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Technical Note

Innovation Platforms for Agricultural Development: A Case Study of SIDS Research Station in Egypt

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Summary

The objective of this research was to review Innovation Platforms (IPs) and their roles in agricultural development and characterize SIDS Research Station to evaluate its potential as a national IP in Egypt. Literature review results indicate that IPs have several functions to stimulate research and development around the world. For example, IPs can help test scientific ideas, technologies, and innovations. These are particularly effective when farming challenges require joint efforts of stakeholders. In this regard, IPs can help stakeholders experiment together and share knowledge, resources, benefits, and risks for issues they cannot solve on their own, and benefit from the synergistic effects of working together. The results of the research station characterization indicate that SIDS Research Station has huge potential as a national innovation platform in Egypt. Therefore, the Agricultural Research Center (ARC) of Egypt can take the initiate to set up the national IP by engaging diverse stakeholders of both public and private sector actors.

Key words

Innovation platforms, SIDS Research Station, Egypt, research for development

1. Literature Review

Innovation platforms (IPs) are an increasingly becoming a popular tool in agricultural development, facilitating collaboration between diverse actors to address complex issues. Research evidence shows that households engaged in IPs experienced increased dairy milk sales and income, alongside improved breeding and feeding practices in Uttarakhand, India (Ravichandran et al., 2020). Key factors contributing to these positive outcomes included a thorough issue identification process, a diverse range of actors involved in meetings, and effective follow-up on agreed-action plans. IPs are collaborative initiatives that assemble diverse stakeholders to address complex issues and drive innovation within a specific sector, theme, or challenge. IPs can be characterized by several key features:

Multi-stakeholder Approach:
IPs bring together participants from various sectors or domains, including researchers, practitioners, policymakers, community members, and other relevant actors. This diversity facilitates the integration of different perspectives, knowledge, and skills, fostering a holistic approach to problem-solving.

Sabine et al. (2013), provided an overview of IPs, their purpose, benefits, and constraints. Innovation platforms IPs bring together diverse stakeholders to address common problems and achieve shared goals, fostering dialogue, understanding, and mutual trust. They enable the identification of bottlenecks and the development of solutions beyond what individual actors can achieve alone. The research highlights the flexibility and adaptability of IPs, which can shift their focus, membership, and responsibilities over time. While IPs offer various benefits, including enhanced communication, capacity development, and impact, the research also acknowledges potential constraints, such as the need for full member buy-in, long-term perspective, and challenges in monitoring and evaluation. The series of briefs on IPs aim to guide the design and implementation of these platforms, drawing on experiences from various CGIAR centers and partner organizations.

Catherine et al. (2013), studied a conceptual framework that explore the role of IPs in fostering co-evolutionary innovation processes in sub-Saharan Africa. They explained that the agricultural innovation systems approach emphasizes the collective nature of innovation and the alignment of technical, social, institutional, and organizational dimensions. IPs are seen as intermediaries that connect different actors in innovation systems to enhance co-evolution. The study reveals that co-evolution is a dynamic process with interactional tensions and unexpected effects. The distributed nature of intermediation helps resolve tensions at different actor interfaces. However, platforms may struggle to adapt to emerging issues, highlighting the need for mechanisms that strengthen feedback, learning, and adaptive management within innovation processes.

Martey et al. (2014) conducted a study that aims to understand the factors influencing smallholder rice farmers' willingness to participate in IPs in northern Ghana. The research identifies factors such as the age and income of the household head, along with household size, as significant determinants of participation. The Probit model and Kendall's coefficient of concordance were used to analyze the data collected from 250 farmers. Their

findings suggest that targeting income-earning and younger household heads, along with locating platforms closer to smallholder farmers, could encourage participation and enhance the effectiveness of IPs as a strategy for technology dissemination and validation in Ghana.

The study conducted by Marc et al. (2015) provided a critical reflection on the implementation and institutionalization of IPs in agricultural research for development (AR4D) programs. IPs are seen as a promising vehicle to foster a paradigm shift by facilitating interaction, negotiation, and collective action between diverse stakeholders. However, the study highlighted that successful IP implementation requires institutional change within AR4D establishments. The experiences from sub-Saharan Africa are used to demonstrate how the adoption and adaptation of IPs create both opportunities and challenges that influence platform performance and impact. Niche-regime theory is employed to understand these challenges and anticipate potential solutions. The study raised concerns about whether IPs genuinely challenge or reinforce existing technology-oriented agricultural innovation paradigms. Factors such as stakeholder representation, facilitation, and institutional embedding are critical in determining the IP's ability to strengthen systemic capacity for innovation and bring about a real paradigm shift. The transition from technology-oriented to system-oriented AR4D approaches necessitates structural changes in mandates, incentives, procedures, funding, and capacity development.

Alexandra et al. (2018) utilized a community of practice (CoP) concept to design IPs, creating a space for interactive learning and active participation of smallholder farmers in the innovation process. The article presents examples from Ethiopia, Mozambique, and Tunisia, analyzing the level of farmers' participation at different stages of the implementation process, including setting up the CoP, identifying innovation needs, and conducting experiments. Strategies such as working with dialogue groups, engaging farmers in data interpretation, and involving farmers in the research process proved effective in strengthening farmers' involvement. Additionally, the use of a simulation game to test innovations showed promising results. The researchers' attitude was found to be crucial in achieving a high level of farmers' engagement in the project.

Jocelyn et al. (2018) did a case study that analyzes the effectiveness of nine IPs established in West and Central Africa, focusing on dairy, crop, and meat value chains, and mixed crop-livestock production systems or seed systems. The findings reveal that the IPs facilitated stronger market connections and value chains, with the most prevalent changes observed in farm productivity and technical knowledge of producers. Some IPs evolved structures like producer collectives, filling institutional gaps. However, the impact on deeper-level institutions influencing agricultural systems and food security was modest, limiting the potential for scale. Transformative changes were observed in research and development organizations, but these were less common. The study emphasizes the role of social capital as a prime mediator for change and suggests that equal attention should be given to pathways through markets, institutions, and innovation capacity to enhance the impact of IPs. Factors such as purposeful network-building, early diagnostic studies, and adaptive processes of critical reflection are highlighted as important for increasing the effectiveness of IPs.

Chebotarev (2019) highlighted five Open Innovation Platforms (OIPs) in different regions of Europe. Each region has unique strengths and challenges, but all possess natural resources and a foundation for developing bioeconomy strategies. Key factors for success include collaboration between educational institutions, research and development units, businesses, and local authorities, along with effective promotion, investment, and infrastructure improvements. The project shed light on potential synergies and complementary aspects between the regional bio-economies and concluded the importance of contributing to a broader vision of a sustainable EU-wide bioeconomy.

Eidt et al. (2020) examined how power dynamics can impact and be influenced by participatory agricultural innovation initiatives. The findings revealed significant disparities in access to and control over platform resources between smallholder farmers and other stakeholder groups, resulting in asymmetries that may increase the risk of agricultural intervention and further marginalize disempowered groups. The article emphasized the need to understand the institutional contexts that shape power dynamics within AIS and the complexities of promoting transformational innovation in such contexts.

Matilda et al. (2020) evaluated the impact of a multi-stakeholder IP approach on smallholder rice farmers' marketing decisions in Homa-Bay County, Kenya. The research focused on how the adoption of the System of Rice Intensification (SRI) and the presence of IPs influence farmers' market participation and channel choices. The findings revealed that the practice of SRI, membership in farmer groups, access to extension services, distance to markets, and transportation facilities are important determinants of market participation. Additionally, factors such as land size under rice cultivation, access to transportation, and collective or individual selling influence farmers' choice of marketing channels. The study concluded that multi-stakeholder IPs improve farmers' decision-making regarding market participation and recommends that governments embrace these platforms to enhance farmer engagement in rice markets.

Peter et al. (2022) conducted a study that examines the effectiveness of IPs in catalyzing the adoption of Conservation Agriculture-based Sustainable Intensification (CASI) among smallholder farmers in South Asia. CASI is a package of practices aimed at improving farm productivity and profitability while enhancing sustainability. The establishment of 37 village-level and five district-level IPs across the Eastern Gangetic Plains of Nepal, Bangladesh, and India facilitated the widespread uptake of CASI practices. The IPs empowered smallholder farmers, input and output suppliers, and improved the efficiency of extension systems. The study found variability across locations, with different modes of IPs established, building on existing farmer or community youth groups, and enabling micro-entrepreneurial opportunities. IPs were successful in building trust, empowering rural youth and women, and fostering direct engagement. Ensuring strong ownership and providing high-level policy support are recommended to enhance the impact of IPs and facilitate large-scale adoption of CASI practices.

Justina et al. (2023) conducted a study that examines the role of IPs in promoting interactions and innovative performance within Ghana's cocoa sub-sector, which is crucial to the country's

economy. Qualitative data collection tools were employed to gather in-depth information on the roles and linkages between different actors in the cocoa innovation system. The findings, analyzed through thematic and social network analysis, highlight the importance of stimulating the participation of farmer groups, actors in research, extension, policy, and the private sector. These actors have the power to attract and sustain relevant stakeholders in the network, contributing to the structure and success of the cocoa innovation platform.

The effectiveness IPs in enhancing wheat production and contributing to food security in Sudan were evaluated by Izzat et al. (2020). Six community-based IPs were established in four states, implementing activities such as technology demonstration, seed production, capacity strengthening, and field days. The IPs facilitated the establishment of 440 farmer-managed demonstration plots, with yields ranging from 6.0-8.0 t/ha in some fields and an average yield of 3.8 t/ha across all IPs, surpassing the national average of 2.3 t/ha. The IPs also conducted 31 training courses, reaching over 2000 trainees, and produced and distributed thousands of tons of seeds to seed producers and farmers. The raised awareness of improved varieties led to an increased demand for quality seeds, and the IPs directly reached over 15,700 stakeholders. The IPs successfully engaged all stakeholders and brought about changes in their attitudes. The IP concept was adopted for technology dissemination and enhancing interactions among stakeholders for various crops in Sudan, contributing to increased national wheat production and productivity.

Knowledge Exchange and Co-learning:

A central characteristic of IPs is their emphasis on knowledge sharing and collective learning. They provide a platform for stakeholders to exchange experiences, best practices, and expertise, encouraging the co-creation of innovative solutions. This knowledge exchange cuts across disciplinary and sectoral boundaries, promoting a more comprehensive understanding of the issue at hand.

Sidi et al. (2015) analyzed the requirements for improving the competence and skills of actors within IPs in agricultural value chains, food systems, and natural resource management. The case studies of IPs in maize and cassava value chains in West and Central Africa showcased significant increases in yields and incomes, along with enhanced inter-actor relationships and behavioral change. The paper emphasized the importance of capacity development interventions, including learning workshops, competence and skill training, and coaching for facilitators and practitioners, to effectively facilitate IPs. The study concluded that IPs require practicable tools that can be visualized and applied by actors to observe, recreate, test, and perfect the IP process and value chain approach, ultimately enhancing their impact on agricultural technology dissemination and adoption.

Susan et al. (2015) provided a paper about the role of small-scale farmers in the global food system and the importance of nurturing their capacity to innovate. Small-scale farmers, often vulnerable and food insecure, possess the ability to innovate and adapt their management practices to suit changing local conditions. By recognizing their active roles in innovation and bridging scientific and local knowledge systems, synergy can be created between small-scale farmers and formal agricultural innovation systems. The paper emphasized that national

innovation strategies that reflect the realities of small-scale farmer innovation systems may be more effective in promoting diversity, enhancing resilience, and contributing to food security. Aligning public policy incentives with farmers' motivations can encourage innovation that yields public benefits and supports a more resilient global food system.

Mekasha et al. (2018) conducted research that describes an innovative partnership aimed at increasing chickpea productivity by improving access to quality seed and technology dissemination. The partnership, which lasted for ten years, focused on Farmers' Participatory Variety Selection (FPVS) as the epicenter of its efforts. FPVS involved farmers selecting varieties, which were then demonstrated and visited by other farmers and stakeholders. This was coupled with the establishment of Farmers' Seed Producer Associations, which addressed the gap in the formal sector by producing and marketing quality seed. The interventions led to a doubling of national chickpea productivity over a decade, reaching a peak of 1.9 tons per hectare in 2014. Additionally, chickpea production in 2015 was 124% higher compared to 2006, reflecting the drastic increase attributed to the partnership's efforts. The successful approach gained recognition from development parties and government policy, underscoring its significance in enhancing the chickpea sector.

Edmond et al. (2019) studied the effectiveness of IPs in enhancing the impact of agricultural research and the scaling of innovations. The study's findings concluded that a combination of two approaches, the innovation process (a linear, short-term problem-solving approach) and the network-building process (a multi-level, transdisciplinary approach), can be effective in scaling innovations. By employing these strategies, the IPs contributed to increased revenues for farmers. Additionally, the alignment of the platforms' activities with political agendas and the consideration of the existing conducive context were found to be critical factors in the scaling process.

Mikinay et al. (2020) discussed the role of research for development (R4D) projects and revealed that R4D increasingly engage in multi-stakeholder IPs as an innovation methodology, but there is limited knowledge of how the IP methodology spreads from one context to another. That is, how experimentation with an IP approach in one context leads to it being successfully replicated in other contexts. To inspire development actors to consider the fit of an innovation methodology for a context, following work on anchoring for scaling, we developed a framework for networking-, methodological, and institutional anchoring and applied it to a R4D IP to test the value of such an anchoring approach for understanding the scaling of innovation methodologies such as IP. the researchers selected a R4D project with a Farmer Research Group-Innovation Platform in Ethiopia, whose technical output and methodological approach were greatly appreciated by the actors involved. Using the anchoring framework, the executed or non-executed tasks were identified. Besides, the embedding of the methodological experiment the potential up-scaling and out scaling were systematically analyzed. The analysis yielded the strengths and weaknesses of the anchoring work done so far to scale the innovation methodology used and provided concrete suggestions of how to proceed if an innovation project considers ‘going to scale’. The researchers recommended R4D projects to valorize their work and pay more explicit attention to anchoring. With a flexible, multi-pronged anchoring approach and continuous scanning of

the progress made in context, more R4D projects and their associated innovation methodologies can 'go to scale'.

Zelalem et al. (2020) conducted research on a case study that examines the effectiveness of multi-level IPs in stimulating sustainable smallholder livestock innovations in the Ethiopian Highlands. The objective was to understand if IPs could facilitate innovations beyond their lifetime and link issues across multiple scales. The study was conducted two years after the IPs were phased out. The findings indicated that interconnected IPs across scales facilitated researcher-led technical innovations, enhancing farmers' and livestock experts' capacity regarding feed technologies. The multi-level IPs also improved linkages and partnerships between actors, supporting the implementation of farm-level technologies. However, for sustained innovation, the authors emphasized the need to create a shared understanding among actors of the complex value chain issues, specifically addressing farmers' lack of access to affordable services. Integrating value chain concepts within multi-level IPs early on is recommended to engage relevant actors and stimulate interventions beyond the farm level.
The study highlighted the significance of organizational changes to reconfigure resources and devolve responsibilities to support innovation. Additionally, power dynamics and institutional contexts favoring the status quo are critical factors to consider when building and evaluating effective multi-level IPs for inclusive value chain innovations in smallholder agriculture.

Sector or Theme Specific: IPs often focus on a specific sector, such as agriculture, health, or energy, or they may revolve around a particular theme or challenge, like climate change, digital transformation, or sustainable development. This focused approach allows for a deep exploration of the unique dynamics and needs within that domain.

Joachim (2010) conducted a study that analyzes the impact of the integrated agricultural research for development approach (IAR4D) on household welfare in the Sahel agro-ecological zone in central eastern Niger. The research simulates the adoption of different innovation packages promoted within IPs and their effect on household income and poverty status. The study found that the adoption of these packages positively influenced household per capita expenditure and reduced the likelihood of falling below the poverty threshold. The average income increases for IAR4D households ranged from $91-$210 higher than non-IAR4D households, depending on the scenario. The findings confirm the potential of productivity-enhancing agricultural innovations to contribute to income growth, poverty alleviation, and food security in developing countries.

Marc et al. (2013) explored the integration of systems approaches to innovation within crop protection literature. Their analysis reveals that only a small portion of the literature adopts a systems-oriented perspective, with the majority favoring a technology-oriented approach. While crop protection is addressed in the agricultural innovation systems literature, the review highlighted that the potential of systems approaches for crop protection innovation remains largely untapped. Many publications focus on cropping or farming 'systems', while 'innovation' is often equated with technology development, transfer, adoption, and diffusion at the farm level. There is limited attention to the institutional and political dimensions of crop protection and the interactions between different levels of crop protection systems.

The traditional roles of researchers, extension personnel, and farmers are challenged to a certain extent, but most publications emphasized optimizing existing features of crop protection systems rather than exploring more structural transformations. The paper concluded that there is a need to further explore systems approaches to enhance the resilience of crop protection systems and address the complex interactions and dimensions involved.

Justus et al. (2014) conducted a study in Kenya's semi-arid lower Eastern region to understand the factors influencing decision-making among smallholder farmers to enhance farm productivity and food security. The region faces challenges due to declining agricultural productivity, and public-private partnership (PPP) initiatives have been implemented to address food insecurity. The study revealed that smallholder farmers faced difficulties in deciding how to improve their farm output, with 76% of key informants noting that promoted technologies often did not meet their immediate needs, and 65% stating that technologies were introduced without considering their circumstances.

The research concluded that farmers require accurate and diverse information to make informed decisions, and that development partners should play a role in providing comprehensive technology and innovation options. Additionally, it emphasized the importance of analyzing and understanding farmers' operating circumstances to ensure the promoted technologies are relevant and effective. The recommendations included providing adequate information through PPP meetings, exploiting the potential of existing partnerships, and developing strategies to improve smallholder farmers' access to suitable technologies and innovations, ultimately enhancing farm productivity and food security.

Kaleb Kelemu et al. (2014) conducted a study aimed at understanding the constraints of tree-crop-livestock farming systems in four sites of the Africa RISING project in Ethiopia. The research identified relevant institutions and gathered them to prioritize problems and consult on improving mixed farming systems in their respective areas. Data were collected from key informants using structured interviews, revealing that smallholders in the studied sites relied primarily on crop production, livestock, trees, and casual labor for their livelihoods. The study found limited efforts by existing institutions to promote integrated agricultural practices, highlighting the need for intervention programs that improve technologies and agricultural practices while also creating awareness and providing knowledge-based training for farmers and extension workers. Modalities for establishing effective IPs were devised, recognizing the potential for collaboration among various stakeholders involved in agricultural development activities. The IPs are crucial for strengthening existing partnerships and building new ones, fostering information sharing, joint planning, and adaptive management in innovation processes. The study recommends establishing IPs at the Woreda level, with innovation networks at the Kebel level, to address current and future challenges in the farming systems.

Ning et al. (2016) shed light on a research project that aims to address the shortage of analysis and research on wheat farmers' current nutritional status and disease diagnosis. The project proposes the design and establishment of a wheat nutrition diagnosis platform based on image processing techniques. The framework, business processes, and data management systems are developed to create a complex data warehouse model. The platform is applied in

Changge, Henan province, and the core applications and key technologies are explored, offering insights into the practical implementation of the wheat nutrition diagnosis system.

Shambu (2016) explored the concept of transformative social innovation in agriculture, specifically focusing on the case of agroecological innovation known as the System of Rice Intensification (SRI) in India. Social innovation theory, which emphasized the roles of social movements and the engagement of vulnerable populations, is utilized to understand this innovation. India has a rich tradition of social innovation where vulnerable communities collectively experiment and drive change. The author argues that social innovations like SRI can recreate possibilities for transformation outside the mainstream, leveraging the opportunities presented by networks in the 21st century. Local and international networks led by Civil Society Organizations have reinterpreted macrotrends in agriculture, offering an alternative paradigm for sustainable transitions. However, these social innovations face opposition from established actors in agricultural research systems. The emergence of heterogeneous networks, as seen in SRI, provides researchers within hierarchical systems new opportunities to engage with Civil Society Organizations and farmers, fostering experimentation and the creation of new norms. The text emphasizes the importance of valuing and embedding diversity in practices and institutions to enhance the resilience and adaptability of systems undergoing sustainable transitions.

Niggli et al. (2016) provided an overview of the potential and challenges faced by organic agriculture on a global scale. Organic farming offers the promise of sustainable, healthy, and ecologically sound food production, but it needs to address challenges to fully realize its potential. The Technology IP of IFOAM-Organics International (TIPI) has developed a vision and agenda to advance organic agriculture through research, development, innovation, and technology transfer. TIPI's vision emphasizes the limitations of conventional agriculture's heavy reliance on external inputs and proposes a shift towards ecosystem services and sustainable technologies. The platform identifies three pathways for innovation: empowering rural areas, practicing eco-functional intensification, and producing food for health and well-being. TIPI calls for the engagement of diverse stakeholders in a multi-disciplinary approach to innovation, seeking to build capacity and overcome barriers. The article concludes by urging the organic community to support TIPI's 17-point action plan, promoting a forward-thinking and innovative approach to organic agriculture.

Urs et al. (2017) revealed the study of the Technology IP of IFOAM-Organics International (TIPI), which aims to advance organic farming practices and address production challenges. Organic food and farming systems have the potential to provide healthy and sustainable food, but they face adoption barriers due to insufficient capacity in research, development, and technology transfer. TIPI advocates for three main pathways to develop compatible technologies: empowering rural areas, practicing eco-functional intensification, and producing food for health and well-being. The platform identified three strategies to build capacity: developing appropriate research methods, renewing partnerships between diverse stakeholders, and integrating technological, social, and ecological dimensions of innovation. By following these pathways, TIPI aims to unlock the potential of organic food and farming systems to contribute to sustainable and healthy food production.

André et al. (2017) introduced an article that discusses the challenges faced by small-scale irrigation systems, which are often characterized by low yields and deteriorating infrastructure. The interventions typically focus on yield increases and infrastructure rehabilitation, neglecting the complex socio-ecological nature of these systems. The article proposes the use of Agricultural IPs to create an environment where actors within the irrigation schemes can engage, experiment, learn, and build adaptive capacity. By facilitating interaction and knowledge sharing, the platforms aim to enhance market-related offtake and improve the livelihoods of those involved, ultimately helping them move out of poverty.

Magala et al. (2018) summarized the adoption of agricultural innovation systems thinking in research and development to harness actor innovative capabilities, enhance knowledge, and drive social transformation. IPs have gained recognition as a viable approach to stimulating the development of agricultural enterprises due to their focus on value chain development and networking. Key findings included the exclusion of stakeholders, unclear management and financing mechanisms, and weak governance structures. To enhance the legitimacy of IPs, the research proposed a formation model comprising actor identification and mobilization, vision and strategy formulation, IP culture development, and robust governance structures. These components are crucial for addressing the gaps and forming vibrant and effective IPs.

Rahma et al. (2018) introduced article about a case study of the success factors of Agricultural Innovation Platforms (AIPs) in Rwanda, specifically focusing on their contribution to gender mainstreaming and equitable benefit-sharing. The study documented two successful AIPs out of nine studied, exploring the social, policy, and capacity factors that enable gender equality in the marketing and selling of crops. The article provided insights into how policy and social factors are operationalized within the AIPs, how they utilize policy mechanisms, and how AIP processes integrate with local social norms and capital. The findings offered valuable lessons for understanding the conditions necessary for successful AIPs and their impact on gender dynamics in patriarchal societies.

Marc et al. (2018) provided a critical evaluation of IPs as a mechanism for technology dissemination and scaling in agricultural research for development (AR4D) programs. While IPs have been widely adopted and are known to generate enthusiasm by bringing together stakeholders to address specific problems, the study questions their effectiveness in achieving impact at a larger scale. The research evaluates the success factors of eight mature IPs across three continents and concludes that pockets of success and local impact are common, but achieving impact at a higher scale remains rare. The analysis highlights the importance of demand-driven, participatory, and collectively invested IP processes, which can lead to technically sound and locally adapted innovations. Additionally, embedding IPs within broader extension mechanisms and networks can facilitate the scaling of innovations beyond the original scope of the IP. The study calls for more rigorous measurement of IP performance to enable adaptive management, improve process design, and facilitate cost-benefit analyses compared to alternative approaches in agricultural development.

Kostapanos and Oleg (2022), in their article that focuses on a unique type of platform business model, known as a platform for the common good, which aims to maximize social impact rather than profit. The article proposes a Causal Loop Diagram (CLD) model to explain the value creation process within such platforms. The model maps out the strategic feedback loops that form the core structure of the platform, illustrating its growth and performance over time. The article finds that multiple types of network effects create interlocking, reinforcing feedback loops, contributing to the platform's overall performance. The article offers insights for social entrepreneurs and managers seeking to understand and optimize platforms that maximize social value. By leveraging the critical feedback loops identified in the CLD model, social entrepreneurs can enhance the impact of their platforms and managers can make more informed decisions about participating in such platforms.

Elrashid (2023) evaluated the impacts of IPs on the adoption of recommended wheat-farming packages and yield enhancement in Sudan. Using data from 532 wheat farmers, the study analyzed the determinants of adoption and yield impact through various regression models. The results showed that farmers' participation in IPs significantly influenced their adoption of recommended practices. Farm-related factors, such as farm area and access to services, were found to be the main determinants of area allocation under the package. In contrast, both technology-related and marketing factors influenced yield, with an average increase of 0.99 ton/ha across the River Nile, Northern, Gezira, and Kassala states. The policy implication of the study urges the use of IPs as an effective technology transfer approach to enhance wheat production in Sudan.

Innovation Facilitation

IPs create an environment conducive to innovation by encouraging experimentation, testing, and the co-creation of new solutions, technologies, or business models. They provide a space where stakeholders can explore and develop novel ideas, building on each other's strengths and insights.

Amede and Sanginga (2014) provided a paper that examined the potential role of IPs in facilitating the adoption and scaling up of Sustainable Land Management (SLM) practices in East Africa, particularly in Ethiopia and Uganda. Land degradation in the region has significantly impacted food security, livelihoods, and environmental services. IPs are presented as a holistic approach, bringing together diverse actors to enhance interaction, coordination, and behavioral changes. The paper analyzes the effectiveness of IPs in solving complex issues like SLM and their potential to enable local actors to manage natural resources effectively. The study also explored the incentives required to engage individuals and organizations actively and successfully in IPs, contributing to their potential for scaling up local successes, improving market opportunities, and influencing policies related to natural resource management.

Dominique et al. (2018) conducted a research program in Benin, Ghana, and Mali, with a focus on improving the institutional context for smallholder farm development in West Africa. The program utilized IPs to engage in open-ended experimental action, aiming to bring about change at the level of institutional regimes covering specific agricultural domains. The IPs sought to remove, bypass, or modify domain-specific institutional constraints and create new

conditions to empower smallholders. The outcomes provide insights into the potential for IPs to facilitate institutional change and improve smallholder farm development in the region.

Mila et al. (2018) provided a summary of a project in Ethiopia that established an IP as a tool for co-creation and innovation systems development. The IP's results are encouraging, indicating positive effects on yields and, more importantly, on the capacity and role of participants as communicators and agents of change within their community. The establishment of the IP facilitated the creation of new networks and modes of communication. Effective facilitation, commitment from all members, and feedback loops were identified as essential factors for the IP's success and sustainability.

Shinan et al. (2019) conducted a study that critically examines the role of innovation platforms (IPs) in agricultural research for development projects. The study showed that IPs are touted as a popular mechanism for facilitating stakeholder collaboration and negotiation. The study emphasizes the importance of appraising when and why IPs are an appropriate mechanism for achieving development outcomes. The review highlights that not all constraints require IPs, and simpler, more cost-effective alternatives should be considered first. The study provides a decision-support tool for research, development, and funding agencies to enhance critical thinking about the purposes and conditions under which IPs can effectively contribute to agricultural development. By considering the design principles and plausible outcomes of IPs, the tool aims to ensure that IPs are utilized efficiently and in the most suitable contexts, avoiding the potential pitfall of promoting IPs as a panacea for all agricultural sector challenges.

Robert (2019) revealed the importance of developing new plant genotypes to adapt agriculture to the changing climate. It highlights how modified environments, such as protected agriculture, may require significantly different genotypes for successful plant performance. Despite the challenges posed by climate change, consumers will continue to demand tasty, convenient, healthy, safe, and sustainably produced food. The research also emphasizes the challenge of improving the nutritional value of foods in a changing climate. To enable this innovation, a thorough understanding of relevant germplasm and the functional roles of alleles controlling key traits is crucial. Genomic sequences provide a foundation for this, offering the potential to develop plant varieties that can thrive in new environments while also meeting consumer demands and enhancing nutritional value.

Edvardsson and Tronvoll (2020) provided an overview of the role of IPs in facilitating service innovations, which are crucial for firms to stay competitive in service-driven economies. Service innovations can take various forms, from adding new services to existing offerings to technology-enabled solutions. IPs serve as a mechanism to coordinate and manage collaboration with external partners, customers, and experts, ultimately fueling business renewal. The article distinguishes between a service platform, which refers to how value is created and offered by an ongoing business, and an innovation platform, which focuses on creating, testing, and launching innovative services. The example of IKEA's Space 10 innovation platform is highlighted, where they collaborate with diverse specialists and creatives to design and test sustainable ways of living. The efficiency and effectiveness of innovative champions,

such as Elon Musk, Steve Jobs, and Jeff Bezos, are enhanced through IPs that provide access to resources, enable service production methods, facilitate secure payments, and improve transportation services. The framework developed by Edvardsson and Tronvoll is utilized to understand how IPs orchestrate collaboration among multiple actors in service innovation efforts. The article emphasizes the importance of IPs in fostering multiple service innovations and enhancing firms' competitive advantage.

Erin et al. (2021) highlighted the crucial role of small farms, especially those operated by women and marginalized groups, in global food security. Despite their significant contribution to food production, small farms faced numerous challenges, including access to information, inputs, capital, and markets. The review aimed to address the unique gender considerations when scaling agricultural innovations to ensure equitable outcomes. It identified six key areas: research team composition, innovation design, communication strategies, scale models, technology adaptation, and engagement with the political economy. Practical methods for collecting data on these considerations were also presented to avoid unintended negative consequences and promote gender-responsible scaling.

Bryan et al. (2022) studied the emerging concept of digital agriculture, which is expected to bring transformative innovation to food and agriculture sectors. The study aims to provide conceptual clarity and establish a common vocabulary for understanding the varied technologies and application areas within the dynamic domain of digital agriculture. Digital agriculture leverages big data to enhance the entire research and development pipeline across agricultural value chains. However, challenges related to data quality, interoperability, intellectual property ownership, and data privacy are noted. Digital agriculture platforms are introduced as a potential solution, facilitating data sharing, analysis, and collaboration. The paper employed a "bottom-up" and "top-down" analysis to develop a taxonomy of the digital agriculture landscape and selects specific platforms for in-depth technical and use-case analysis.

Sarah et al. (2023) conducted a research assessment of the impact of an IP in Terbol Station on Lebanon's wheat seed sector. Data collected from seed producers revealed that the IP played a crucial role in the sector's functionality and viability. The analysis highlights the importance of IP functions, such as incentives and joint planning among value chain members. The findings provide valuable insights for both theory and practice, indicating that integrating an IP with its various components positively influences the operational efficiency of the wheat seed sector. Effective mapping and identification of stakeholders are essential for the IP's success, as they facilitate knowledge sharing and contribute to food security goals. The study also emphasizes the need for agricultural guidance and policy support, particularly in the context of the economic crisis and the absence of certification and adoption frameworks. Strategic actions are proposed, including promoting sustainable farming practices, enhancing regulations, boosting investment in research and development, and engaging with the informal seed sector. Upgrading Terbol Station to a national innovation platform (NIP) is suggested, involving diverse partners and stakeholders to address complex challenges in agriculture and natural resource management.

2. Characterization of SIDS Station in Egypt

SIDS Agricultural Research Station is located 150 Kms south of Cairo. It is considered one of the first research station established in Upper Egypt to serve agriculture and farmers in Middle and Upper Egypt through scientific research and agricultural, inducing a revolution in developing varieties and hybrids of strategic crops, namely wheat, corn, cotton and legumes, in addition to playing an important role in developing varieties that are tolerant to high temperature, drought, salinity besides the prevailing climate conditions in Upper Egypt. It is worth mentioning that SIDS is one of the four largest field crops research stations engaged in Agricultural Research Center nationwide.

Station characteristics

First: Functions of innovation platforms (Ips)

IPs can be classified according to their core intended objectives/functions, including innovations relating to technology, capacity development, organization, policy, institutional governance, in addition to a combination of two or more of these innovation dimensions. Therefore, IP functions are subject to the context of each agricultural innovation system as an entry point. The following is a description of SIDS station:

1- **SIDS Research Station is established over 362 acres of which** 282 acres are allocated for applied research and seed propagation of different varieties, 80 acres allocated for facilities, administration buildings, rest houses, housing for expatriates, specialists and employees, a garage for agricultural equipment, machinery and tractors, and storehouses for crops and agricultural production requirements.

There are two sifting facilities at SIDS. The first is for preparing and sifting breeder and foundation seeds, and is affiliated to the Agricultural Research Center, with an operational capacity of 50 tons/day. The second is affiliated to the Central Administration for Seed Production (CASP) and specializes in screening and preparing approved seeds on a total area of 4 acres.

2- **In addition, there is a clave fattening station**, with a capacity of 1,000 heads, established in partnership with Misr Al Khair Foundation.

Second: Station objectives

SIDS Agricultural Research Station aims to conduct applied research and studies in the following areas:

- Increasing the productivity of major field crops by developing high-yielding varieties that are resistant to diseases and climate challenges.
- Production of approved base seeds for improved varieties of various crops, especially wheat.
- Maximizing the return of land and water units,
- Plant nutrition research to improve productivity,
- Integrated management of land and water and improving their productivity,
- Finding solutions to agricultural obstacles in the Middle Egypt region,
- Providing farmers with the most important technical recommendations to maximize productivity,
- Implementing the work of the national campaign in Beni Suef Governorate and the Middle Egypt region,
- Implementing international and local training courses in various scientific fields,
- Training agricultural undergraduates in the fields of improving plant and animal production

Third: Technical/technology Aspects: IPs can help members develop and test specific (new) technologies, for example, new varieties of wheat, maize, sorghum, soya bean and cotton, in addition to producing cheap, unconventional fodder from Azolla. The branch of CASP in the station and the Farm Production sector are the main tools responsible for technical aspects in the station. The Following is the characterization of the two tools:

1- **The Central Administration for Seed Production (CASP).** As previously mentioned, CASP has a sifting and preparation unit for certified seeds at SIDS station. The Table below describes the main characteristic of this unit.

Table 1. Description of SIDS Station's Sifting Unit

Item	Description
Establishment Date	In the year, 1990
Station area	4 acres

Storage capacity	5250 tons
Production capacity of the station	100 tons / day
Quantity stored during the 2023 season	7211 tons
Quantity sifted to date	4750 tons
Area covered by seeds	120 thousand acres
Seed Varieties sifted at the station	Wheat - Faba beans - soybeans - maize - sorghum
Number of silos	8
Storage capacity per silo	250 tons
Total storage capacity of silos	2000 tons

Source: SIDS station (2024).

2- Farm production sector

Area and crops grown:

SIDS Farm, affiliated to the production sector, provides seeds and seedlings to farmers in the region. Total area of the farm is about 389 acres, distributed as follows:

- 70 acres for growing medicinal and aromatic plants,
- 44 acres for growing citrus farms,
- 265 acres for growing field crops (110 acres for soybeans - 130 acres for maize - 10 acres for cotton - 12 acres for sugary corn),
- One acre animal production station for about 100 buffalos,
- The remaining area, around 8 acres, is dedicated for buildings, facilities, roads, drains, and drainage, administrative building (2 rest rooms - 7 administrative housing units).

3- SIDS station for mechanized agriculture

Table 2. SIDS Station and mechanized agriculture

Item	Number	Description
Station area	13600 acres	It has departments: operation, maintenance, administrative affairs,

		warehouse, treasury, and industrial security.
Area served by the station	10,000 acres	Plowing, laser leveling, planting grains, baling hay, harvesting wheat, softening the soil, and clearing canals and waterways.
Equipment owned by the Station	15 Equipment	From 29 up to 180 Horsepower.
Number of attached machines	39 machines	Plows, harrows, harrows, mowers, presses, laser devices, hoeing and smoothing machines, harvesting companies.
Number of employees at the station	39	Different staff categories

Source: SIDS station (2024).

Fourth: Capacity development

IPs can help enhance the capacity of various stakeholders to learn, self-organize and innovate, as well as nurture members' skills regarding entrepreneurship, representation, coordination and communication. The station is distinguished by the presence of large assets that help it to be a major source of training and capacity building, for example, it has good assets such as administrative buildings, Foundation and breeder seed screening unit, Mechanized service unit, Ammonia injection unit, 5 buildings with 20 residential apartments for expatriates and 2 residential villas, one rest house with a capacity of 16 beds, Sawmills for drying corn seeds, leguminous crops, and others.

Specialized employees at the station, who can be classified as 9 Chief of research, 6 senior researchers, 5 researchers, 17 full-time Chiefs of research, 3 assistant researchers and 10 research assistants. These staff members work at various research institutes, including Field Crops Research Institute, Cotton Research Institute, Land, Water and Environment Research Institute, Agricultural Engineering Research Institute, Plant Diseases Research Institute, Plant Protection Research Institute, Agricultural Extension Research Institute and the Central Laboratory for Weeds. **The managerial staff includes** 11 agronomists, 99 technicians (engineering, agricultural and administrative), in addition to 22 workers (guards, drivers,

support services and security). Furthermore, **A vast area for cultivation,** for example, cultivated areas during the summer season of 2023 are 133 acres of soybeans (research and multiplication programs), 106 acres of maize (research and multiplication programs), as well as 40 acres to implement research programs for various institutes.

Fifth: Policy development

Involving policy advocates and decision makers in an Innovation Platform is a way to sensitize effectively about policy gaps and generate evidence. However, SIDS station is working within the framework of the policy followed in seed production as one of the research stations affiliated with the Central Administration of Research and Experiment Stations.

The Central Administration for Seed Production design the policy of production for seeds selection that focus on locally produced and protect crops from pests, develop high-quality and productive agricultural strains and varieties, and reduce the cost of imports.

To implement the selected seed policy, a medium-term plan was drawn up that end by 2025/2026, which includes preparing a variety map for each agricultural crop, topped by strategic agricultural crops, starting with seed needs according to crops and the areas targeted for cultivation for each crop, supported by implementation mechanisms with a specific time plan. As well as developing new strains to produce distinct, highly productive varieties capable of adapting to climatic changes, linking farmers' requirements in terms of high early yields, quality characteristics and the tastes of the Egyptian consumer.

According to the plan, programs to expand the production of approved seeds for strategic crops (wheat, maize, cotton, soybeans, and sunflowers) aim to increase the coverage percentage of approved seeds for wheat cultivation and increase the area of seeds selected for cultivation.

Assessment of innovation platform (Ip)

The main purpose of IP assessment is based on its contributions of participatory action research and outcome-oriented research, in addition to sustaining them due to finance capabilities, particularly in the long-term impacts for beneficiaries. The effective monitoring, evaluation, and learning (MEL) system is needed to ensure that IP functions well, according to participants, achieves their goals, and generate lessons for future scaling. IP (SIDS station) has usually monitored and evaluated their activities and outputs and prepared an annual traditional report to the Agricultural Research Center (ARC).

Currently, the ARC is planning to reform the station structure in addition to being an innovation platform, to play an extension role in transferring innovations and applied research results to farmers, as field experiments were carried out in the current agricultural season (in

cooperation with ICARDA) in the field of developing on farm surface irrigation of the SIDS station, as well as in the farmers' fields themselves. Carrying out this extension role requires developing the station's work plan by establishing the station's board of directors (the alliance) that will include researchers, farmers, extensionists, the general manager of the agricultural administration in the governorate, the private sector (seed traders and agricultural commodity traders), in addition to local experts and ICARDA experts.

The work plan of the station is going to establish the board station (Alliance) that will include researchers, farmers, extensionists, the general director of agricultural management governorate, private sector, (seed traders and agricultural commodities traders), in addition to local and ICARDA experts. The initiative leader for this Alliance is the ARC.

The main role of this board is to participate in diagnosis of the problems in the station area and prepare the executive plan based on alternative ways to solve these problems. The plan will adopt the theory of change and determine the main drivers, in addition to establishing the system of MLE. The expected results of participatory diagnosis adoption and setting a clear theory of change will identify the changes they anticipate to cause as a result of the IP; establish indicators to track IP performance over time, including innovation activities; clarify who will design and participate in the innovation process; agree on what to do about emerging results; implement collaborative learning processes among members and decide collectively on how IP members will assess the overall effectiveness of the multistakeholder process.

Indicators for monitoring and evaluation

Three aspects of an IP can be monitored and evaluated. These are activities, process changes, and results generated by the IP for beneficiary groups.

First: Activities

1- Carry out mechanical and chemical soil analysis, irrigation water analysis, identifies agricultural soil problems, and develops appropriate solutions to them through research programs. (The Laboratory of Land, Water and Environment Research).

2- Serve scientific research purposes by the improved seed production unit that contains several laboratories. (The laboratory of plant diseases research, The laboratory of land, water and environment research, The laboratory of cell and tissue culture research, and the laboratory of plant protection research).

3- Conduct breeding programs and treatments for all field crops; the station includes 10 research institutes represented by 22 research departments.

4- Produce certified seeds by agricultural research station, which is approximately 280 acres.

5- Prepare and screen seed in the preparation and screening unit.

6- Develop fruits and vegetables by the horticulture research unit that has an area of (50) acres.

7- Facilitate housing researchers and trainees during their work and conduct course training.

8- Conduct breeding programs and treatments for all field crops; the station includes 10 research institutes represented by 22 research departments, (The number of employees at the station is 366, including 66 researchers with various academic degrees).

9- Communicate with the farmers to solve their problems.

10- Launched a national campaign to promote crops, in which a demonstration field was established in every village through which recommendations were made to farmers and guided to how to save water by linking it to the economic return.

Second: Outputs

The main outputs of SIDS station are focusing in developing, producing and propagating seeds of many improved field crop varieties with high productivity, quality and resistance to diseases, the most important of which are:

1- Bread wheat varieties such as S1, S12, 13, 14, 15, 16.

2- Pasta wheat varieties such as Beni Suef 1, 3, 4, 5, 6, 7, 8.

3- Developing varieties of **long-staple Egyptian cotton** for Upper Egypt, such as (Giza 90, Giza 95, Giza 98)

4- Yellow and white maize hybrids with high yields, such as (white single hybrid 10 - 125 - 128, 130, 131, yellow single hybrid 168 - 176 - 178 - 183, white triple hybrid 310 - 311 - 314 - 321 – 324, and triple hybrid Yellow 352 - 353 - 368 - 369 and class Giza 2).

5- Faba bean varieties that are resistant to halo, with high productivity and cooking quality, such as Giza 843, and disease-resistant, with high productivity, which is one-sixth of 1, and Giza 716.

6- Egyptian clover varieties with high productivity and a long vegetative growth season, such as (Giza 6, Sas 1, Sas 2).

7- High-yielding green fodder sorghum hybrids, such as Hybrid 102.

8- Providing farmers in the region with improved, high-yielding seeds.

9- Produce crop varieties that mitigate the negative impact effects of climate changes.

10- Providing extension services to farmers to raise the level of productivity and help solve the problems facing farmers.

11- Implementing national campaigns for various crops at the level of the Beni Suef region and Central Egypt.

12- Field visits to farmers in the governorate.

13- Using Gaseous ammonia component as a successful alternative to nitrogen fertilizers.

14- Partnership and carried out experiments with ICARDA to:

- ✓ Produce wheat and legume crops seed varieties,
- ✓ Estimate and evaluate modern irrigation systems water needs with various modern irrigation methods.

15- Producing cheap, unconventional fodder from Azolla.

Third: Available seeds this year and revenues: This year there are

- Wheat seeds varieties (Sakha 95 - Giza 171 - Egypt 3 - 14 sixths).
- Faba bean seeds (Sakha 1 variety) are available for sale at the farm to the people of the region for the winter season within the quantities produced at the sector level.

Fourth: Financial position 2022/2023

• Revenues are 5,815,087 Egyptian pounds + 1,189,650 pounds of wheat supplied for seed production, as of 6/30/2023.

• Number of employees on the farm: 75 employees.

Table 3. Wheat seeds being prepared for sale

Item	Number of packages	Package capacity	Weight in tons	Total
Wheat	3300	30 kg	99000	822210 tons

Source: Own elaboration from filed data (2024).

Fifth: SIDS agronomic experiments

The CGIAR regional initiative F2R-CWANA aims to build resilient agrifood systems in the region, primed to withstand the effects of climate change and generate better livelihoods for rural communities. At its core, this Initiative serves to provide options for climate adaptation and mitigation that respond to and are effective for smallholder farmers in the region to scale up and seek out the best bet solutions. Among the activities of the F2R-CWANA initiative, Soil, Water, and Agronomy team (SWA) in ICARDA, in collaboration with ARC-Egypt, is conducting an on-station field experiment aiming to design and evaluate a group of integrated sustainable bundles of agronomic practices to improve the production of wheat-based system in Egypt.

This experiment started in the winter season of 2022/2023 and was carried out in the Sids Agriculture Research station of the Agriculture Research Center (ARC-Egypt), located in Bani Sweif governorate of Egypt, which represents local conditions of the agriculture systems in the old lands of the Nile Valley. The experiment included three levels of treatment (i) a comparison between three irrigation systems of drip irrigation, gated pipes irrigation vs. traditional surface system, and (ii) three method of crop establishment methods of broadcasting (Flat) planting, seed drilling plant, and raised beds.

As the experiment focuses on the wheat crop system, soybean is the summer crop investigated under the same experimental setup and treatments.

Other experiments are conducted aside from the main experiments to investigate several on-farm practices of (i) biofertilizers, (ii) Nitrogen fertilizers optimization and precision application, (iii) the effect of crop rotation on soil carbon, and (iv) minimum tillage.

Sixth: Other Useful Indicators

Table 4. Other useful indicators

Indicator	**Number**
1. Number of farmers visiting the station annually (i.e. demand from farmers).	120-150
2. Number of training / field visits organized annually.	15-20
3. Number of crop varieties cultivated and evaluated*	23
4. Number of seed or crop varieties taken up by the private sector (i.e., scaling) *.	23

5. Number of researchers visiting the station	50-60
6. Number of diverse participatory tests organized with farmers and consumers. (the intended days of a field or harvest)	10-15 visit days, in addition to
7. **National day;** with ICARDA for only winter crops (wheat, faba bean and chickpea)	1
8. Number of multi-stakeholder meetings on implementing partners (i.e. governance).	2-3
Number of farming/crop techniques developed by implementing partners (i.e. technologies):	
a. Cultivation of wheat, Faba bean, chickpeas and soybeans assessed by several farmers, researchers and those interested in agriculture	70-80
b. Modern Irrigation Methods**, (Surface irrigation, Drip irrigation and Gated pipes)	3 experiments
c. Raised Bed ***	1 in the station and 60 - 70 farmers
d. Biofertilizer***	1 in the station and 60 - 70 farmers
9. Number of multistakeholder meetings organized around the IP (i.e., governance).	2

Source: Own elaboration from field data (2024).

* Wheat, legumes (Faba bean, chickpea, lentils, fenugreek, Lupine, soya beans), feed crops (clover, feed beet, Fodder cowpea, Sorghum, Triticale plant, Millet) Maize, onion, Oil crops (sunflower, sesame, canola), cotton, sugar beets, green horticultural crops, fruit, medicinal plants and aromatic.

** (b) is applied in the station only.

*** (c) and (d) are performed in both in station - off station.

The evaluation result is the same and farmer has a higher yield compared in station. The application of raised bed technology at the farmer level has a problem that the raised machine is heavy and needs to tractor 85 Horsepower which is not available in most villages. As farmer said "Raise bed is saving energy and water by 7-13% compared to traditional one.

Main Problems in the Station

- Absence of periodic maintenance of laboratory equipment.
- Absence of an ambulance unit to rescue workers if they are injured while they are at the station for research work.
- Weak interest in educating or conducting courses to improve the standards of young researchers.
- Lack of media support. The station needs to communicate its recommendations and the additions it has reached to scientific research so that society can benefit.

3. Conclusion

This technical note reviewed roles of Innovation Platforms (IPs) in stimulating agricultural development in Egypt and characterize Sids Research Station for using it as a national Innovation platform for research and development. The literature reviews indicate that IPs offer great potential for a range of stakeholders to work together to find solutions for complex problems that need joint efforts. The IPs helped in facilitating innovations related to technology adoption, capacity development, organization, policy, institutional governance, and the integration of these dimensions. Contemporary tools of monitoring, evaluation, and learning (MEL) can be used to assess the IPs' contribution to these dimensions and generate lessons for future scaling of innovations. The characterization of Sids Research Station results shows that there is huge potential to upgrade the Research Station into National Innovation Platform (NIP) by engaging diverse partners and stakeholders to jointly identify their challenges and test their innovations to address complex challenges. For example, improved varieties of cereals and forages could be entry points to set up the Sids research station as a NIP in in the Egyptian farming context. The Agricultural Research Center (ARC) of Egypt can take the initiative to set up the NIP and lead the operational processes while engaging the various partners by forming an alliance of stakeholders.

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