering everything from digital marketing and content creation to blockchain traceability and logistics partnerships.

Lesson 4: Public investment as a catalyst for private innovation. The Dong Rui model illustrates that public investment in foundational infrastructure (like rural broadband) is critical for de-risking and "crowding-in" private sector innovation in high-tech agriculture, which the private sector might not undertake on its own due to high initial costs and uncertain returns.

Strategic solution: The government should focus its public investment on "digital public goods"—universal last-mile connectivity, open government data platforms (e.g., meteorological, soil, and market data), and cybersecurity—to create a secure and fertile environment where private AgriTech companies can innovate and thrive.

4.2. Actionable policy recommendations for Viet Nam

4.2.1. For policymakers (Government, MAE, MIC):

Develop an economy-wide DRC framework

Move beyond individual pilot projects to create a unified economy-wide framework for "Smart Rural Areas" that harmonizes technical standards, key performance indicators, data governance protocols, and funding mechanisms across ministries and provinces to ensure policy coherence and interoperability.

Launch an economy-wide digital literacy program for farmers

Design and implement a large-scale, practical training program with a gender-sensitive curriculum, focusing on skills for e-commerce, digital finance, and data management. This program should be delivered through trusted local intermediaries such as the Farmers' Union, the Women's Union, and agricultural cooperatives.

Establish a "DRC Innovation Fund"

Create a dedicated fund, possibly through a public-private partnership model, to provide catalytic, milestone-based grants and low-interest loans for startups and cooperatives that are developing and scaling digital solutions for rural areas, with a clear focus on sustainable and inclusive business models.

4.2.2. For practitioners (Cooperatives, local authorities):

Build a "digital champion" in every cooperative

Identify and provide advanced training to at least one member within each cooperative to act as a local technology guide, trainer, and first point of contact for technical support, thereby bridging the gap between members and external experts.

Co-design solutions with community members

Ensure that any digital tool or platform is developed with the active participation of its intended users—particularly women, ethnic minorities, and smallholder farmers—throughout the design and testing process to guarantee that it is relevant, user-friendly, and solves a real problem.

Foster peer-to-peer learning networks

Actively create and moderate local and regional communication platforms (e.g., Zalo groups, online forums) to connect different DRC and cooperatives, allowing them to share successes, challenges, and practical solutions, thereby accelerating the learning process for all.

4.2.3. For the private sector (Tech companies, investors):

Design for rural realities

Develop products that are affordable, have intuitive user interfaces, and are capable of functioning reliably in areas with low or intermittent connectivity (e.g., through robust offline modes and data-light applications).

Integrate service and support into business models

Recognize that ongoing training and responsive technical support are essential components of the product offering, not an afterthought. Build the cost of this "human infrastructure" into the business model to ensure long-term customer success and sustainability.

Prioritize interoperability and open standards

Commit to building technologies that can easily connect with other systems (e.g., government databases, other private platforms). This avoids creating fragmented "data silos" and contributes to a more integrated, efficient, and user-friendly digital ecosystem.

REFERENCES

1. Aggarwal, P.K., Zougmoré, R. and Kinyangi, J. (2013), *Climate-Smart Villages: A Community Approach to Sustainable Agricultural Development*, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Copenhagen, Denmark, available at: https://cgspace.cgiar.org/items/d34846fe-b882-4390-884c-b625dd031aa6 (accessed 18 September 2025).

2. Ali Research (2014), *Research Report of Taobao Villages in China*, Ali Research Institute, Hangzhou.

3. Ali Research (2017), *Research Report of Taobao Villages in China*, Ali Research Institute, Hangzhou.

4. Arctic Smart Rural Community Cluster (2015), *Cluster Report*, available at: http://luotsi.lappi.fi/c/document_library/get_file?folderId=1664044&name=DLFE-29555.pdf (accessed 18 September 2025).

5. Bộ Khoa học và Công nghệ (n.d.), *Làng số Yên Hòa vươn ra thế giới*, Cổng Thông tin điện tử, available at: https://mst.gov.vn/lang-so-yen-hoa-vuon-ra-the-gioi-197159305.htm (accessed 18 September 2025).

6. Bộ Chính trị (2019), *Nghị quyết số 52-NQ/TW ngày 27/9/2019 về một số chủ trương, chính sách chủ động tham gia cuộc Cách mạng công nghiệp 4.0*, Hà Nội.

7. China Daily (n.d.), *'Taobao village' on the move to deliver perfect holiday*, available at: https://www.chinadaily.com.cn/business/2015-12/31/content_22885325.htm (accessed 18 September 2025).

8. Digital Villages Germany (2020), *Case Study: Smart Villages in Germany*, European Network for Rural Development (ENRD), available at: https://ec.europa.eu/enrd/sites/enrd/files/tg_smart-villages_case-study_de.pdf (accessed 18 September 2025).

9. ENRD (2019), *Smart Villages in Finland: Ideas for Designing Support in the Future CAP Strategic Plans*, European Network for Rural Development, available at: https://ec.europa.eu/enrd/sites/default/files/enrd_publications/smart-villages-briefs-finland_future_cap_strategic_plans.pdf (accessed 18 September 2025).

10. European Union (2020), *Smart Villages Pilot Project*, available at: http://pilotproject-smartvillages.eu (accessed 18 September 2025).

11. Food and Agriculture Organization (FAO) (n.d.a), *Digital Villages Initiative in Asia and the Pacific – Digital Villages*, available at: https://www.fao.org/digital-villages-initiative/asia-pacific/digital-villages-list/en (accessed 18 September 2025).

12. FAO (n.d.b), *Dong Rui Commune (Viet Nam)*, Digital Villages Initiative in Asia and the Pacific, available at: https://www.fao.org/digital-villages-initiative/asia-pacific/digital-villages-list/digital-villages/dong-rui-commune-(viet-nam)/en (accessed 18 September 2025).

13. FAO (n.d.c), *Tuong Son Commune (Viet Nam)*, Digital Villages Initiative in Asia and the Pacific, available at: https://www.fao.org/digital-villages-initiative/asia-pacific/digital-villages-list/digital-villages/tuong-son-commune-(viet-nam)/en (accessed 18 September 2025).

14. FAO (n.d.d), *Xuan Tho Commune (Viet Nam)*, Digital Villages Initiative in Asia and the Pacific, available at: https://www.fao.org/digital-villages-initiative/asia-pacific/digital-villages-list/digital-villages/xuan-tho-commune--(viet-nam)/en (accessed 18 September 2025).

15. FAO (n.d.e), *Yen Hoa Commune (Viet Nam)*, Digital Villages Initiative in Asia and the Pacific, available at: https://www.fao.org/digital-villages-initiative/asia-pacific/digital-villages-list/digital-villages/yen-hoa-commune-(viet-nam)/en (accessed 18 September 2025).

16. Hayat, P. (2016), "India Quarterly – A Journal of International Affairs", *India Quarterly*, 72(2), Indian Council of World Affairs, New Delhi.

17. Heap, B., Holmes, J. and Jones, B. (2017), *Can Smart Villages Help to Stem Biodiversity Loss?*, Smart Villages, available at: https://e4sv.org/wp-content/uploads/2017/05/TR15-Can-Smart-Villages-help-to-stem-biodiversity-loss_web.pdf (accessed 18 September 2025).

18. Hortidaily (2019, 11 April), *South Korea to get second Smart Farm Innovation Valley*, available at: https://www.hortidaily.com/article/9090841/south-korea-to-get-second-smart-farm-innovation-valley/ (accessed 18 September 2025).

19. HTX Nông nghiệp số (2020), *Thuyết minh đề tài "Làng thông minh, xã kết nối: Nghiên cứu cơ sở lý luận và thực tiễn xây dựng làng thông minh, xã kết nối góp phần hiện đại hóa nông thôn"*, Hà Nội.

20. IEEE (2020), *Smart Village*, available at: http://ieee-smart-village.org/ (accessed 18 September 2025).

21. Khuyennongvn (2019, 7 May), *Đồng Tháp: Mô hình hội quán – Thuận lợi và khó khăn*, available at: https://khuyennongvn.gov.vn/hoat-dong-khuyen-nong/thong-tin-huan-luyen/dong-thap-mo-hinh-hoi-quan--thuan-loi-va-kho-khan-18588.html (accessed 18 September 2025).

22. Khamphahue (n.d.), *[Bài viết trên Cổng thông tin du lịch Huế]*, available at: https://khamphahue.com.vn/desktopmodules/DNNTinBai/PrintTinBai.aspx?newsid=D69A033D-687D-4569-8DEB-ACFE00A59AA7 (accessed 18 September 2025).

23. Ngọc, N.Q. (2009), *Một số vấn đề về làng xã Việt Nam*, Nhà xuất bản Đại học Quốc gia Hà Nội, Hà Nội.

24. Nhiều tác giả (2018), *Kỷ yếu Hội nghị trực tuyến toàn quốc và triển lãm quốc gia: Tổng kết 10 năm thực hiện Nghị quyết TW 7 khóa X về Nông nghiệp, Nông Dân, Nông thôn*, Hà Nội.

25. Nông thôn mới Thành phố Huế (n.d.a), *Quảng Thọ đã có hình hai xã thông minh*, available at: https://www.nongthonmoithuathienhue.vn//mo-hinh-tot/quang-tho-da-co-hinh-hai-xa-thong-minh/ (accessed 18 September 2025).

26. Nông thôn mới Thành phố Huế (n.d.b), *Hoạt động các địa phương*, available at: https://www.nongthonmoithuathienhue.vn//hoat-dong-cac-dia-phuong/20230911-6/ (accessed 18 September 2025).

27. Qian, L. and Chen, R. (2023), "'Where you live determines how you are treated': E-commerce geography and digital inequality in China", *Eurasian Geography and Economics*, 66(1), available at: https://www.tandfonline.com/doi/full/10.1080/15387216.2023.2210596 (accessed 18 September 2025).

28. Sahu, P.P. and Ghosh, A. (2018), *Mainstreaming Smart Village in Rural Development: A Framework for Analysis and Policy*, Indian Institute of Technology, Delhi.

29. Thủ tướng Chính phủ (2020a), *Quyết định số 357/QĐ-TTg ngày 10/3/2020 ban hành Kế hoạch triển khai Kết luận số 54-KL/TW ngày 07/8/2019 của Bộ Chính trị về tiếp tục thực hiện Nghị quyết Trung ương 7 Khóa X về nông nghiệp, nông dân, nông thôn*, Hà Nội.

30. Thủ tướng Chính phủ (2020b), *Quyết định số 749/QĐ-TTg ngày 3/6/2020 phê duyệt "Chương trình chuyển đổi số quốc gia đến năm 2025, định hướng đến năm 2030"*, Hà Nội.

31. TTXVN – Việt Nam Hạnh Phúc (n.d.), *Bạch Đằng – Mô hình làng thông minh hướng đến phát triển bền vững nông thôn*, available at: https://happyvietnam.vnanet.vn/bach-dang-mo-hinh-lang-thong-minh-huong-den-phat-trien-ben-vung-nong-thon/38420.html (accessed 18 September 2025).

32. Văn phòng Nông thôn mới các tỉnh Bắc Kạn, Ninh Bình, Hà Tĩnh, Thừa Thiên Huế, Bình Dương và Đồng Tháp (n.d.), *Báo cáo tổng hợp xây dựng nông thôn mới*, Hà Nội.

33. VJST (2021, 31 May), *Chuyển đổi số cấp xã thu hẹp khoảng cách số giữa nông thôn và thành thị*, available at: https://vjst.vn/chuyen-doi-so-cap-xa-thu-hep-khoang-cach-so-giua-nong-thon-va-thanh-thi-27197.html (accessed 18 September 2025).

34. Zeng, Y., Qiu, D., Shen, Y. and Guo, H. (2015), "A Study of the Formation of Taobao Villages: The Case of Dongfeng Village and Junpu Village", *Economic Geography*, 12, pp. 90–97.

35. Zhang, X. and Zhang, Z. (2020), "How Do Smart Villages Become a Way to Achieve Sustainable Development in Rural Areas? Smart Village Planning and Practices in China", *Journal of Rural Development Studies*, Beijing.