



Digital Climate Advisory Services (DCAS) in Rwanda – GENDER RESPONSIVE BUSINESS CASES REPORT

AUTHORS & ACKNOWLEDGEMENTS

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CONTENTS

Authors & Acknowledgements	2
Contents.....	3
1. Introduction	5
Background.....	5
Purpose of the Study	6
Scope and Methodology	6
2. RWANDA DCAS ECOSYSTEM OVERVIEW	7
3. BUSINESS CASE ANALYSIS-VIAMO.....	Error! Bookmark not defined.
Viamo platform description	9
Gender-Responsive strategy	10
Revenue model	11
Financial sustainability and scalability.....	11
4. BUSINESS CASE ANALYSIS-BK TECHHOUSE	Error! Bookmark not defined.
Company overview	12
Smart Nkunganire and Smart Kungahara Systems.....	13
Revenue model	14
Gender-Responsive strategy	14
Financial sustainability and scalability.....	15
5. COMPARATIVE ANALYSIS OF VIAMO AND BK TECHHOUSE BUSINESS MODELS.	17
6. CONCLUSION	
Lessons for gender-responsive DCAS business models	Error! Bookmark not defined.
7. REFERENCES	21

EXECUTIVE SUMMARY

This study was conducted to assess the sustainability of companies producing and delivering Digital Climate Advisory Services (DCAS) to smallholder farmers across Rwanda, with a specific focus on gender responsiveness. DCAS are “platforms, activities or tools that are used to disseminate agricultural information or advisories that are tailored to climate information to the farmers helping them to make climate resilient decisions while adapting to climate variability.” These services include radio information, online platforms, mobile applications, and Interactive Voice Response (IVR) systems. While face-to-face interactions with extension workers or peers allow for personalized guidance, trust-building, and immediate feedback, DCAS platforms such as IVR provides timely, consistent, and on-demand information that users can access at their convenience.

Agriculture remains the backbone of Rwanda’s economy, contributing 25% of GDP and engaging 65% of the population, yet it is highly vulnerable to climate variability due to its predominantly rain-fed nature. Shifts in weather patterns increasingly disrupt planting schedules and depress yields, creating a volatile production environment. Women, who constitute a significant proportion of the agricultural labor force, continue to face systemic barriers including restrictive social norms, limited land rights, limited time and digital literacy, and limited access to strategic extension systems. These constraints restrict their access to knowledge, productive resources, and inclusive economic opportunities.

The study applied the Caroline Moser Gender Planning Framework to assess whether DCAS business models address both practical gender needs and Strategic Gender Needs (SGNs) including enhanced decision-making power, control over productive resources, and equitable access to digital technologies. Two business models were analyzed: Viamo, a voice-first digital engagement platform delivering climate and agricultural advisories directly to users via IVR and SMS; and BK Techouse, a systems-level digital integrator operating the Smart Nkunganire System (SNS) and Smart Kungahara System (SKS), which combine climate advisories with input distribution, financial services, and insurance integration.

Findings show that Viamo demonstrates strong last-mile inclusion, with over 3.2 million listeners in Rwanda, 60% female users, 79% rural penetration, and 80.8% of users accessing services through basic phones. Its voice-first, local-language model removes literacy barriers and supports independent access to information. BK Techouse, by contrast, operates as an integrated digital agricultural ecosystem connecting over 2.45 million farmers registered in Smart Nkunganire System (SNS) and facilitating approximately 85 billion Rwandan Francs in annual agricultural input transactions. Its embedded finance model links climate advisories with credit scoring, insurance, and financial inclusion mechanisms.

While both models demonstrate gender-responsive design features, they differ in value proposition, cost structure, scalability dynamics, and sustainability pathways. The analysis provides practical insights into how inclusive DCAS can strengthen climate resilience, promote women’s agency, and enhance agricultural transformation in Rwanda.

1. INTRODUCTION

Background

Agriculture in Sub-Saharan African countries is rainfed and farmers' capacity to manage climate-related risks and adapt to it is still limited. Agriculture remains by and large the main source of subsistence for 65% of the Rwandan population (Tesfaye et al., 2020). This sector contributes 25% of the national Gross Domestic Product (GDP) and about 80% of Rwandans living in rural population are to some extent involved in agricultural activities (Aragie et al., 2025). According to the National Institute of Statistics of Rwanda (NISR) agriculture is the most frequent economic activity with the highest number of employed females at 55.6% with male constituting 39.8% of the sector (NISR survey, 2023). As agriculture in Rwanda is predominantly rain-fed, it remains the nation's most climate-vulnerable sector (Gasheja and Gatemberezi 2017). Shifts in weather patterns increasingly disrupt planting schedules and depress yields, creating a volatile economic environment. Without robust adaptation measures, these climate-driven productivity losses are projected to cost Rwanda at least 1% of its annual GDP by 2030 (Tesfaye et al., 2020).

Farmers contend with inefficient farming practices, suboptimal production techniques, and limited post-harvest handling, processing, and value-addition capacity. Collectively, these constraints contribute to low productivity levels and heightened vulnerability to climate-related shocks. This vulnerability is further exacerbated by limited access to decision-support tools, climate information services, and innovative agricultural technologies that could otherwise strengthen resilience and improve outcomes for farmers and other agricultural value chain actors (Aragie et al., 2025). Recognizing systemic constraints within the sector, Rwanda's Ministry of Agriculture, through the Strategic Plan for Agricultural Transformation (PSTA4, 2018), has prioritized the digitalization of the agricultural extension system. As improved fertilizer recommendations become available, digital platforms present a viable mechanism for disseminating these recommendations efficiently and on a scale, thereby enhancing farmers' access to timely and relevant agronomic information.

The fifth Sustainable Development Goal (SDG) "achieve gender equality and empower all women and girls", highlights a shared recognition of developing programs and strategies that align with gender inclusion while also contributing to improving agricultural productivity. These need to fill the gender gaps in access to timely, actionable and gender responsive climate information (Henry & Arison, 2025). Women play a central role in food production, post-harvest management, and household nutrition; however, they continue to face a persistent gender gap in access to productive resources. Compared to their male counterparts, women farmers have more limited access to land, credit, agricultural inputs, and, critically, knowledge delivered through agricultural advisory and extension services (Quisumbing et al., 2014).

Gender norms shape not only women's participation in agricultural markets but also their access to and use of climate advisories and information. In many rural contexts, socially constructed expectations define women primarily as caregivers and household managers, while positioning men as principal farmers and decision-makers. These norms influence who owns productive assets, who controls mobile phones, and who is perceived as the legitimate recipient of agricultural and climate information (Lyakaremye, 2016). Women often have lower ownership of mobile phones and limited control over digital devices. Where climate information is delivered through SMS, mobile apps, or digital platforms, access may be mediated through husbands, cooperative leaders, or other male household members leading to information distortion and reduced autonomy. Even when women receive information directly, literacy gaps and limited digital skills can restrict effective use especially when services are not designed with inclusive features such as voice-based systems.

Purpose of the Study

The purpose of this study is to examine the design, gender responsiveness, sustainability, and scalability of selected Digital Climate Advisory Service (DCAS) business models operating in Rwanda.

Ultimately, the study seeks to identify key enabling factors and constraints within each case and to derive practical lessons that can inform the replication, adaptation, and strengthening of inclusive DCAS approaches in other country contexts.

Scope and Methodology

Case Study Approach

This study focused on selected companies involved in delivering or supporting Digital Climate Advisory Services (DCAS) in Rwanda. The assessment concentrated on two business models and operational sustainability, partnership structures, revenue mechanisms and financing pathways, gender inclusion and responsiveness as well as scalability and investment readiness.

A workshop held on 20th January, 2026 brought together stakeholders from key private companies in Rwanda, who are currently or planning to operate DCAS. Gender responsiveness emerged as a central theme throughout the workshop. Participants noted that gender-blind digital services risk enhancing the existing inequalities, as women often face structural barriers related to mobile phone ownership, digital literacy, time constraints, and control over productive resources. The discussions made it clear that making DCAS gender-responsive requires more than translating messages into local languages, but the inclusive design features such as flexible delivery times, voice, trusted intermediaries, and the integration of advisory services with inputs, and market access are critical for ensuring that women can meaningfully access and use climate information. Nevertheless, not all private companies present are at a stage that is business-model ready.

Africa Improved Foods (AIF), for example, is a Rwanda-based social enterprise established in 2016 as a public–private partnership between the Government of Rwanda and international partners, including DSM, FMO, IFC, and the UK's FCDO. AIF's mission is to eradicate malnutrition through the production of affordable, nutritious, and locally sourced fortified foods, while simultaneously building resilient and inclusive food systems that benefit millions of Rwandans and smallholder farmers. AIF serves as a key private-sector anchor, linking digital climate advisories to tangible economic opportunities for over 90,000 smallholder farmers in its supply network. By integrating timely, localized, and actionable climate information into its sourcing and production operations, AIF could enhance farmers' climate resilience, improve crop quality, reduce post-harvest losses and aflatoxin contamination, and strengthen overall supply reliability.

The two selected case studies to generate in-depth insights into how DCAS models function in practice are: Viamo—a digital engagement platform that leverages mobile technology to deliver information, services, and interactive training to rural populations—and BK Techouse, a private technology company that developed the Smart Nkunganire System (SNS) in partnership with the Rwanda Agriculture and Animal Resources Board (RAB) to digitize the agricultural input subsidy value chain, expand access to financial services, and generate data-driven insights for decision-making. The study assesses how each model addresses structural gender barriers affecting access to climate information, agricultural inputs, and financial services. It further evaluates the sustainability and scalability of each approach, with particular attention to operational design, partnership arrangements, revenue structures, inclusion strategies, and their capacity to contribute to long-term climate resilience outcomes.

This study adopted a mixed-methods approach combining qualitative and descriptive analytical methods to assess the business models, operational structures, and gender responsiveness of the selected companies implementing Digital Climate Advisory Services (DCAS) in Rwanda. This approach enabled triangulation of data from multiple sources to strengthen the reliability and validity of findings. Data were

collected using multiple complementary tools: A structured survey form was developed and administered through Kobo Collect. The tool was shared electronically with representatives of the selected companies to gather standardized information. Physical site visits were conducted to engage directly with company staff and relevant stakeholders. These visits enabled first-hand observation of implementation processes, delivery channels for climate advisory services and operational realities at field level. Video documentation and stakeholder testimonials were collected to capture qualitative evidence of ongoing DCAS implementation. Finally, a stakeholder validation workshop was conducted to present preliminary findings, validate interpretations and gather additional insights

Gender Analysis Framework

This study applied the Caroline Moser Gender Planning Framework to assess the gender responsiveness of the digital climate advisory service (DCAS) business models implemented by BK Techhouse and Viamo. The framework was adapted to focus specifically on women and guided the development of data collection tools, including questionnaires and interview guides. The analysis concentrated on four key areas: women's practical needs, women's strategic needs, women's control over digital tools and resources, and women's participation in feedback and co-production processes.

The first step of the assessment examined whether the DCAS platforms respond to women's practical needs. This involved analyzing the extent to which the services provide timely agronomic and climate information, improved seed recommendations, and other relevant advisory content that supports women in their agricultural activities and livelihoods.

The second step assessed whether the platforms address women's strategic needs. This focused on identifying whether the services contribute to reducing broader gender-based constraints, such as unequal access to information, technologies, and opportunities within agricultural systems.

The third step evaluated women's control over digital resources and tools. The analysis explored whether women have direct access to mobile phones and digital climate information services, and whether they are able to use these tools independently.

The final step reviewed women's participation in providing feedback and in the co-production of DCAS. This involved assessing whether women are actively consulted during service design, whether their feedback is systematically collected, and whether their perspectives are incorporated into the improvement and adaptation of the platforms.

By systematically applying these four analytical steps, the methodology provides a structured approach to evaluating how well DCAS business models respond to women's specific needs and experiences

Limitations

Despite the use of multiple data collection methods, several limitations should be acknowledged. The study relied significantly on self-reported information from company representatives, which may introduce response bias and the assessment of gender responsiveness was based on available company data and qualitative insights, without independent verification of intra-household and women decision-making dynamics at scale. Financial sustainability assessments were based on indicative information rather than audited financial statements.

2. RWANDA DCAS ECOSYSTEM OVERVIEW

Regulatory and policy context

Rwanda's Vision 2050 sets an ambitious pathway to achieve upper middle-income status by 2035 and high-income status by 2050, anchored in a carbon-neutral and climate-resilient economy. To operationalize this ambition, the country has established policy frameworks such as the Green Growth

and Climate Resilience Strategy, which integrates climate change adaptation and mitigation across all sectors while promoting balanced economic development and environmental sustainability (Buheji et al., 2024). Central to these efforts is the prioritization of climate data and projections as key adaptation tools. In parallel, Rwanda has committed to closing the gender digital divide and advancing gender equality through the revised 2021 National Gender Policy, which emphasizes women's economic empowerment, equitable access to productive resources, and strengthened gender-responsive capacity across public and private institutions.

The second phase of the National Strategy for Transformation (NST2) sets an ambitious target for the agriculture sector to achieve an annual average growth of over 6%. To reach this headline indicator, the Government of Rwanda is prioritizing modern input adoption, promotion of climate resilient agriculture by enhancing productivity through expanded irrigation schemes among others.

Despite strong policy underpinnings, a significant gender digital divide remains a barrier to equitable growth. In Rwanda, mobile phone access remains uneven: 68% of men have access compared to just 38% of women. This gap, coupled with low digital literacy, presents a critical challenge to the scaling of Digital Climate Advisory Services (Kropff et al. 2021). The 2021 Annual Report of the National Bank of Rwanda (BNR) indicates that agricultural loan uptake declined more sharply among women (78.5%) than among men (57.4%). Women's disproportionate caregiving responsibilities, combined with heightened risk aversion and social norms that limit independent financial decision-making, and constrain their capacity to invest in productive assets and climate-resilient practices (Musabanganji et al., 2015).

Rwanda DCAS landscape and demand

Rwanda's DCAS landscape comprises a network of public, private, and intermediary organizations that collaborate to generate, translate, and disseminate climate information for agriculture. The Rwanda Meteorology Agency (Meteo Rwanda) plays a central role in developing and continuously refining historical, monitored, and forecast weather products tailored to agricultural and food security decision-makers (Birachi et al., 2020). These products are disseminated in coordination with the Ministry of Agriculture and Animal Resources and the Rwanda Agriculture and Animal Resources Development Board, as well as private digital service providers. Delivery channels include SMS, Interactive Voice Response (IVR), mobile applications, rural radio broadcasts, and extension-facilitated platforms, ensuring broader reach across diverse farmer segments. Agricultural extension agents and intermediary actors such as farmer cooperatives, ICT providers, and NGOs further contextualize and communicate decision-relevant advisories to farmers across all 30 districts, while strengthening their capacity to interpret and apply climate information for improved risk management and resilience

According to 2024 household survey by National Institute for Statistics of Rwanda, 3.6 million Rwandans are engaged in agricultural activities with 48.3% and 51.7% of male and female participation respectively. 67.1% of agriculture households have access to extension services on good agricultural practices, guidance on fertilizer application, erosion control measures, and financial literacy. Media and communication channels are the most prevalent source of agricultural technical information, utilized by 22.5% of agricultural households. This is closely followed by government officials as the source of information (22.1%). Community meetings and group work also play a major role, serving as the third most common source at 19.8%. Other notable sources include farmer field schools (7.2%) and NGOs or private companies (6.9%).

3. VIAMO RWANDA BUSINESS CASE

Company overview

Viamo is a global social enterprise and recognized leader in mobile engagement, specializing in connecting “unconnected” populations through basic and feature phones. Headquartered in Rwanda for its regional operations, Viamo’s mission is to ensure that all individuals, regardless of literacy levels or access to advanced technology, can access the information necessary to make informed, climate-resilient, and economically productive decisions.

The company operates through a voice-first approach, meaning voice communication is at the core of its services. Viamo primarily uses Interactive Voice Response (IVR) technology to deliver pre-recorded and validated information directly to users in their local languages. This approach removes the need for smartphones or internet access and overcomes literacy barriers, which is critical in communities where many people cannot read or write. By delivering content directly to community members without relying on intermediaries, Viamo ensures that information is not diluted, mistranslated, or altered during field-level communication.

Viamo works with partners such as governments, NGOs, and development organizations that need to disseminate validated information at scale. These partners use Viamo’s platform to increase reach, improve visibility of their programs, and ensure accurate messaging reaches communities directly. Additionally, Viamo serves end users in rural and underserved communities, particularly individuals with limited literacy or without access to smartphones, such as smallholder farmers. Through its voice-first approach, the platform ensures that even users with basic phones can access important information in local languages. In Rwanda, for example, 80.8% of Viamo listeners use basic phones, highlighting its accessibility beyond smartphone users. The majority of users are young people aged 18–34 years (75.5%), with 60% female and 38% male listeners. Additionally, 79% of listeners are from rural areas, demonstrating Viamo’s strong effectiveness in reaching populations that are often excluded from internet-based digital services.

Viamo operates across more than 20 major markets in Africa and Asia. In Rwanda specifically (2025 impact figures), Viamo reached over 3.2 million listeners, with 195 million key messages listened to in Kinyarwanda. Engagement spans all 30 districts of the country, reflecting nationwide coverage and strong penetration in rural communities.

Viamo platform description

Viamo delivers Digital Climate Advisory Services (DCAS) through a voice-first model designed to reach farmers who use basic and feature phones. Climate advisories are co-designed with partners, validated at the government level, and aligned with national extension and digital agriculture frameworks to ensure accuracy and avoid duplication. Information is shared as needed, allowing timely responses to emerging climate conditions rather than relying only on seasonal updates. The advisories integrate climate and agronomic guidance, ensuring that weather-related information is practical and directly linked to farming decisions.

The primary delivery channels are IVR and SMS. IVR is the core channel, enabling farmers to access recorded voice messages in local languages without requiring internet access or smartphones. A key engagement feature is that users receive eight free calls, reducing financial barriers and encouraging repeated use; subsequent calls require airtime, which supports sustainability. Additional formats include digital training modules and recorded surveys, which are implemented in collaboration with partners. Call detail data (such as gender, age, location, phone type, and call duration) is used to track engagement and equitable reach. In Rwanda, the platform reaches over 3.2 million farmers nationwide, with more than 75% active users.

Through Viamo, of the 195 million messages sent, over 1.3 million were related to climate and environment and 1.4 million were related to agriculture. These messages were delivered in Kinyarwanda without requiring internet or literacy. This positions Viamo as an immediately scalable, gender-responsive DCAS delivery channel. Measurement is central to the DCAS model, 93% of surveyed farmers reported using advisory services, and 74% reported increased knowledge on nutritious diets and farming practices.

Tracking and dashboards paired with learning loops allow disaggregated monitoring of behavior change by gender. Results from this dashboard show that women aged 18–34 are the most active listeners and provide more feedback than any other age group. .

Gender-Responsive strategy

Viamo's strategy intentionally integrates gender-responsive digital climate agro-advisories from the start: they design for women's access constraints first, then continuously adapt content using feedback and disaggregated data. They act as a primary delivery and feedback partner—pushing interactive, actionable advisories to women who often rely on basic phones, and using two-way mechanisms (e.g., interactive surveys and prompts) so women farmers can shape what they receive and increase relevance and uptake. Viamo's model also supports bundling (e.g., adding market prices, finance/insurance linkages alongside advisories) and collecting real-time, sex-disaggregated engagement data via their digital survey and campaign tooling enabling tighter monitoring of reach, listenership, and reported behavior change.

Viamo integrates gender-responsive design through a strong voice-first and local language approach that prioritizes inclusion. All content is delivered primarily through IVR in local languages, particularly Kinyarwanda, ensuring that women who may have limited literacy or digital skills can access information independently. By relying on audio rather than text-based communication, the platform removes reading barriers and ensures that services are accessible from basic phones, including non-smartphones supported by AI-enabled voice systems.

The platform also recognizes women's time constraints and workload responsibilities. To accommodate this, content is accessible on demand rather than at fixed times. For example, through the integration of the popular radio drama *Urunana* into the IVR platform, listeners can access eight calls for free and start being charged on the ninth call. Moreover, subscribers can listen to the episodes at any time, pause, and resume where they left off. This flexibility allows women farmers to engage with content while balancing farm work, childcare, and household duties, rather than being restricted to scheduled broadcast hours. The incentive of eight free calls encourages women to explore and engage with the platform before incurring any costs.

Content is further tailored to women through language adaptation, targeted outreach strategies, and co-development processes that incorporate user feedback. Dedicated budgets support training, content adaptation, and outreach efforts to enhance inclusion and relevance. Additionally, accessibility is extended to women who may not own phones directly, as the voice system can be accessed from any available phone, broadening reach beyond individual device ownership and strengthening equitable access to advisory information. Table 1 highlights strengths and limitations of VIAMO's business model.

Language accessibility is a key feature. Content is delivered in local languages, particularly Kinyarwanda, ensuring comprehension among users with limited literacy or digital skills. The voice-based format removes reading barriers and is accessible from any phone. Communication timing is also tailored (e.g., evening hours or market days) to accommodate users' workloads, especially women, who represent approximately 60% of listeners. With 79% of users located in rural areas and 81% using basic phones, the platform effectively reaches populations often excluded from internet-based advisory systems.

VIAMO DCAS FRAMEWORK



Figure 1: Framework of ViAMO DCAS production

Revenue model

ViAMO's DCAS is financed primarily through government and donor funding (80%), with the remaining 20% coming from private telecom partnerships. The preferred partnership structure is government-led, as the government serves as the primary partner for donors. Funding predictability over the next three years is considered uncertain, and the organization is currently developing a model to transition from donor reliance toward a more commercial structure.

Telecom partnerships are central to the revenue model. MTN is identified as both a partner and a funder, contributing to service delivery. Within existing public-private partnerships, the government provides data while telecom partners support delivery. Users contribute by purchasing airtime to access services. User engagement is influenced by the provision of eight free calls, after which additional calls require airtime payment.

Financial sustainability and scalability

ViAMO's financial sustainability and scalability depend on its ability to transition from a predominantly donor-funded model toward a more diversified and commercially viable structure while leveraging its existing scale and infrastructure. The platform's current reliance on government and donor financing (80%) presents a risk to long-term sustainability, particularly given uncertain funding predictability; however, its established partnerships with telecom operators, such as MTN, provide a strong foundation for cost-sharing and revenue generation through airtime usage beyond the initial free calls. Scalability is further supported by a cost-efficient model built on infrastructure reuse and service bundling, where the same IVR system delivers climate advisories, market information, training, and feedback mechanisms, thereby reducing marginal costs per user. The platform's ability to operate on basic phones without internet access enables rapid expansion across rural and underserved populations, while integration with national systems ensures alignment and potential government adoption at scale. Moving forward, strengthening public-private partnerships, introducing tiered or value-added services, and embedding DCAS within broader agricultural and financial ecosystems will be critical to ensuring both financial resilience and sustained large-scale impact.

Table 2: Strengths and limitations of VIAMO business model

Strengths	Limitations
Wide national reach: 3.2 million users across all 30 districts in Rwanda	Heavy reliance on government and donor funding, 80% of financing.
High user engagement: over 75% active users.	Uncertain funding predictability over the next three years
Strong adoption and knowledge impact: 93% reported use; 74% increased knowledge	Delays in government payments affecting cash flow
Voice-first model accessible on basic phones, 80.8% basic phone users.	Airtime required after eight free calls may limit continued access
Strong rural penetration with 79% rural users.	Digital divide (literacy gaps, phone ownership, limited digital skills)
Government validation enhances credibility and policy alignment	Government validation processes may slow content dissemination

4.BK TECHHOUSE'S BUSINESS CASE

Company overview

BK Techouse is a private technology company and a subsidiary of Bank of Kigali Group PLC, operating under Bank of Kigali. As the innovation and technology arm of the Group, BK Techouse develops and delivers digital solutions across multiple sectors, including education, agriculture, finance, and retail. Its mandate aligns with the Bank of Kigali's strategic objective of advancing digital financial services through integrated payment systems and the bundling of complementary products such as credit and insurance. This institutional affiliation strengthens BK Techouse's capacity to design scalable, data-driven platforms and embed agricultural services within broader financial ecosystems.

Within Rwanda's agri-digital landscape, BK Techouse plays a systems-level integrator role. In partnership with the Rwanda Agriculture and Animal Resources Development Board, it developed the Smart Nkunganire System (SNS), a national digital platform designed to modernize and digitize the government's agricultural input subsidy program. SNS connects over 2,454,900 registered farmers, 1,900 agro-dealers, more than 800 agronomists and extension agents, 36+ input suppliers, and 100+ distributors through mobile applications, USSD channels, and web-based interfaces.

Through this integrated system, approximately 131,380+ metric tons of agricultural inputs are distributed annually, representing a transaction value of about 85.1 billion Rwandan Francs (RWF) per year. By digitizing farmer registration, input distribution, and transaction reconciliation in real time, SNS enhances transparency, reduces leakages, and improves efficiency within the subsidy value chain.

Beyond input distribution, the platform facilitates access to agricultural advisory services including climate-related information while enabling digital integration of financial and insurance products. Farm-level data captured within the system (such as farm size, crop type, input usage, and production projections) strengthens credit assessment processes and supports data-driven decision-making for both policymakers and financial institutions.

Building on SNS, BK Techouse also co-developed the Smart Kungahara System (SKS) in partnership with the National Agricultural Export Development Board to digitize cash crop value chains. Collectively, these platforms position BK Techouse as a backbone digital infrastructure provider within Rwanda's agricultural

transformation agenda, facilitating value chain coordination, financial inclusion, and scalable Digital Climate Advisory Services.

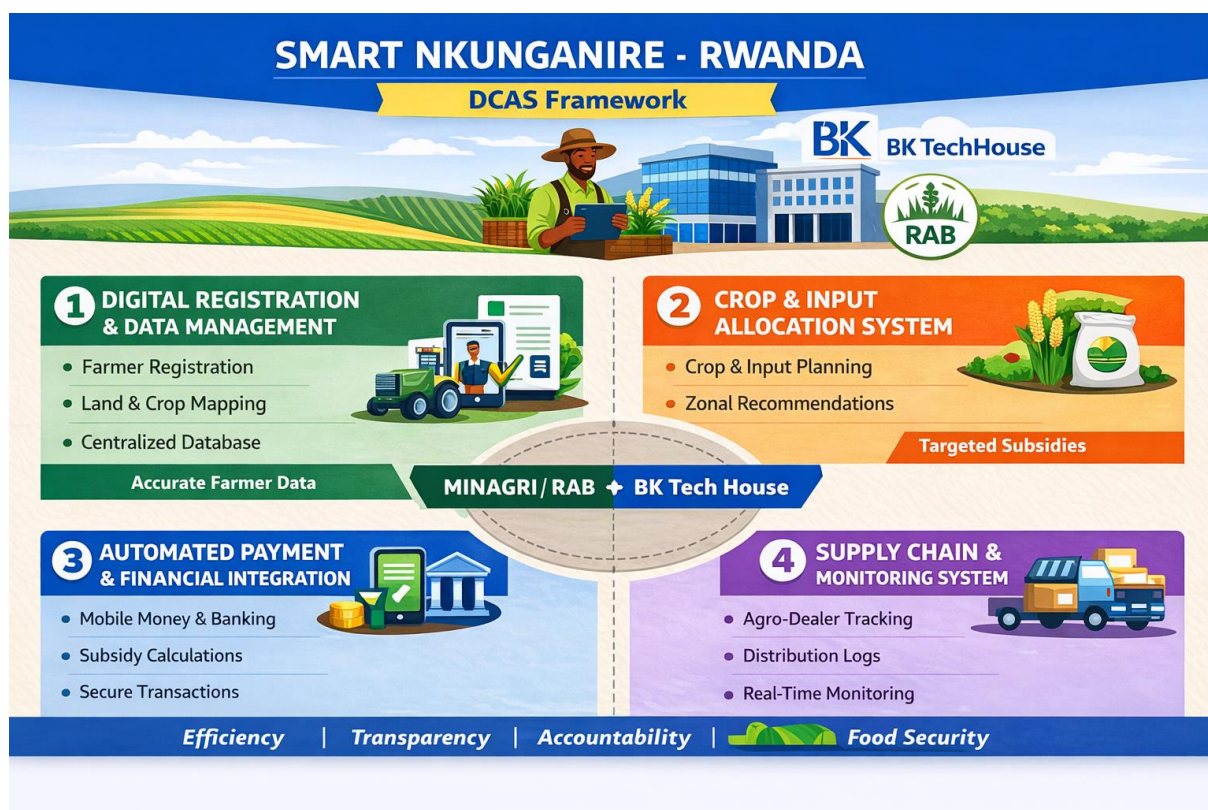
Smart Nkunganire and Smart Kungahara Systems

The Smart Nkunganire System (SNS) and Smart Kungahara System (SKS) deliver agro-climatic advisories through a multi-channel communication model designed to maximize reach across diverse farmer profiles. Core delivery channels include SMS, radio broadcasts, community meetings, extension agents, cooperative and farmer group platforms, and web-based applications. The systems are accessible through mobile applications, USSD interfaces, and web portals, enabling both smartphone and basic phone users to access services. Notably, more than 800 registered extensionists nationwide support information dissemination and farmer engagement, reinforcing last-mile delivery and interpretation of climate advisories.

To enhance gender inclusivity, targeted outreach strategies have been integrated into the delivery model. These include peer-learning and participatory approaches, engagement of female facilitators or champions, and mapping of farmers by gender, region, and community to enable tailored communication. These measures were introduced to address structural barriers faced by women farmers, including limited phone ownership, SIM registration constraints, connectivity gaps, airtime and data costs, literacy and digital skill limitations, cultural norms, time burdens, and language localization challenges. By combining digital and human-mediated channels, the platforms seek to reduce exclusion risks and improve effective uptake among women users.

SNS is strategically integrated with financial service providers to support agricultural de-risking and enhance farmer resilience. Through embedded credit scoring and risk assessment functionalities powered by data analytics, the platform facilitates loan eligibility assessments for smallholder farmers. This enables financial institutions to make informed lending decisions based on farmer production histories and transaction records. In addition, the system allows insurance providers to integrate directly into the platform, offering agricultural insurance products tailored to farmer needs.

SNS and SKS function as integrated data ecosystems that consolidate multiple data streams to support evidence-based decision-making. These include farmer registration data, input distribution records, production tracking, financial transaction data, and insurance information. Climate and weather-related advisories are incorporated into the system and disseminated digitally and through extension agents.



Revenue model

BK Techhouse currently operates under a hybrid financing structure supported by donor funding and private capital, allowing all farmers registered on the Smart Nkunganire System (SNS) to access agricultural and climate advisory services free of charge. This subsidized access model has facilitated broad farmer inclusion and rapid system uptake. Through integration with financial institutions and insurance providers, farmers receiving climate information and agronomic advisories often linked to recommended improved inputs can access input credit and weather-index insurance products, with repayment structured around post-harvest cycles. This embedded finance model creates revenue opportunities through service integration, transaction facilitation, and risk-sharing arrangements, positioning BK Techhouse to progressively shift from a grant-supported platform to a commercially viable digital agricultural ecosystem.

Gender-Responsive strategy

BK Techhouse's Digital Climate Advisory Services (DCAS) are closely integrated with financial inclusion mechanisms, creating a seamless connection between climate-smart farming and access to credit and insurance. Through the Smart Nkunganire System (SNS), end-users can not only receive climate and agricultural advisory messages but also purchase agricultural inputs, apply for loans, and access weather-indexed insurance products. The platform consolidates real-time farm-level data including farm size, crop types, input usage, and production forecasts alongside the farmer's financial history, enabling lenders to accurately assess loan eligibility and repayment capacity. This integration particularly benefits vulnerable groups, such as women farmers, who often face constraints in collateral ownership, limited credit history, lower income, and reduced confidence in negotiating financial services. By coupling climate advisories with access to financial products, DCAS empowers women to optimize yields, mitigate climate-related losses, and stabilize income streams, thereby enhancing their capacity to invest in expanding and improving their agricultural activities.

Through the training of digital ambassadors, both men and women from across all districts, women farmers are specifically supported by peers who understand their unique challenges. To reach women with low literacy levels and limited digital skills, BK Techhouse employs inclusive approaches such as IVR

messages, radio programs in local languages, group training sessions, and personalized extension support. The platform's equitable reach is monitored using sex-disaggregated registration data, providing insights into how effectively women are being engaged. Feedback from women through community meetings, user committees, and extension agents is systematically collected and shared with the technical team, enabling continuous improvements to the platform's usability, relevance, and gender responsiveness.

Financial sustainability and scalability

The financial sustainability of BK Techouse, particularly through the Smart Nkunganire System (SNS), is anchored in its large transaction volume, embedded financial integration, and institutional backing. With over 2.45 million registered farmers and more than 85 billion Rwandan Francs (RWF) in annual agricultural input transactions, SNS operates at a scale that generates substantial economic activity within Rwanda's agricultural sector. This transaction intensity creates opportunities for revenue generation beyond donor support, including service contracts with government, commission-based arrangements with financial institutions and insurance providers, and data-driven credit scoring services. The platform's integration with financial services, allowing real-time reconciliation of transactions, loan eligibility assessment, and insurance access, positions it within a revenue-generating ecosystem rather than as a standalone advisory tool. Furthermore, its affiliation with the Bank of Kigali strengthens financial credibility, enhances capital access, and supports the bundling of digital payments, credit, and insurance products.

However, despite these strengths, the sustainability of the current model remains partly dependent on public and donor funding, as farmers access advisory and digital services free of charge. The ongoing transition toward a commercially driven model introduces both opportunity and risk. While the large user base and transaction flows provide a strong foundation for monetization through ecosystem partnerships, sustainability will depend on the company's ability to diversify revenue streams without compromising farmer inclusion. Over-reliance on digitization of the government's subsidy system may expose the platform to policy shifts or fiscal constraints. Therefore, long-term financial resilience will require strategic revenue diversification, including private-sector partnerships, value-added services for agribusiness actors, and structured revenue-sharing agreements with financial service providers.

In terms of scalability, BK Techouse demonstrates high potential due to its nationally integrated digital infrastructure, established stakeholder network (MINAGRI, RAB, Rwanda Space Agency and Meteo Rwanda, NGOs, insurance and financial companies), and data-driven architecture. SNS already connects millions of farmers with agro-dealers, agronomists, input suppliers, distributors, and regulators, reducing marginal costs for additional users and enabling system-wide coordination. The platform's ability to consolidate farm-level production data, financial records, and climate advisory information enhances its replicability across value chains and potentially across geographic contexts. Moreover, its embedded finance model linking climate information, input distribution, credit, and insurance create a scalable ecosystem logic where multiple services reinforce one another. While challenges such as digital literacy gaps, connectivity constraints, and gender-based access barriers may affect inclusive expansion, the structural design of SNS positions BK Techouse as a scalable backbone infrastructure for digital agricultural transformation and climate-responsive service delivery. Table 3 highlights strengths and limitations of BK Techouse's business model and Fig.2 presents its monitoring dashboard.

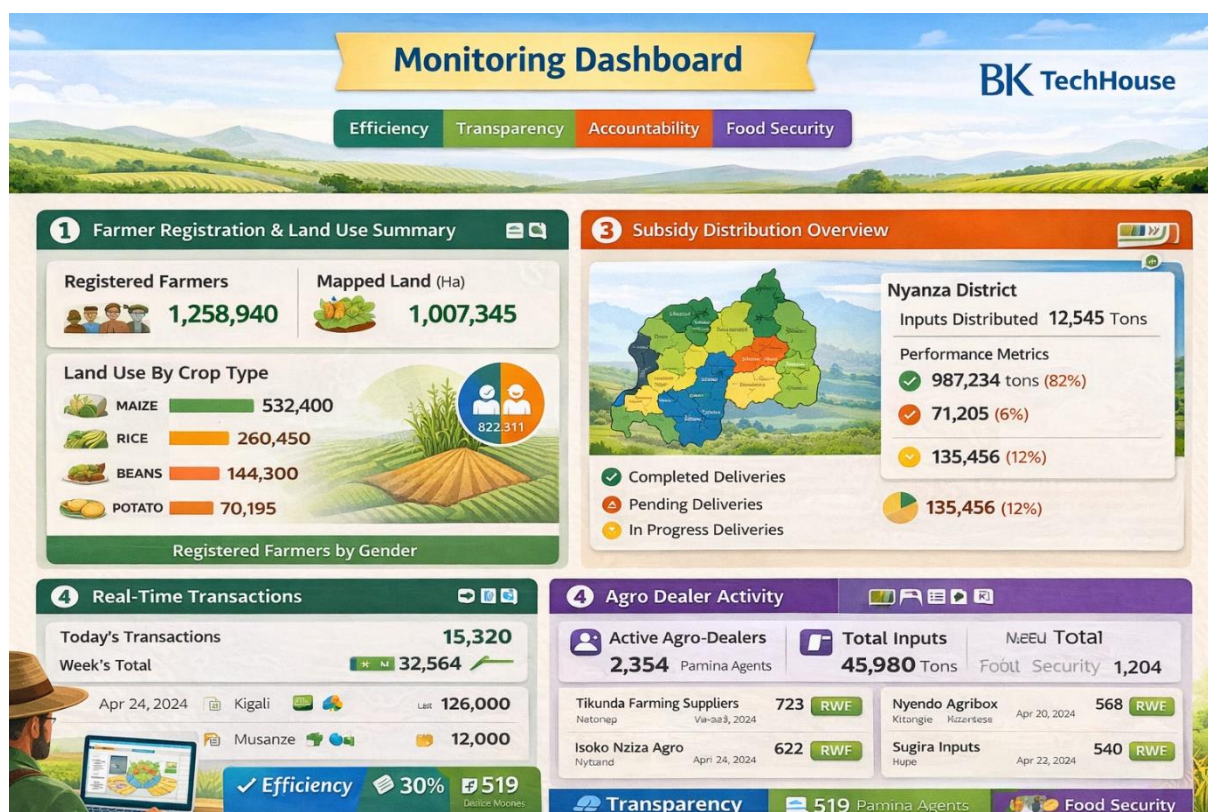


Fig.2 Monitoring dashboard of BK Techhouse's business model

Table 4: Strengths and limitations of BK Techhouse business model

Strengths	Limitations
Strong institutional backing: Subsidiary of Bank of Kigali with government partnership (RAB).	Dependence on public & donor funding: core model linked to subsidy system.
National scale & high transaction volume : 2.45M+ farmers; 85B+ RWF annually.	No direct farmer revenue model: services currently free to users.
Embedded finance & insurance integration: Credit scoring and risk assessment-built in.	Commercial transition still under development: monetization model not fully matured.
Integrated data ecosystem: farm, financial, and climate data consolidated	Limited impact & engagement evidence: Weak data on outcomes and retention.
Multi-channel delivery system: SMS, radio, extension, cooperatives.	Seasonal advisory frequency: Limited real-time responsiveness.
Gender-targeted outreach strategies – Peer learning, female champions, gender mapping.	Persistent gender access barriers: phone ownership, literacy, norms, connectivity gaps.
Strong PPP & policy alignment – Embedded in national extension framework.	Coordination complexity & telecom cost constraints.
High scalability potential – Digital infrastructure already national; regional expansion interest.	Long-term sustainability risk: Revenue diversification required.

5. COMPARATIVE ANALYSIS OF VIAMO AND BK TECHHOUSE BUSINESS MODELS

Table 3 provides a comparative analysis between BK Techhouse and VIAMO business models. VIAMO delivers a direct-to-user, voice-first Digital Climate Advisory Service (DCAS) designed to reach farmers through basic mobile phones, without requiring literacy or internet access. By providing validated climate and agronomic information in Kinyarwanda, it prioritizes last-mile inclusion and nationwide accessibility. Its revenue model is largely government- and donor-supported (80%), complemented by a telecom partnership with MTN (20%), where users receive eight free calls before paying via airtime under a public-private partnership framework. While currently subsidy-dependent, VIAMO is transitioning toward a more commercial model. Gender inclusion is central to its design: the voice-based IVR system enables equitable access for women, who make up 60% of users, with flexible on-demand timing, dedicated gender budgets, tailored outreach, and strong rural penetration (79%). Its scalability is particularly strong due to minimal infrastructure requirements, reliance on basic phones, nationwide telecom coverage, AI-enabled automation, and standardized content that can be replicated rapidly across districts and markets.

In contrast, BK Techhouse operates as an integrated digital agricultural ecosystem anchored in Rwanda's subsidy digitization systems (SNS/SKS). Rather than focusing solely on information delivery, it combines climate advisories with input distribution, financial services, credit scoring, insurance, and transaction management within a broader national agricultural infrastructure. Its hybrid financing model blends donor and private capital, generating revenue through embedded finance mechanisms, transaction facilitation, service contracts, and ecosystem partnerships, with strong institutional backing from the Bank of Kigali. Gender inclusion is embedded through gender mapping, peer learning, female champions, extension support, IVR and radio outreach, and the integration of advisories with credit and insurance products to strengthen women's financial inclusion, supported by sex-disaggregated monitoring. While highly scalable within integrated value-chain systems and supported by strong national infrastructure, its expansion is inherently more complex than VIAMO's due to the coordination and system integration required across financial, agricultural, and institutional actors.

Table 5: Comparative analysis between BK Techouse and VIAMO business models

Dimension	VIAMO	BK Techouse
Primary value	Direct-to-user, voice-first DCAS accessible on basic phones; delivers validated climate and agronomic information in local languages without requiring literacy or internet access. Strong focus on last-mile inclusion and nationwide reach.	Integrated digital agricultural ecosystem anchored in subsidy digitization (SNS/SKS); combines climate advisories with input distribution, financial services, credit scoring, insurance, and transaction management within a national agricultural infrastructure.
Revenue source	80% government/donor funding; 20% telecom partnership (MTN); user-paid airtime after eight free calls; PPP model with government-led coordination. Transition toward commercial model under development.	Hybrid financing: donor and private capital; embedded finance model generating revenue through transaction facilitation, credit and insurance integration, service contracts, and ecosystem partnerships. Strong institutional backing from Bank of Kigali.
Gender inclusion strategy	Voice-first IVR in local language (Kinyarwanda); 60% female users; flexible timing (on-demand access); AI-enabled non-smartphone access; dedicated gender budgets; tailored outreach and feedback loops; strong rural penetration 79%.	Gender mapping, peer learning, female champions, extension support, IVR and radio; integration of advisories with credit and insurance to strengthen women's financial inclusion; sex-disaggregated monitoring; group training and participatory outreach.
Scalability potential	Highly scalable due to low infrastructure requirements (basic phones), nationwide telecom coverage, AI-enabled IVR, and standardized content delivery. Rapid replication is possible across districts and markets.	High scalability within integrated value-chain systems; strong institutional integration and national infrastructure; scalable through embedded finance ecosystem, but expansion more complex due to coordination requirements and system integration.

Gender responsiveness comparison

Viamo demonstrates stronger direct access to women numerically, with approximately 60% of its 3.2 million users being female and 80.8% using basic phones. Its voice-first model overcomes literacy and smartphone barriers, allowing women to access information independently. BK Techouse reaches women through the national subsidy platform but relies more on structured registration systems and extension intermediaries, which may indirectly limit spontaneous access compared to Viamo's open IVR system.

Additionally, Viamo shows high engagement metrics (over 75% active users, repeated listening, 60-minute average engagement) and flexible access aligned with women's daily schedules. BK Techouse fosters participation through peer learning, female champions, and extension networks, which may deepen relational engagement but depend more heavily on institutional coordination. Viamo's measurable behavioral tracking suggests stronger real-time participation analytics.

On the other hand, BK Techouse may offer stronger structural livelihood benefits due to its embedded finance model linking advisories to credit, insurance, and input access, directly influencing production and income pathways. Viamo demonstrates knowledge gains (74% increased knowledge; 93% reported use

of advisories), but income or yield outcome evidence remains less developed. BK Techouse's integration with financial services potentially translates advisory uptake into economic outcomes more directly.

Regarding decision-making power, Viamo enhances informational agency by enabling women to independently access climate and agricultural information without intermediaries. BK Techouse enhances economic agency by improving women's eligibility for credit and insurance through data-driven risk assessment. While Viamo strengthens knowledge autonomy, BK Techouse may contribute more directly to financial decision-making power.

Cost effectiveness comparison

Viamo likely has a lower marginal cost per farmer reached due to its IVR-based infrastructure, reusable digital content, and telecom-based scaling. The absence of physical extension dependency reduces delivery costs at scale. Its direct voice-based outreach, rural targeting (79%), and a high proportion of female users (60%) suggest a relatively efficient cost per woman reached. Automated call systems and a high rate of active users (over 75%) also contribute to lower cost per active user over time.

In contrast, BK Techouse operates within a more complex system that requires platform maintenance, financial integration, coordination with extension agents, and transaction reconciliation. These factors likely increase system-level operational costs but provide potentially higher value per user due to the integration of financial services and insurance. BK Techouse also invests in participatory outreach, digital ambassadors, and gender-targeted facilitation. While these efforts may raise the cost per woman reached, they could also deepen the quality and impact of engagement.

Regarding outcomes, Viamo reports strong usage and knowledge gains, with 93% of users accessing advisories and 74% reporting increased knowledge. However, quantified impacts on income or yields are limited. BK Techouse, by linking advisories with financial products and facilitating over 85 billion RWF in annual transactions, suggests higher economic throughput per user, although advisory-specific outcome metrics remain less clearly defined.

Risk and sustainability comparison

Viamo faces a higher funding concentration risk, with 80% of its financing derived from government and donor sources, and uncertain predictability over the next three years. The ongoing transition toward commercialization introduces additional financial uncertainty. Engagement sustainability is partly dependent on airtime availability, as users only receive eight free calls before subsequent calls require payment. While the voice-first, IVR-based infrastructure reduces marginal costs per user, reliance on telecom partners also exposes Viamo to potential service disruptions.

BK Techouse, while also partially donor-supported, benefits from transaction-based revenue streams embedded in the Smart Nkunganire System and institutional backing from Bank of Kigali. This provides a more stable commercial foundation, though revenue diversification remains crucial to mitigate long-term financial risk. Its system-level complexity including integration with financial institutions, input suppliers, and extension services, creates higher operational costs but also positions the platform to deliver greater economic value per user.

Operationally, Viamo's direct, automated IVR outreach reduces dependency on physical extension workers, enabling rapid scaling across districts and markets at relatively low marginal cost. It reaches 79% of users in rural areas and 60% women, reflecting efficient gender-targeted coverage. BK Techouse relies on multi-channel delivery (SMS, radio, extension agents, cooperatives) and gender-targeted facilitation, such as female champions and digital ambassadors. While this approach may increase operational costs per woman reached, it potentially strengthens engagement and deepens impact.

Both models face policy and regulatory risks. Viamo is subject to data privacy and interoperability standards and depends on government validation processes, which may delay content dissemination. BK Techouse's close integration with national subsidy systems makes it vulnerable to fiscal or policy changes affecting agricultural subsidies, though its institutional anchoring provides a buffer against abrupt shifts.

Gender-related barriers persist in both models. Viamo must address women's limited phone ownership, airtime affordability, and workload constraints, while BK Techouse faces barriers linked to digital literacy, SIM registration, cultural norms, and financial inclusion gaps. However, BK Techouse's embedded finance

approach partially mitigates these risks by providing women with access to credit and insurance alongside advisory services.

6.CONCLUSION

The comparative analysis highlights two complementary approaches to gender-responsive Digital Climate Advisory Services (DCAS) in Rwanda. Viamo offers a scalable, voice-first model that prioritizes last-mile inclusion, delivering IVR-based advisories in local languages with flexible access. Its strong rural penetration and 60% female user base demonstrate high engagement and knowledge gains, though sustainability remains tied to government and donor funding. In contrast, BK Techouse operates within an embedded ecosystem linking climate advisories with input distribution, credit, insurance, and transactions. Serving over 2.45 million farmers, it shows potential for structural economic empowerment, particularly for women, but requires diversification beyond subsidy-supported operations. From a gender perspective, Viamo strengthens informational agency, enabling independent access to climate knowledge, while BK Techouse enhances economic agency by connecting advisories to financial tools that influence production and income. Cost-effectiveness also differs: Viamo achieves lower marginal costs per user, whereas BK Techouse delivers higher value through integrated financial services. Sustainability risks vary accordingly, with Viamo vulnerable to funding concentration and telecom dependency, and BK Techouse reliant on policy stability.

From a gender responsiveness perspective, Viamo strengthens informational agency by enabling women to independently access climate and agricultural information without intermediaries. BK Techouse enhances economic agency by linking advisories directly to financial inclusion mechanisms that influence production, income stabilization, and investment capacity. In this sense, Viamo shows stronger performance in access and engagement metrics, while BK Techouse presents greater potential for long-term structural empowerment through financial integration.

Cost-effectiveness dynamics also differ. Viamo likely achieves lower marginal costs per farmer reached due to its automated IVR infrastructure and reusable digital content. BK Techouse, while potentially incurring higher operational costs due to system complexity and coordination requirements, delivers higher value per user through embedded credit, insurance, and transaction systems. Overall, inclusive DCAS can advance climate resilience and gender equity, but pathways differ. Viamo provides broad, cost-efficient informational reach, while BK Techouse offers finance-integrated, structural empowerment potential. Hybrid strategies combining both models could maximize reach, engagement, and transformative impact in Rwanda.

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