Digitization and agricultural markets: a proposal for the San Martín region

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Digitalización y mercados agrícolas: una propuesta para la región San Martín

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ABSTRACT

Introduction: the study addressed the problem of the structural disconnect between agricultural producers in the San Martín region and potential markets, a situation that limited profitability and created high dependence on intermediaries. Given this reality, the design of a virtual platform was proposed to facilitate direct commercial coordination, improving the visibility of local supply and strengthening the economic inclusion of farmers.

Development: the research was based on a review of international, national, and local experiences that demonstrated the potential of digital platforms to optimize agricultural marketing processes. Cases were analyzed where digitization made it possible to shorten intermediation chains, strengthen partnerships, and expand access to high-value markets. The findings highlighted that, although technology improved the competitiveness and diversification of producers, its effectiveness depended on factors such as technological infrastructure, digital capabilities, and the existence of inclusive public policies. The analysis of the profile of producers, customers, and suppliers in San Martín made it possible to define the functional requirements of the platform, as well as its orientation towards a sustainable model adapted to the territorial and productive conditions of the region.

Conclusion: it was concluded that the design of a virtual platform was a catalyst for the transition of family farming in San Martín towards a more competitive and inclusive model. However, its success required the integration of training, infrastructure, and inter-institutional collaboration strategies, aligned with global trends in digitalization and the particularities of the regional agri-food value chain.

Keywords: Virtual Platform; Commercial Coordination; Family Farming; Agricultural Markets; Digitization.

RESUMEN

Introducción: el estudio abordó la problemática de la desconexión estructural entre los productores agrícolas de la región San Martín y los mercados potenciales, situación que limitó la rentabilidad y generó alta dependencia de intermediarios. Ante esta realidad, se planteó el diseño de una plataforma virtual que facilitara la articulación comercial directa, mejorando la visibilidad de la oferta local y fortaleciendo la inclusión económica de los agricultores.

Desarrollo: la investigación se sustentó en la revisión de experiencias internacionales, nacionales y locales que evidenciaron el potencial de las plataformas digitales para optimizar procesos de comercialización agrícola. Se analizaron casos donde la digitalización permitió acortar cadenas de intermediación, fortalecer la asociatividad y ampliar el acceso a mercados de alto valor. Los hallazgos resaltaron que, si bien la tecnología mejoró la competitividad y diversificación de los productores, su efectividad dependió de factores como la infraestructura tecnológica, las capacidades digitales y la existencia de políticas públicas inclusivas. El análisis del perfil de productores, clientes y proveedores de San Martín permitió definir los requerimientos funcionales de la plataforma, así como su orientación hacia un modelo sostenible, adaptado a las condiciones territoriales y productivas de la región.

Conclusión: se concluyó que el diseño de una plataforma virtual constituía un catalizador para la transición de la agricultura familiar en San Martín hacia un modelo más competitivo e inclusivo. Sin embargo, su éxito requería la integración de estrategias de capacitación, infraestructura y colaboración interinstitucional, alineadas con las tendencias globales de digitalización y las particularidades de la cadena de valor agroalimentaria regional.

Palabras clave: Plataforma Virtual; Articulación Comercial; Agricultura Familiar; Mercados Agrícolas; Digitalización.

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INTRODUCTION

In the San Martín region, despite sustained growth in agricultural production, there is still a structural disconnect between agricultural producers and potential markets, which translates into low levels of profitability and high dependence on intermediaries. The lack of technological mechanisms to facilitate direct commercial coordination limits access to business opportunities, reduces regional competitiveness, and creates gaps in the agri-food value chain. In this context, there is a clear need to develop a virtual platform for market coordination as a strategic tool to digitally integrate actors in the agricultural production system, improve the visibility of local supply, optimize marketing processes, and strengthen the economic inclusion of San Martín farmers.

Thus, the research problem was formulated: How will a virtual platform contribute to the commercial coordination of agricultural producers in the San Martín region? The overall objective of the study was to design a prototype virtual platform with functionalities that contribute to direct commercial coordination between small agricultural producers and buyers in San Martín. The specific objectives were: a) To analyze the profile of agricultural producers in San Martín. b) To analyze the profile of customers of agricultural products from San Martín. c) To analyze the profile of suppliers of agricultural products from San Martín. Moreover, d) To evaluate the commercial coordination of markets for agricultural producers in the San Martín region.

Thus, the alternative hypothesis of the study was defined as: The design of a virtual platform will facilitate direct commercial coordination between agricultural producers, suppliers, and buyers in San Martín. Moreover, the null hypothesis was defined as: The design of a virtual platform will not facilitate direct commercial coordination between agricultural producers, suppliers, and buyers in San Martín.

DEVELOPMENT

Background to the research

International

According to Cubides et al.[1] in their study "Family farming and digital platforms in the context of COVID-19. Initiatives in South America," on family farming and digital platforms in South America in the context of COVID-19, highlights how farmers, facing challenges from the pandemic and the limitations inherent in family farming, have adopted technologies such as social media, websites, and messaging apps. Experiences of producers in Colombia, Brazil, and Chile, supported by universities, private companies, and organizations, revealed that these initiatives mitigated initial losses by enabling the marketing of lagging products. Although digital tools facilitate communication and marketing, the study highlights the need for public policies tailored to each territory and the active participation of farmers in technological and political processes. The study suggests the importance of a more in-depth analysis of financial aspects and the role of the State in the adoption of technologies.

The study highlights the adaptability of family farming in South America through the use of digital platforms during the pandemic and beyond, where farmers face challenges and have found technology to be a tool to mitigate losses and strengthen their initiatives. This approach not only highlights the importance of technology but also the need for institutional and social support to ensure its sustainable and positive impact on family farming in the region.

Singh & Dey in their study "A typology of agricultural market information systems and its dimensions: Case studies of digital platforms," aimed to analyze and classify agricultural market information systems based on their impact on value chain networks, given the inadequacy of current theoretical frameworks to adequately describe emerging initiatives in the dynamic environment of agricultural systems. To this end, they applied the theory of network externalities, agency theory, and the approach of information and communication technologies for development 2.0, conducting documentary research through the analysis of archives and case studies of five representative systems in emerging markets. This methodology was complemented by interviews with experts, and five key dimensions were considered: technology used, available information, services offered, target users, and value architecture. As a result, a typology was proposed that groups agricultural systems into independent, integrated, and self-organized platforms, concluding that integrated and self-organized platforms showed superior performance, with the latter being the most effective in facilitating value co-creation, adapting to contextual needs, and overcoming location constraints.

Bustamante[2] in his study "Digital platforms as common goods or economic goods? Constructing the worth of a nascent agricultural data platform," aimed to understand how perceptions of value are constructed and consolidated in the early stages of the development of digital agricultural data exchange platforms, focusing on cases in Sweden, where the predominance of economic value over social value has traditionally been debated. Using a qualitative methodology based on valuation studies, the experiences of the founders of multiple emerging platforms were analyzed, revealing that in the initial phases, various values were considered, including data accessibility and transparency, profitability, sustainability, and innovation, all articulated under the notions of familiar sound and economic good. However, the process of seeking funding and strategic partners forced developers to prioritize measurable attributes, which progressively displaced specific values and reconfigured the weight of stakeholders in the discourse and design of the platform. As a result, the study highlighted the tension between social and economic objectives in digital agri-food innovation. It concluded that it is necessary to critically review current value assessment frameworks to promote a more equitable and representative balance in this sector.

Tombe & Smuts in their study "Agricultural Social Networks: An agricultural value chain-based digitalization framework for an inclusive digital economy," aimed to discover the role of agricultural social networks in the digitalization of the agricultural value chain (AVC), to promote an inclusive digital economy in the context of sustainable agriculture, considered key to food security and human well-being by SDG 3. To achieve this objective, an automated analysis of the scientific literature was carried out, complemented by case studies that allowed the development of a conceptual framework aimed at the digitalization of the AVC. A transdisciplinary framework was also proposed, integrating principles of resilience and sustainability, aimed at guiding the process of systematizing agricultural digitalization. As a result, the study showed that agricultural social networks, by connecting interdependent actors such as farmers, distributors, processors, and retailers, played a strategic role in contextualizing digital scenarios,

facilitating innovative practices for the development of technological solutions in agricultural environments. The findings provided a theoretical and practical basis for software developers, agricultural stakeholders, and policymakers by demonstrating the potential of technological infrastructure to support sustainable communities through digitized value chains.

Tauzie et al.[3] in their study "The new achikumbe elite: food systems transformation in the context of digital platforms use in agriculture in Malawi," aimed to characterize the emerging group of young urban farmers in Malawi, called the new *achikumbe* (NAE), and to understand their role in the transformation of the country's agricultural system, within the framework of the goals established by the Malabo Declaration, which prioritizes agricultural modernization as a driver of economic development, poverty reduction, and job creation. Using a qualitative methodology based on interviews and ethnographic research conducted between 2018 and 2022 with 32 young farmers, as well as representatives of agricultural organizations and service providers, the study analyzed how digital platforms have favored the emergence of this new category of producers. The results showed that the NAE is distinguished by its academic training, self-sufficiency, and intensive use of digital tools, which have enabled them to manage productive resources, access new markets and commercial contracts, and actively participate in training programs. The study showed that these digital platforms are facilitating a transformative role for these young people in the food system, but also warned that without adequate regulation and an inclusive approach, they could perpetuate or even widen existing inequalities. It was therefore concluded that it is essential to orient the design and use of digital technologies towards more equitable models that truly promote an inclusive and sustainable transformation of the agricultural system in Africa.

Wang et al.[4] in their study "Platform ruralism: Digital platforms and the techno-spatial fix," aimed to analyze how digital platforms were integrated into the Chinese rural environment through the phenomenon known as "platform ruralism," placing this process in the broader context of neoliberal globalization and the advance of platform capitalism. Based on field studies conducted since 2016 on rural e-commerce, a qualitative methodology was used that included participant observation, interviews, and case studies in rural areas to understand how these platforms act as "techno-spatial" solutions by building local infrastructures that reorganize traditional social and economic dynamics. It was found that so-called platform enablers—local actors who facilitate the adoption of these technologies—played a key role in articulating social networks through the use of mobile phones and social media, complementing the platforms' algorithmic mechanisms. As a result, a process of techno-spatial reification was observed, whereby digital platforms not only conquered new markets by converting rural residents into users but also centralized local social and economic networks under their operational logic. The study concluded that this transformation is redefining rural space from the intersection between technology, communication, and socioeconomic structure, providing a critical perspective on the expansion of digital capitalism in rural contexts.

National

De Loayza et al.[5], in their study entitled "Influence of commercial coordination plans on the export performance of chestnut producers in Madre de Dios: 2015-2020," whose primary purpose is to identify the influence of the commercial articulation plans (PAC) of Sierra y Selva Exportadora (SSE) on the export performance of small and medium-sized chestnut producers in Madre de Dios in the period 2015-2020. Sierra y Selva Exportadora (SSE) is an implementing agency attached to the Ministry of Agrarian Development and Irrigation (Midagri), created as a result of Law 30495 of 2016. Initially operating only in the highlands of Peru, SSE began operations in the jungle in 2017. Its purpose is to promote and facilitate access to national and international markets for small and medium-sized producers organized under some form of association by strengthening capacities and coordination. On this occasion, the production chain taken as a model is chestnuts, whose small and medium-sized associated producers have been able to export directly in recent years. Using semi-structured interviews as data collection tools, the study has identified the commercial coordination plans of SSE through promotional events, which do have a positive influence on export sales and, consequently, on export performance due to the contribution of spaces where suppliers and buyers have more opportunities to interact, establish contacts, and/or close sales. However, this effort has not had a very significant impact.

Laurenzio[6] in his study "Small-Scale Cocoa Farming and Mechanisms of Access to Support Services Bridging Producers with High-Value Market Participation: A Comparative Analysis Between Ecuador & Peru," aimed to examine how access to various resources influences the ability of small cocoa producers to integrate into high-value markets in Ecuador and Peru, comparing the role of support services and sectoral intervention in both countries. Based on the theoretical approaches of Gereffi's Global Value Chain (1994) and Ribot and Peluso's Access Theory (2003; 2020), the research used a qualitative methodology based on primary data obtained through 30 interviews (13 in Ecuador and 17 in Peru), field notes, and national reports compiled within the framework of the MOCCA project in 2019, funded by the United States Department of Agriculture (USDA). The results revealed that, although significant efforts are being made in both countries to support smallholder farmers in linking to an exclusive market for speciality cocoa, the strategies vary considerably. In Ecuador, support is more institutionalized and promoted from within the sector, while in Peru, there is a high dependence on external intervention to access European markets. Consequently, it was concluded that technical services, certification systems, and sectoral support were decisive in linking these small producers to high-value chains, although conditioned by the power dynamics and governance structures present in each country.

Martínez[7], in his study "The platform economy in agriculture: the interests at play when northwest Indian large-scale commercial farmers face platformization," aimed to explain the configuration of interests in the transition toward platformization of the agricultural sector in northwest India, analyzing how platform capital business models collided with the interests of agricultural capital, especially that of large commercial farmers. The results revealed that, although Agri Stack promised to modernize agriculture and double farmers' incomes, large commercial producers perceived a threat to their autonomy, to traditional marketing systems (such as mandis), and their influence over agricultural policy design. It was concluded that the platform represented a reconfiguration

of economic power in rural India, promoted by transnational interests that, by controlling strategic nodes in the digital value chain, could displace local actors and centralize control of the agri-food system under a corporate and technocratic logic.

Martínez et al.[8] in their study "The associativity of small producers as a way of enhancing biodiversity through biotrade. The case of the Association of Ecological Agricultural Producers of Cruz de Plata Tuti–AGROECOTUTI," aimed to examine how the association of small producers allows for the revaluation of biodiversity through the biotrade business model, taking as a case study the Association of Ecological Agricultural Producers of Cruz de Plata Tuti, located in Caylloma – Arequipa, an organization with more than 15 years of experience in harvesting organic products, with quinoa as its flagship product of native biodiversity. The results showed that collective organization improves conditions for participation in biotrade, promotes sustainable organic production, and strengthens integration into national and international markets, in line with the economic, social, and environmental sustainability criteria promoted by MINCETUR's National Biotrade Strategy. However, structural limitations were also identified, such as low technical knowledge, limited practical state assistance, and limited dissemination of biodiversity products. It was therefore concluded that it is essential to promote coordinated work between the public and private sectors and international cooperation to strengthen both associativity and biotrade in Peru.

Local

Wong conducted a study entitled "Virtual Market for Agricultural Producers as a means of improving the profitability of farmers in San Martín," which presents how virtuality can improve the profitability of farmers in San Martín, focusing on virtuality as a way to access timely and reliable information on prices, agricultural services, and markets for rural producers at the national level. It also seeks to improve efficiency in the marketing process of agricultural products and services by shortening traceability and minimizing intermediaries. Likewise, it promotes the organization of small and medium-sized producers through associations, the formalization of organizations, and business management. It also seeks to identify and promote agricultural and forestry value chains and clusters by commercially promoting differentiated, high-quality agricultural products with added value. To this end, they proposed a virtual IT platform that allows farmers to display their products and buyers to purchase them directly from producers, avoiding the presence of intermediaries.

Theoretical foundations

Virtual platform

According to Coppola,[9] a digital platform is an environment in which users can carry out tasks, manage activities, collaborate with other users, and interact through the tools and functionalities offered by the platform. In addition, platforms generally offer free access to their primary functions, as they require the active participation of users to develop their collaborative potential, since users are the ones who contribute content and interaction.

According to Sebastián Díaz[10], a virtual platform is a computer environment that provides us with many tools grouped and optimized for training purposes, as well as allowing the creation and management of complete courses for the internet without the need for in-depth programming knowledge. Its main objective is to facilitate task execution using programs in a centralized location on the web. There is a wide variety of virtual platforms, and their specific objectives vary according to user needs.

Types of virtual platforms

According to Coppola,[9] there are different types of virtual platforms depending on their intended purpose. In this case, for the commercial coordination of agricultural markets, the types of virtual platforms that would theoretically contribute to the exact definition of a virtual platform are:

Virtual Customer Relationship Management (CRM) Platforms: These types of platforms allow companies to manage their customer relationships in the areas of marketing, sales, and customer service.

Virtual digital advertising platforms: these types of platforms allow companies to place image, text, or video ads on the internet, search engine pages, social networks, emails, maps, and other associated sites. These ads are strategically displayed to ideal users, considering search words, location, age, and preferences. The most famous digital advertising platforms are Google Ads and Facebook Ads.

Virtual E-commerce Platforms: Brands and companies need to have an online store that allows buyers to purchase products easily from the comfort of their own homes. Likewise, small businesses without a physical location can also benefit from online stores. Some of the most popular options for creating stores include Shopify, WooCommerce, and Magento.

Process of creating a virtual platform

According to Coppola,[11] in order to design a virtual platform, the first step is to define the platform's objective, as this will serve as a guide for the entire creation process. To define the objective, you must answer the question: "What is it needed for?" Given that digital tools are essential for a large part of the market worldwide, in many cases, it is not necessary to have a complex online system or, in some cases, even a website. Alternatives such as third-party social networks or traditional commercial media may be sufficient for some.

If you are creating a digital platform, it is because you have previously identified an offering that may be of interest to an audience of digital consumers. For example, you may want to create a new social network for young people in a specialized niche, launch an online store, or have an internal communication system in your company that works through your website. Having clear objectives will allow you to anchor your ideas and plan a sound digital strategy with specific goals.

However, before that, it is important to consider the following aspects:

Budget assessment: Any company needs a digital platform that is optimized for online sales, customer communication, internal operations management, and online service provision. However, not all companies can afford this, in addition to paying programmers to develop the application. Fortunately, there are software options, hosting, and other tools on the market that can make creating your digital platform easier. There are CRMs and website builders that already have templates and features programmed to create platforms of any kind. Ultimately, the resources you have define the scope, design, and features.

Have IT professionals on hand: It is best to have an IT staff to plan your digital strategy properly. Otherwise, hire IT

professionals to evaluate the possibilities for your company, consider costs, and create a platform that suits your needs. Each digital platform is a universe unto itself, and depending on the type of digital platform, there will be features such as video playback, real-time communication, or content publishing on user profiles, some more specialized than others.

Proper use of tools: A virtual platform is more than just a website accessible via an email address. In reality, virtual platforms encompass the entire set of programs, applications, and tools that execute complex instructions to update the site, manage tasks, facilitate internal communication, maintain databases, administer security profiles, and process payments.

Platform segmentation: When launching a digital platform, companies usually offer free services or publicly accessible features to gain followers and build trust in the platform. The platform should be highly interactive, featuring sections like best-selling products, most popular products, and recent products. This gives your platform more than one avenue for interaction and makes it attractive to a broader audience. Keep in mind that this strategy should go hand in hand with the business plan, so you should always balance digital tools to increase the platform's effectiveness.

Maintenance and control: Creating a virtual platform requires investing in professionals who will accompany you in the process of designing, optimizing, and launching the virtual space. However, it also entails the responsibility of monitoring the platform to keep it in good condition, functional, secure, and operational. Often, when hiring external personnel to develop highly specialized systems, you become highly dependent on their services and conditions. This administrative factor is something to keep in mind when creating a virtual platform. Establish who owns the rights to the platform, create a process manual, and maintain control over the security of your site to avoid problems in the future.

Before launching a digital platform: it is necessary to study the audience in detail and evaluate what the competition is doing. You may have a great idea in mind, but if the public is not interested in that solution, the plan could fail. Many companies make the mistake of not paying attention to the needs of their audience. This opens the door for your competitors to innovate with better offers or provide a superior service to your company. If, on the other hand, the company learns to listen and respond assertively to customer needs, it is likely to create a loyal community around the brand.

Test, test, and test: It is necessary to test the system or create a group to work on the backend to ensure that the databases are operating correctly, that the code is running smoothly, and that everything is connected on your site. It also means that the front-end verifies that the interface navigation, design, and user journey are functional. It is always a good idea to launch a test version to allow for feedback before reaching a final version.

Commercial articulation of markets

According to Laos[12], commercial market coordination is defined as the sustained relationship between supply (microenterprises) and demand (medium-sized and large companies, state-owned enterprises, and international markets). These activities can be mediated by an intermediary agent, broker, or business manager. One limitation for this intermediary in meeting its objectives is having to deal with the informality of microenterprises, which is related to low-quality standards and economic and financial instability. Currently, there are two options for the intermediary agent, which must be taken in parallel: identifying mature microenterprises and preparing microenterprises with growth potential. Microenterprises that do not meet these two characteristics will be crushed by competition or will focus on survival.

According to Carpio Vallejos[13], commercial market coordination is closely related to supply and demand, and it is necessary to understand supply and demand, marketing costs, and negotiation prices. Therefore, we are ready to promote meetings with our potential customers, in which all parties will be transparent in roundtable discussions, business meetings, or agreements, generating a sustained relationship between supply (producers, sellers) and demand (buyers from the region, domestic and foreign), in which the purchase and sale of a good or service takes place and which can be strengthened through roundtable discussions, business roundtables, agreements, fairs, internships, etc., to increase the market share of a company or sector.

In the same vein, Dueñas Sanchez[14] defines Commercial Market Coordination as the coordination that generates a balance between supply and demand, with these activities being a business planner that leads them, especially in the case of micro-enterprises. First, to articulate the market, they must be formalized as a company and, if possible, associated with others. This allows them to identify commercial opportunities in the short term and guide access to the market, especially in international markets. Micro-enterprises have limited access to the market for medium and large companies, and clusters improve organized group work. Commercial coordination is crucial for the development of sectors and a nation, particularly in countries like Peru, which has export potential and regions where niche markets and value chains for agricultural products are being developed.

An initial step is to identify what is sold in the market, rather than producing for the sake of producing and then selling. Contacts are necessary in this first stage. For instance, with products like avocados, you must seek new commercial contacts and business opportunities, verify that you possess all necessary certifications, and assess whether entering other markets would require additional certifications. Training in business management, innovation, sales, quality, and other relevant areas is essential. The more trained companies are, the more competitive they will be.

Many companies carry out processes in a way that is often not documented, due to the day-to-day nature of the work. However, innovation involves documenting all the steps needed to optimize a process. Innovation does not only apply to technology; it applies to everything: service, management, and policies. Unity is necessary to articulate markets, as it achieves alliances between private and/or public companies to create synergies on both sides, with common benefits, identifying strengths and weaknesses.

SMEs need business contacts and exposure to establish themselves; what better way to do so than at an event where buyers and sellers can meet? One option is to attend events that also serve as business networking opportunities. Companies must be prepared. It is essential to identify competitive companies with the potential to enter the market, support them in obtaining quality certifications (some certificates allow us to enter international markets), follow market trends, develop

new products (part of innovation), and implement new business management techniques and processes.

Trade fairs, business roundtables, and events are the next step to grow hand in hand with a private or public coordinating entity, seeking mechanisms that facilitate coordination, part of which are commercial platforms where you can post your products. These products must be labeled appropriately with their certificates, offer, volume, geographical location, and commercial descriptions. Access to markets through local, regional, national, and/or international trade fairs is one of the most comprehensive mechanisms. Among the benefits are finding new contacts, analyzing new trends, and meeting potential customers in person. In addition to developing a follow-up strategy, it is important to understand that we must think globally and opt for commercial research as part of the commercial plan. To be successful, the company must prospect for customers and have commercial follow-up. The inclusion of commercial agreements is part of good commercial coordination, a difficult task but one with good results.

According to the Peru Learning Alliance,[15] commercial coordination of markets is the mechanism that offers the most promise as an alternative to combat the new form of exclusion in the modern world: lack of access to markets. This study analyzes, through case studies, the motivations of private companies to approach small producers: to conquer new markets, reduce fixed costs, and better exploit economies of scale, among others, with the consequent growth of companies that adopt this system. The idea is for companies to use coordination tools to achieve their business objectives, access larger markets, and become more competitive. Companies opt for business coordination mechanisms, such as outsourcing processes, based on specific strategies, such as diversification or prioritization of certain sectors. This decision implies the flexibility to adjust coordination according to the needs and characteristics of the sector, product, and market, even if this increases operational risk.

Some small rural producers do not produce completely independently of private companies: the latter intervene directly in their production process by establishing specifications, controlling quality, and even training personnel. In other cases, private companies support organizations that bring together small producers and, through them, promote improvements in the efficiency of the production process; or they outsource complementary services that they then adapt to the process. Ultimately, interaction with small producers can be delegated to collectors.

A similar situation exists among small producers who participate in these forms of coordination. Each assumes a role according to their interests and objectives. Some aspire to grow as independent production units; others aspire to independence but with a secure customer base; and a third group consists of producers who consider themselves satellite workers of the company.

Barrionuevo[16] highlights the varied conceptualizations of family farming in the Andean countries, emphasizing the central role of family labor. Although countries categorize this type of agriculture according to various elements, the need for differentiated public policies is common. Marketing, which is crucial for Andean family farming, faces challenges in terms of supply and logistics, as well as in terms of recognition of its value by consumers. The weak connection with formal circuits generates uncertainty and unstable conditions. Alternative mechanisms have been implemented, such as gastronomic alliances, fair trade, and fairs, seeking a more inclusive link and reducing intermediation. These efforts have shown positive results at the pilot level, focusing on the organization of supply, associativity, differentiation by quality, and commercial promotion. However, challenges remain in the search for long-term impact and sustainability beyond temporary projects, focusing on organization, links to niche markets, support from allies, differentiation by quality, and advocacy for public policies. The keys to answering these questions are oriented toward:

Promoting territories with farmers' markets and short supply chains in capital cities and medium-sized towns.

Planned growth based on increased demand from fair trade niches, avoiding saturation due to oversupply, and considering the actual capacity of markets to absorb the product.

Generating balance in public procurement, avoiding dependence on government purchases during times of fiscal constraints.

Improving quality differentiation based on territorial cultural identity in order to access broader urban consumer markets, as is the case in fairs of this type in urban areas and gastronomic chains.

In terms of sustainability, in order to consolidate these markets, it is necessary to have differentiated and comprehensive public policies that cover everything from sustainable production, post-harvest management and quality differentiation, trade promotion and facilitation of entry into diverse markets, to the strengthening of commercial and associative capacities and investment in territorial assets such as infrastructure to support production and marketing.

Although the factual data available from the cases analyzed do not allow for national or regional extrapolations, they do provide evidence that small interventions by the State and/or international cooperation have positive impacts at the targeted level for which they were designed, but represent models with potential for scalability and market sustainability if accompanied by public policies that strengthen them.

According to Alianza de Aprendizaje Peru,[15] in its study entitled "Mechanisms for linking small rural producers with private companies in Peru," business coordination consists of a voluntary and strategic agreement between companies that involves the exchange, coordination, and cooperation of products, technologies, or services. Moreover, it can occur as a result of different motivations, leading to the application of various options and manifesting itself horizontally or vertically.

This study examines the reasons why private companies (EP) choose to coordinate with small rural producers (PPR) or not.

Among the reasons for coordinating with SRPs are responding to new demands, managing land availability constraints, minimizing investment risks, seeking specialization in production, and promoting community progress.

Similarly, PEs avoid coordinating or working with small rural producers due to the design of their business logistics platform, a vertical integration business strategy (the company takes on activities that it had previously delegated to small rural producers), the costs they must bear, and the low production capacity of small rural producers (SRPs).

For their part, PPRs coordinate with PSEs to secure a market, finance their activities, receive technical assistance, and ensure stable prices and permanent employment. At the other end of the spectrum, PPRs do not work with EPs. They leave them little

profit margin due to low prices, mistrust of compliance with agreements, lack of added value that differentiates them from collectors, no need for technical assistance because they already know the crop, and no cash payment.

Business coordination is recognized by the Peruvian companies analyzed as a growth strategy that allows them to gain market share for their products and adapt to changes in the market. The PEs have adapted the traditional theoretical model of vertical subcontracting to what is now known as contract farming, which, in the cases analyzed, extends to formal and informal contract production. These models allow for direct intervention by the PEs in the production processes of the PPRs, without this implying a loss of legal independence for the latter.

Some elements that favor coordination are: 1. Facilities for organizing the productive base. 2. The presence of associations that allow for higher production volumes and reduce the transaction costs of the POs. 3. The identification of leading producers capable of forming producer groups and taking responsibility for them. 4. The functioning of creative financing mechanisms. 5. Generational change in land ownership, which allows for PPRs who are better educated and less resistant to the possibility of establishing agreements with PEs. 6. The decision of PPRs, accustomed to growing staple crops, to start working with agro-export crops. In addition, there is little support for PPRs from public entities, forcing them to rely on their internal efforts.

Improving business coordination requires overcoming the gaps that still exist in its functioning, mainly the limited contact between the PE and the PPR, the lack of information on alternative markets for the PPR, the lack of leverage funds for the production chain, and the lack of capacity building for the PPR to manage non-traditional or promising crops.

Factors that could improve business coordination and lead to government policies include reducing transaction costs, training associations to negotiate better with the public sector, and implementing technology that can measure the evolution of coordination schemes in the country's different productive sectors.

The challenges facing coordination mechanisms between the EP and the PPR include:

Coordination mechanisms should enable business development among PPRs. Promote the involvement of cooperating entities and non-governmental organizations that foster business development among PPRs. Increase the number of vertical coordination experiences in which PPRs are organized as horizontal associations.

Promote the strengthening of horizontal associations that participate in vertical coordination schemes.

Promote financing that incorporates the contribution of PEs and, at the same time, allows PPRs access to the financial system.

According to Kogut,[17] three motivations lead parties to join together: reducing transaction costs, improving market access conditions, and the knowledge or learning generated by coordinated relationships.

Virtual platforms in agricultural trade coordination

According to Sierra y Selva Exportadora,[18] commercial market coordination is a trade promotion mechanism that seeks to connect and establish potential commercial links and networks between suppliers and buyers of agricultural products, virtually using a digital platform, to provide a space where new contacts, commercial relationships, and sales can be generated in the short, medium, and long term. It also implements Virtual Business Roundtables as a national policy, which aims to enable small producer organizations to generate business opportunities with national and international buyers, while initiating and/or strengthening sustainable commercial ties, to promote commercial rapprochement between the supply of producer organizations and the national and international market with new buyers and suppliers, and exploring market trends, promoting inter-institutional coordination with public and private entities in the producing regions that will support in the realization of the event in: Promotion and dissemination, provision of databases of producer organizations in Peru, and support in required logistical matters.

According to Carrion and Toro,[19] who conducted a study on the importance of digital technology for trade in family farming, family farming is a key sector for the eradication of hunger, as it is the first link in the food and nutrition security chain. They also mention that Sierra y Selva Exportadora,[18] family farming has not been given the same priority as other industrial sectors in the country, including agribusiness and exports, with "short circuits" existing as a form of trade based on selling closer to food consumers, minimizing intermediation. The traditional way of selling agricultural products, given the concentration of the population in urban centers and the intensification and scaling up of production, distances the rural world from consumers, allowing the emergence of intermediaries, distributors, and retailers, developing increasingly long and complex marketing chains. As a result, gaps have been created between production and consumption processes, tending to homogenize products and producers focused on reducing costs rather than developing their value attributes.

According to Sotomayor et al. in their study entitled "Better policies for micro, small, and medium-sized enterprises in Latin America" (Euromipyme), digitization generates encouraging and positive achievements in the agricultural economy, having a positive impact on productivity and strengthening links with product and service markets. With apparent differences between producers and territories, there are clear advantages in adopting technological innovations and severe limitations in adopting digital innovations, which affect their production models and market links. This is due to the lack of public policies with a territorial focus on the part of the State. To close this gap, infrastructure, affordable internet access, and digital literacy should be provided to producers with fewer resources. Once these conditions are in place, the use of information platforms and digital networks should be promoted, in addition to the provision of equipment that enables the use of technologies in agriculture. Furthermore, digital tools are crucial in the territories for implementing research, development, and innovation (R+D+I) policies and strategies.

According to CEPAL-FAO-IICA,[20] "short circuits" refer to a form of trade based on selling closer to food consumers, minimizing intermediation. The traditional form of selling agricultural products, given the concentration of population in urban centers and the intensification and scaling up of production, has distanced the rural world from consumers, allowing the emergence of intermediaries, distributors, and retailers, developing increasingly long and complex marketing chains. As a result, gaps have been created between production and consumption processes, tending to homogenize products

and producers focused on reducing costs rather than developing their value attributes.[21]

According to the Institute for Agricultural Development (INDAP),[22] e-commerce is undoubtedly a marketing mechanism that is rapidly taking hold around the world, especially at this time with the emergence of the COVID-19 pandemic, and could be an excellent platform for family farming.

In this context, virtual platforms focused on e-commerce are emerging as a mechanism to bring farmers closer to end consumers, generating growing demand for local, healthy, seasonal products with geographical identity. On the other hand, it supports producers by enabling them to earn higher incomes for their production, saving in other segments of the chain, and creating value from other attributes (brand, territorial anchoring, authenticity, social ties, history).[23,24]

According to the Agricultural Development Institute,[22] e-commerce is a marketing mechanism that has rapidly taken hold around the world, especially with the COVID-19 pandemic, and could be an excellent platform for agriculture. In rural areas, internet use is on the rise, and there is a positive perception of the opportunities it offers in terms of marketing and attracting new customers. On the other hand, consumer use of e-commerce is increasing, generating expectations for this business model, which can be adapted by family farming, adding value to its products and services.

Similarly, e-commerce enables the virtual delivery of family farming products from various regions to urban consumers, thereby enhancing access to these products and services in a fast and secure manner. This also strengthens and improves marketing channels, uniting producers to secure better prices.

An e-commerce system can be a viable alternative that allows you to adequately reach your end consumer, who is looking for products with a seal of origin and quality from family farming.[26,27]

In Peru, it is crucial for family farming, which accounts for 90 % of producers, to transition to commercial agriculture. This shift enables them to operate as businesses, moving beyond mere subsistence, and to grow entrepreneurially. In Peru, both government and non-governmental institutions are making efforts to incorporate technology into agricultural improvement needs.[28]

According to Tenorio, the NGO CEPEDAS NORTE, as operator of the REDEXperu platform, leads the provision of quality business development services, with virtual platforms supporting trade, where a group of institutions interact and provide business development services, articulated around a shared vision, which is to lead the provision of quality business development services, is important on two levels. Internally, it serves as a platform that generates value and promotes the efficiency and quality of services provided by associated institutions. Externally, it serves as a space where large, medium, and small companies can come together to find information and various services that strengthen their competitiveness.[29]

In addition, in its role as operator, it also acts as a facilitator for REDEXPerú, establishing coordination mechanisms between partner institutions and companies that require services, ensuring compliance with quality standards. To achieve this, service validation mechanisms are put in place, facilitating timely access and assuming responsibility for serving as a point of access to various service providers.

The benefits expected from this experience for exporting producers and future partners of the Network are access to a portfolio of validated service providers, discussion forums, recommendations, free advice to evaluate their business performance, and targeted mailing services.

CONCLUSION

In summary, the theoretical and empirical review shows that the commercial coordination of agricultural producers in the San Martín region faces structural limitations that restrict their competitiveness, mainly due to production fragmentation, dependence on intermediaries, and the absence of technological mechanisms that favor direct connection with higher value markets. The international, national, and local experiences reviewed show that virtual platforms, in their various forms, can be strategic tools for closing these gaps, provided they are designed taking into account the specific characteristics of the territory, the profile of the actors involved, and the dynamics of the agri-food value chains.

The comparative analysis suggests that the incorporation of digital solutions not only improves the visibility of supply and expands commercial opportunities but also promotes partnerships, optimizes logistics processes, and facilitates diversification into more profitable niche markets. However, their practical implementation requires the integration of inclusive public policies, investment in technological infrastructure, the strengthening of digital capacities, and the creation of collaborative environments where producers, buyers, and suppliers interact under principles of trust and mutual benefit.

Consequently, the design of a virtual platform aimed at commercial coordination in San Martín should not be seen as an end in itself, but rather as a catalyst to drive the transition of family farming towards more sustainable, competitive, and inclusive models, aligned with global trends in digitalization and long-term regional economic development.

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CONFLICT OF INTEREST

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