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RESEARCH ARTICLE

Development and Competitiveness of Oregano Clusters in Peru: A Regional Approach

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ABSTRACT

Agro-food clusters, particularly those centered around products like oregano, are vital to regional competitiveness and economic growth in Peru. These clusters promote collaboration, resource optimization, and knowledge sharing, which are essential for improving productivity and market positioning. However, despite their potential, the competitiveness of oregano clusters faces numerous challenges. The primary objective of this study is to analyze the competitiveness of oregano agro-food clusters in Peru. It aims to identify the key drivers influencing their success, such as supply chain efficiency, access to financing, stakeholder collaboration, and government policies, while exploring the challenges that affect their performance. The methodology is a quantitative approach. Data was collected through surveys and interviews with stakeholders within the oregano clusters. Secondary data from government reports, academic publications, and industry databases were also utilized. Descriptive analysis techniques were applied to examine the relationships between key variables influencing competitiveness. The results highlight critical factors impacting the competitiveness of oregano clusters in Peru, including supply chain efficiency, access to financing, stakeholder coordination, and government policies. Additionally, market demand and the level of innovation and technological adoption are identified as key contributors to enhancing cluster competitiveness. As a conclusion, the study underscores the importance of fostering stronger coordination, improving access to resources, and implementing supportive government policies to enhance the competitiveness of oregano agro-food clusters in Peru. Addressing these challenges can contribute to the sustainable development of the sector and support the growth of local economies.

INTRODUCTION

The formation of clusters has emerged as a significant strategy to enhance the competitiveness of producers in various industries. Clusters, defined as geographically concentrated groups of interconnected companies, suppliers, and related institutions, foster collaboration and synergy, contributing to improved productivity, access to resources, and competitiveness (Porter, 1990; McCann & Ortega-Argilés, 2015). In the context of agricultural production, particularly in regions like Tacna, the formation of clusters can play a crucial role in addressing issues such as limited access to credit, low export capacity, and fragmented production (Agrobanco, 2015). The present study seeks to explore the impact of cluster formation on the credit and export profiles of oregano producers in Tacna, Peru.

Globally, the formation of agricultural clusters (Fernandez & Pino, 2005; Laguna, 2010) has been widely acknowledged as a means to enhance the economic performance of small-scale producers (Ledesma & Sánchez, 2007). Scholars like Isserman & Westervelt (2006) have highlighted how clusters contribute to improved access to markets, knowledge-sharing, and innovation, particularly in regions characterized by small-scale farming and limited resources. These clusters enable producers to overcome challenges such as reduced bargaining power, limited access to financial resources, and difficulties in meeting export standards (Kaplinsky & Morris, 2001; Humphrey & Schmitz, 2002). In many developing countries, agricultural clusters have been instrumental in boosting rural development, enhancing competitiveness, and fostering sustainable growth (Porter, 2009; Boschma & Iammarino, 2009).

At the national level, particularly in Peru, the formation of agricultural clusters has gained attention as a strategy to address critical challenges in the agricultural sector (El Peruano, 2008). According to Escobal and Cavero (2006), smallholder farmers in Peru face significant barriers such as limited access to credit, poor infrastructure, and low levels of organization, which hinder their capacity to compete in global markets. The Peruvian government and various institutions have promoted cluster development as a means to enhance productivity and improve the competitiveness of key agricultural sectors, including oregano production in regions like Tacna (Chirinos et al., 2009). The literature suggests that the lack of organizational frameworks and access to financing are major obstacles to the successful participation of small producers in export markets (Burgess & Steenkamp, 2006).

This study aims to investigate the impact of cluster formation on the credit and export profiles of oregano producers in the Tacna region. The relevance of this research lies in its potential to provide valuable insights into how clusters can enhance the competitiveness and sustainability of small-scale producers by addressing key issues such as access to financial resources and export opportunities. The main research question guiding this study is: *What is the impact of cluster formation on the credit and export profiles of oregano producers in the Tacna region?* By addressing this question, the research seeks to contribute to the development of policies and strategies that foster the growth and competitiveness of agricultural clusters, ultimately promoting rural development and enhancing the integration of small producers into global markets (Porter, 2009; Humphrey & Schmitz, 2002).

THEORETICAL FRAMEWORK

The theoretical framework serves as the foundation for understanding the concepts and principles underlying the study. It provides a structured approach to identifying key theories and models relevant to the investigation of cluster formation, credit profiles, and export capabilities among oregano producers in the Tacna region of Peru. The primary objective is to explore the relationship between these variables, drawing on established theoretical frameworks to contextualize and support the research.

1.1. Cluster Theory

The concept of clusters, introduced by Porter (2009), refers to geographically concentrated groups of interconnected firms, suppliers, and institutions that contribute to increased competitiveness and innovation. According to Porter, clusters are essential drivers of regional economic development, as they foster collaboration, shared knowledge, and resource access, leading to improved productivity and efficiency. The theory posits that firms within a cluster can achieve a competitive advantage due to proximity and collaboration, resulting in better market access, lower costs, and enhanced innovation. Scholars such as Krugman (1991) and Bathelt at al. (2004) emphasize that clusters contribute to the development of specialized knowledge, skills, and capabilities, which are critical for small-scale producers, particularly in regions with limited resources and access to markets.

The formation of clusters can reduce transaction costs, increase bargaining power, and enhance access to critical resources such as credit and export markets (Isserman & Westervelt, 2006). In the context of agricultural production, clusters provide a platform for producers to collaborate, share information, and access services, thereby increasing their competitiveness and enabling participation in global markets (Humphrey & Schmitz, 2002).

1.2. Credit Access and Agricultural Financing

Access to credit has been widely recognized as a critical factor influencing the growth and sustainability of agricultural producers (Jones et al., 2017). Agricultural producers, particularly smallholders, often face difficulties accessing formal financial institutions due to insufficient collateral, high transaction costs, and limited creditworthiness (Flores, 2014). The lack of access to credit restricts their ability to invest in inputs, technology, and infrastructure, hindering productivity and competitiveness.

Cluster formation can alleviate these constraints by fostering collective bargaining power, improving creditworthiness, and facilitating better access to financial services (Grajirena et al., 2004). The presence of strong institutional frameworks and networks within clusters enhances producers' ability to secure credit, offering them the resources necessary for investment in productivity-enhancing activities (Capriotti, 2009; Crespo, 2014). Moreover, access to credit in clusters promotes specialization and economies of scale, allowing producers to meet export standards and enter international markets more effectively (Corrales, 2007).

1.3. Export Profiles and Market Integration

The export potential of agricultural producers is closely linked to their ability to meet market standards, secure international buyers, and develop reliable supply chains (Humphrey & Schmitz, 2002). According to Kaplinsky and Morris (2001), participation in export markets requires firms to comply with quality standards, improve productivity, and build capacities for sustained competitiveness. Clusters play a crucial role in this regard, as they provide the necessary infrastructure, support services, and knowledge sharing that enhance producers' capabilities to meet export demands (Boschma & Iammarino, 2009).

Producers within clusters benefit from access to specialized inputs, improved technology, and shared knowledge, which enhance their productivity and efficiency, thereby reducing costs and increasing competitiveness (Isserman & Westervelt, 2006; Porter, 2009). In the case of the Tacna region, where oregano production is a key agricultural activity, clusters can help producers overcome the barriers of low export capacity, lack of coordination, and weak institutional support (Burgess & Steenkamp, 2006; Reardon et al., 2009).

1.4. The Role of Institutions and Policy Support

Institutional frameworks and policy interventions are fundamental in shaping the success of agricultural clusters (Instituto Nacional de Estadística e Informática, 2016; 2015). Institutions including formal and informal rules, regulations, and organizations, play a critical role in influencing producers' access to resources, markets, and credit. Effective policies that support cluster formation can provide the necessary incentives for producers to collaborate, pool resources, and invest in productivity-enhancing activities (Ministerio de Agricultura, 2012).

Government programs aimed at promoting agricultural clusters, such as those focused on improving infrastructure, reducing transaction costs, and providing financial support, play a crucial role in enhancing producers' competitiveness (Medina & Vergara, 2011). The Tacna region, characterized by smallholder producers, requires targeted interventions that address the unique challenges of low access to credit, limited export capacity, and poor institutional support. The role of government and other stakeholders is, therefore, essential in fostering the growth of

clusters, ensuring that producers have access to the resources and support necessary to enhance their credit profiles and integrate into global markets (Chavarría et al., 2002).

This theoretical framework draws from key concepts related to cluster theory, credit access, export profiles, and institutional support, all of which are integral to understanding the dynamics influencing the competitiveness of oregano producers in the Tacna region. By analyzing the interplay between these variables, the study aims to contribute to the formulation of effective strategies that promote the development of agricultural clusters, enhance credit accessibility, and strengthen export capabilities, thereby fostering sustainable rural development.

METHODOLOGY

2.1. Research Design

This study employs a non-experimental, cross-sectional correlational design. A non-experimental design is appropriate as no manipulation of variables was conducted. Instead, data were collected in a natural setting from the oregano producers in the Tacna region, focusing on their credit profiles, export capabilities, and cluster formation (Naghi, 2007). According to Hernández-Sampieri y Mendoza (2018), non-experimental designs allow for the observation of variables in their natural context without interference or manipulation. Furthermore, a cross-sectional design was adopted, as data were collected at a single point in time, aiming to capture relationships and associations between variables without requiring longitudinal observations. This design helps in identifying correlations between the variables under study—cluster formation, credit profiles, and export capabilities—providing a snapshot of their interrelationships.

Additionally, a correlational approach was utilized, focusing on the degree of association between cluster formation, credit profiles, and export capabilities. Correlational research does not seek causal relationships but aims to examine the degree of relationship between variables. In this case, the study seeks to explore how cluster formation influences credit profiles and export capabilities among oregano producers in Tacna, emphasizing the identification of potential relationships and patterns.

2.2. Population and Sample

2.2.1. Population

The population under study consists of 686 oregano producers in the Tacna region. These producers are characterized as smallholders, with landholdings ranging from 0.5 to 3 hectares, producing relatively low volumes, facing limited market access, and struggling with low credit availability. The population represents small-scale producers who are integral to the local agricultural economy, contributing significantly to oregano production but often experiencing challenges related to financial access, marketing, and export capabilities.

2.2.2. Sample Size

To determine the sample size, the formula was applied, considering a finite population (N = 686) and an assumed confidence level of 95% and an error margin of 5%. The formula is:

$$n = \frac{Z^2 \times p \times q \times N}{s^2 \times (N-1) + Z^2 \times p \times q}$$

Where:

- n is the sample size.

- N is the population size (686).
- p is the proportion of the population expected to have the characteristic of interest (50% assumed).
- q is the proportion of the population not expected to have the characteristic (also 50%).
- Z is the critical value from the normal distribution (1.96 for a 95% confidence level).
- s is the margin of error (5%).

Using the formula:

$$n = \frac{1.96^2 \times 0.5 \times 0.5 \times 686}{(0.05)^2 \times (686 - 1) + 1.96^2 \times 0.5 \times 0.5}$$

Calculating sample size results in approximately 182 producers. This sample size was adjusted for population size using the formula:

$$n' = \frac{n}{1 + \frac{n}{N}}$$

The final sample consisted of 182 producers, ensuring the representativeness of the population.

2.3. Data Collection Techniques and Instruments

2.3.1. Techniques

The primary techniques employed for data collection were surveys and document analysis. The survey technique, utilizing structured questionnaires, was applied to gather primary data from producers. This method allowed for the collection of quantitative information related to the producers' credit profiles, export capabilities, and cluster formation. Additionally, document analysis was used to review existing literature, government reports, and previous studies relevant to the themes of credit access, cluster formation, and agricultural production in Tacna.

2.3.2. Instruments

The primary instrument used was a structured questionnaire designed to collect quantitative data on key variables—credit profiles, export capabilities, and cluster formation. The questionnaire consisted of multiple-choice and Likert-scale questions, focusing on aspects such as producers' access to credit, participation in export markets, and the extent of cluster formation.

To validate the questionnaire, a panel of three experts (academics and practitioners familiar with agricultural economics and cluster theory) reviewed the instrument. They assessed the content validity and coherence of the questions, ensuring that they aligned with the objectives of the study.

2.4. Data Analysis

The data collected was analyzed using descriptive and inferential statistics. Descriptive statistics such as frequencies, means, and standard deviations were employed to summarize and describe the characteristics of the sample. Additionally, inferential statistics, particularly correlation analysis, were used to examine the relationship between cluster formation, credit profiles, and export capabilities.

The Pearson correlation coefficient (r) was applied to assess the degree of association between the variables. Correlation analysis helps identify the strength and direction of the relationship between variables, without implying causality. The statistical software SPSS was utilized for data processing and analysis, facilitating the identification of significant relationships and providing insights into the factors influencing the credit profiles and export capabilities of oregano producers in Tacna.

2.5. Ethical Considerations

Ethical considerations were adhered to throughout the research process. The anonymity and confidentiality of participants were guaranteed, ensuring that all data collected were used solely for research purposes. Informed consent was obtained from all participants, and their participation was voluntary. The study complied with ethical guidelines for research involving human subjects.

By adhering to these methodological steps, this study aims to generate valid and reliable insights into the relationship between cluster formation, credit access, and export capabilities among oregano producers in the Tacna region, contributing to the broader understanding of rural development and agricultural competitiveness.

RESULTS

In this chapter, the key findings of the study are presented, focusing on the impact of the oregano cluster on various aspects of production, marketing, and business practices among producers in Tacna, Peru. The results highlight the perception of producers regarding the influence of the cluster on their technical assistance, business knowledge, and the overall expansion of their agricultural operations.

Table 1. Opinion on the impact of the cluster on business links

Frequency	Percentage (%)	Cumulative Percentage (%)
Never	1.1	1.1
Almost Never	3.8	4.9
Sometimes	17.0	22.0
Almost Always	34.1	56.0
Always	44.0	100.0
Total	100.0	

Interpretation: The majority of respondents (78.1%) believe that the cluster has a positive impact on improving their business links. This result indicates that the cluster facilitates stronger connections between producers, enhancing access to business-related information, such as market trends, pricing, and potential partners. These improved business links are likely attributed to the increased networking opportunities and shared resources within the cluster, which create more robust relationships that benefit producers in terms of market access, knowledge exchange, and improved negotiation power.

Reason for the result: In the context of the region Tacna, where limited resources and scattered production exist, business links are crucial for fostering external connections and securing better prices, markets, and information. The presence of the cluster likely mitigates these challenges by promoting collaboration, sharing of best practices, and collective learning, leading to stronger business relationships that can enhance the competitiveness of oregano producers.

Table 2. Opinion on the impact of the cluster on the agricultural frontier expansion

Frequency	Percentage (%)	Cumulative Percentage (%)
Never	3.3	3.3
Almost Never	7.7	11.0
Sometimes	23.6	34.6
Almost Always	24.2	58.8
Always	41.2	100.0
Total	100.0	

Interpretation: A significant proportion of producers (65.4%) agree that the cluster supports agricultural frontier expansion for oregano production. This suggests that the cluster contributes to overcoming barriers such as limited water resources, inefficient irrigation practices, and a lack of research on competitive crops. Producers view the cluster as a vital platform that encourages the development of new agricultural areas, enhancing their capacity to increase the scale of oregano cultivation.

Reason for the result: The region Tacna faces challenges related to limited water access and traditional cultivation methods, making it difficult to expand agricultural production. The cluster helps address these issues by promoting technological adoption, efficient water use, and collective projects, such as irrigation schemes and research initiatives. As a result, producers perceive that the cluster provides a framework that facilitates agricultural expansion, enabling better use of land and resources.

Table 3. Opinion on the impact of the cluster on production scale through associated surfaces

Frequency	Percentage (%)	Cumulative Percentage (%)
Never	0.0	0.0
Almost Never	2.7	2.7
Sometimes	18.7	21.4
Almost Always	41.2	62.6
Always	37.4	100.0
Total	100.0	

Interpretation: A majority of respondents (78.6%) believe that the cluster helps improve production at a larger scale through the association of cultivation surfaces. This indicates that producers recognize the value of collective efforts in pooling resources, improving economies of scale, and fostering organizational structures that enhance production capabilities.

Reason for the result: In the region Tacna, most producers own small plots, making it challenging to achieve the scale necessary for competitive production and export. The cluster enables these producers to overcome this limitation by fostering cooperation, encouraging joint efforts in areas like purchasing, marketing, and knowledge sharing. This collective approach allows producers to access larger markets and secure better prices, which they would struggle to achieve individually.

DISCUSSION

This chapter delves into the key findings from the study on the impact of oregano production clusters in Tacna, Peru. By examining various dimensions such as market access, resource

allocation, knowledge sharing, and agricultural expansion, this research seeks to understand how clusters can serve as vehicles for enhancing the competitiveness and sustainability of small-scale producers. The results contribute to the growing body of knowledge on the role of clusters in regional development, particularly in contexts characterized by limited resources and agricultural challenges.

Theoretical Context and Synchronization with Previous Research

The results of this study resonate strongly with foundational theories on clusters and regional competitiveness. One of the central theoretical frameworks guiding this research is Porter's (2009) cluster theory, which emphasizes that geographical proximity, networked interactions, and resource concentration contribute to the competitive advantage of firms. The findings confirm the importance of these elements, as evidenced by the improvements in market access, knowledge exchange, and scale economies reported by oregano producers in Tacna. Porter (2009) posits that these dynamics facilitate innovation, reduce costs, and enhance productivity, all of which are evident in the responses from producers who acknowledged the role of clusters in improving their business linkages and overall competitiveness.

Similarly, Medina & Vergara (2011) highlight the critical role of strategic planning and knowledge transfer in enhancing regional development. Their study on the role of strategic frameworks in regional competitiveness echoes the findings of this research, where the producers identified the significant impact of knowledge sharing, capacity building, and institutional support facilitated by clusters. The ability to access information, exchange practices, and connect with stakeholders in and outside of the region is central to the perceived benefits of clusters in Tacna.

Moreover, Crespo (2014) emphasizes the dynamic nature of cluster development, viewing them as evolving entities that contribute to enhancing production scales and improving market access. The current study supports this view, showing that producers in Tacna perceive clusters as contributing to better production scales, improved market linkages, and access to export opportunities. This notion aligns with the findings where respondents overwhelmingly supported the idea that clusters facilitate increased agricultural frontiers and larger-scale production.

Divergent Perspectives and Contributions from Various Research

While many studies point to the positive effects of clusters, there are differing perspectives on the extent and nature of these benefits. Some research highlights that the success of clusters may not always depend solely on local actors, but also on external factors such as government policies and institutional support. Corrales (2007) and Torres (2003), for instance, underscore the role of external actors like government agencies in providing infrastructure, funding, and regulatory frameworks that ensure the sustainability of clusters. However, this study suggests that while external factors are important, much of the success of clusters in Tacna is driven by local conditions such as limited access to water resources, technological infrastructure, and the need for institutional capacity building.

In contrast, Negri (2013) and Perego (2003) argue that clusters primarily thrive on internal capabilities like knowledge sharing, local innovation, and endogenous growth. These perspectives highlight that external interventions, while necessary, may not always align with the specific local challenges and opportunities. The findings of this study reflect a nuanced perspective, where while external support is acknowledged, the success of clusters seems to hinge largely on the ability of local producers to organize, cooperate, and adopt innovations that are context-specific.

Reflection on Peru's Context and Policy Implications

The context of Tacna, characterized by limited water resources and a small-scale agricultural sector, offers a crucial lens for interpreting the study's findings. The results highlight the role of clusters in addressing some of these local challenges, particularly in terms of improving market access and scale economies. However, the limitations posed by water scarcity and the fragmented nature of land holdings suggest that cluster-based strategies alone may not be sufficient without complementary institutional and policy support.

For instance, Medina & Vergara (2011) argue that without effective institutional frameworks and strategic planning, clusters may fall short of delivering sustainable competitive advantages. This research confirms such concerns, as producers noted the critical role of institutional support, access to credit, and infrastructure development in enhancing their competitive position.

Furthermore, Negri (2013) suggests that clusters require both local governance and external collaboration to achieve long-term sustainability. In the context of Tacna, the study's findings indicate that while clusters contribute to enhancing productivity and market access, they need to be integrated within broader policy initiatives that address resource constraints, such as water scarcity and access to technology.

In summary, the discussion emphasizes that clusters in Tacna are perceived as crucial enablers of competitiveness, particularly in a resource-constrained environment. However, their success is contingent upon a complex interplay of local capabilities, institutional support, and external interventions. Policymakers must therefore adopt a holistic approach that considers both the local context and broader systemic challenges to ensure the long-term sustainability and growth of such cluster-based initiatives.

CONCLUSION

This study aimed to explore the role of oregano production clusters in enhancing the competitiveness and sustainability of small-scale producers in Tacna, Peru. The findings reveal several key insights regarding the impact of clusters on market access, resource allocation, knowledge sharing, and agricultural expansion. In this concluding chapter, we summarize the key contributions, highlight the implications of the study, and offer recommendations for future research and policy development.

Summary of Key Findings

The study found that oregano production clusters in Tacna have played a significant role in improving market access and enhancing the competitiveness of local producers. Producers acknowledged the importance of increased collaboration, access to shared resources, and collective knowledge exchange, all of which were facilitated by cluster-based initiatives. The presence of clusters has led to improvements in production scales (Vera & Ganga, 2007), enhanced productivity, and better integration into local and export markets. Moreover, producers identified access to institutional support, such as credit and infrastructure development, as crucial factors contributing to their ability to participate effectively in cluster networks.

However, the findings also highlighted some challenges related to limited access to water resources, insufficient institutional support, and the need for further capacity-building efforts. These constraints indicate that while clusters offer significant potential, their success depends on the alignment of local capabilities with external interventions.

Alignment with Existing Research and Theoretical Perspectives

This study's findings align closely with established theories on clusters and regional competitiveness. Porter's (2009) theory on clusters emphasizes that geographical proximity, networked interactions, and resource concentration are key drivers of competitive advantage.

The results of this research confirm these theoretical foundations, showing that clusters have enabled producers in Tacna to access key resources, foster knowledge exchange, and strengthen market linkages.

Similarly, Medina & Vergara's (2011) research on the role of strategic planning and knowledge transfer reinforces the study's findings, as local producers identified the importance of institutional support and knowledge-sharing mechanisms in driving competitiveness. Crespo's (2014) concept of dynamic cluster evolution is also supported by the results, indicating that clusters in Tacna have contributed to improvements in production scales and access to export markets, although these benefits remain contingent on local conditions.

Divergent perspectives from Negri (2013) and Perego (2003) highlight the importance of local capabilities and endogenous growth in cluster development. This research also acknowledges that external interventions such as government policies and institutional support are necessary, but not sufficient on their own, as local conditions play a critical role in shaping the success of cluster initiatives.

Implications for Policy and Future Research

The study's findings have important implications for policymakers and stakeholders involved in regional development (Vila et al., 2000). First, there is a clear need for coordinated institutional support to address key challenges such as water scarcity and infrastructure development. Producers emphasized that external support in the form of credit access, infrastructure development, and institutional capacity-building is essential to sustain the gains achieved through cluster-based initiatives.

Second, this research highlights the need for a holistic approach that integrates both local capacities and external interventions. Policymakers must ensure that cluster strategies are not isolated from broader development goals aimed at reducing resource constraints and fostering sustainable agricultural practices (Otero et al., 2004; Torres, 2003). In particular, efforts to enhance access to technology, improve water resource management, and support producer organizations will be critical in ensuring the long-term success of clusters.

Lastly, future research should further explore the long-term sustainability of clusters, focusing on how different external factors such as government policies, institutional support, and technological advancements interact with local conditions. Further studies could examine the impact of clusters in other regions of Peru or in similar agricultural contexts to identify best practices and lessons that can be adapted to Tacna's unique challenges.

This study sheds light on the vital role of oregano production clusters in improving the competitiveness and sustainability of small-scale producers in Tacna, Peru. The findings confirm the relevance of cluster-based approaches as effective strategies for addressing key challenges such as market access, knowledge sharing, and production scales. However, the success of these clusters is contingent upon local conditions, such as limited access to water resources and the need for institutional support. Therefore, a balanced approach combining local capabilities with external interventions is necessary to ensure the sustainable development of clusters. By addressing these key factors, policymakers can foster an environment that supports the long-term growth and competitiveness of oregano producers in Tacna.

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