

A Performance Model for Sustainable Endogenous Development in Tayacaja, Peru

Modelo de actuación para el desarrollo endógeno sostenible en Tayacaja, Perú

Dr. Ronald Ortecho Llanos^{1*} <http://orcid.org/0000-0002-8878-5847>

Dr. Darío Emiliano Medina Castro¹ <http://orcid.org/0000-0003-1748-7313>

Dr. Antonio Sánchez Batista² <http://orcid.org/0000-0003-3352-9368>

Dr. Damián Manayay Sánchez¹ <http://orcid.org/0000-0002-1621-7250>

MSc. Gino Paul Prieto Rosales¹ <http://orcid.org/0000-0003-2156-9864>

Dr. Luis Taramona Ruiz³ <http://orcid.org/0000-0001-7670-3210>

¹National Autonomous University of Tayacaja, Huancavelica, Perú

²Ignacio Agramonte Loynaz" University, Camagüey, Cuba

³Le Cordon Bleu University, Lima, Perú

*Corresponding author: ronaldortecho@unat.edu.pe

ABSTRACT

Aim: To present a performance model that contributes to local sustainable development in the province of Tayacaja, Peru, which includes triple helix, human resources training, business incubator, production chains, and the local potential.

Methods: The methods used in this research were analysis and synthesis, induction and deduction; the techniques used were observation, interviews, and document review.

Main results: The methodological elements comprised in the performance model are defined and explained in order to help develop sustainable endogenous development, based on a structured systemic approach, as suggested to stakeholders, based on the analysis of these elements, and the outcome of the study of ecosystem resource potential in the province.

Conclusions: In Latin America, particularly in Peru, the local development projects designed and developed show modest and punctual results. In the suggested performance model, the university plays a key role in human resource training, the evaluation of the ecosystemic potential, and the encouragement of entrepreneurship. The performance model for sustainable endogenous development suggested in this research was methodologically structured through five duly-explained theoretical elements, proving that it may be a powerful referent to stimulate endogenous development in the province. Moreover, it includes painstaking and complex elements, which have had a successful performance. Working in integration, they create the proper synergy to produce sustainable endogenous development.

Key words: sustainable endogenous development, entrepreneurship, triple helix, chain.

RESUMEN

Objetivo: Exponer un modelo de actuación que contribuya el desarrollo local sostenible en la provincia de Tayacaja, Perú, el cual considere como elementos: la triple hélice, la preparación de los recursos humanos, la incubadora de emprendimiento, los encadenamientos productivos y las potencialidades de la localidad.

Métodos: Para la investigación se emplearon: análisis y síntesis, inducción y deducción; además de las técnicas: observación, entrevistas y revisión documental.

Principales resultados: Se definen y argumentan los elementos metodológicos que integran el modelo de actuación para contribuir al desarrollo endógeno sostenible, con un enfoque sistémico estructurado. Se realizan sugerencias a los *stakeholders* a partir del análisis de estos elementos y de los resultados del estudio del potencial de recursos ecosistémicos en la provincia.

Conclusiones: En América Latina, y particularmente en Perú, se escribe y se desarrollan proyectos de desarrollo local, con resultados discretos y puntuales. La Universidad, en el modelo de actuación propuesto, juega un rol decisivo en la preparación de los recursos humanos, la evaluación del potencial ecosistémico y la potenciación del emprendimiento. El modelo de actuación para potenciar un desarrollo endógeno sostenible propuesto en esta

investigación, quedó estructurado metodológicamente a través de cinco elementos debidamente fundamentados teóricamente, lo cual permite afirmar que puede constituir un valioso referente en aras de estimular el desarrollo endógeno en la provincia. Asimismo, incluye elementos laboriosos y complejos, pero cada uno ha tenido éxito en su empeño; integrados logran la sinergia suficiente para conducir al desarrollo endógeno sostenible.

Palabras clave: desarrollo endógeno sostenible; emprendimiento; triple hélice; encadenamiento

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INTRODUCTION

Differences in life quality and living standards between rural and urban areas are significant worldwide, but especially in Latin America. Due to the need to reduce the natural migration that it generates, particularly among the young population, it is important to offer training opportunities to this sector, as well as support for activities that allow them to have decent life quality.

The information provided by INEI (the National Institute of Statistics and Information technology, 2019) shows that the Peruvian macro-economy was robust by 2019. The Gross Domestic Product (GDP) of Peru maintained a growing trend in the last ten years. A departmental analysis showed that the highest incidence was observed in large cities. Mining, manufacturing, and trade are the leading sectors; however the submerged economy and the social or ecological impact of several activities is not included in the GDP, though, according to this research, these are pivotal elements.

A recent analysis of the human development index (HDI)¹ 2019 ranked the country in the 82nd position (0.759) among 189 economies. It meant seven positions higher than the 89th from the previous report. Among the outstanding indicators are life expectancy and gross domestic product. However, when the same analysis is made in Latin America and the Caribbean, the country

continues in the ninth position in the region. Meanwhile, a study conducted in the departments of the country showed that Huancavelica was last, with a HDI of 0.605 (United Nations Development Program [UNDP], 2019), which evidenced the need that each province in this department had to work to achieve local sustainable development, and increased living standards of the population. Tayacaja province is one of the most relevant due to its economic importance.

The main provincial indicators published by INEI (2020) also evidenced other issues that lead to an increase and deepening of poverty and exclusion conditions in the provincial processes of development. Illiteracy, the lack of basic services, and access to new technologies stand out among them; their negative effects go beyond issues like climatic change and ecosystems in Tayacaja. The reduction of these socioeconomic gaps involves, among others, responsible and sustainable use of the local resources, and the promotion of more promising economic and economically friendly activities.

Sustainable endogenous development is an alternative to meet the needs of today without compromising the capacity of future generations, thus guaranteeing a balance between economic growth, environmental care, and social welfare focused on efficiency, efficacy, and competitiveness (United Nations, 2012).

In concert with the above, the aim of this paper was to present a model of performance to achieve sustainable endogenous development in the province of Tayacaja, which includes these key elements: triple helix, human resources training, production chains, and enterprising, that stem from identification of the local potentials.

DEVELOPMENT

Sustainable endogenous development

The reduction of State involvement —late twentieth and early twenty-first centuries— compelled the intervention of local and regional actors; a strategy for decentralization was structured in favor of local initiatives; and a perspective

of local development combined with changes in exogenous development paradigms was centered in productivity and competitiveness (Vázquez, 2000). Local development efforts are meant to be the most adequate choice to create processes that tackle social issues with local, inclusive, and sustainable perspectives (Portales, 2014). These efforts are erected on the basis of addressing territorial issues using a multidimensional logic, and considering the global context, which are common features of different social enterprising approaches that favor visualization as a mechanism to achieve completion (Portales and Arandia, 2015)

Vázquez (2000) also claimed that endogenous development retakes local capacities for management and development, engaging innovation and the spread of knowledge, institutional density, territorial rural development, and flexible organization of production.

Sustainable endogenous development stems from knowledge of ecosystemic potentialities. The ecosystemic approach is a strategy for integrated arrangement of land, water, and living resources that promotes the conservation and use of biodiversity (Toure, 2016). Considering the principles stated, those who can lead it to success or failure are the people and the relationships they can create.

According to (Kopfmüller *et al.*, 2001), it is based on the principles shown in Table 1.

Table 1 General objectives and principles to define sustainable development

OBJECTIVES			
	A- To secure human existence	B- To keep the productive potential of society	C- To maintain society's development and performance options
PRINCIPLES	1. Protection of human health	6. Sustainable use of renewable natural resources	11. Equal opportunities in education, employment, and information
	2. Satisfaction of basic needs	7. Sustainable use of non-renewable natural resources	12. Engagement in social decision-making processes
	3. The possibility of people to ensure autonomy of existence	8. Sustainable use of the environment as a receiver of emissions	13. The protection of cultural heritage, and cultural diversity
	4. Fair distribution of natural resources and their utilization	9. Avoidance of unacceptable technological risks	14. Cultural protection of nature
	5. A balance of external differences between income and property of goods.	10. Sustainable development of material, human, and knowledge capitals.	15. Assurance of social resources and capacities.

Source: (Kopfmüller *et al.*, 2001)

Shumpeter (2003) laid down the figure of entrepreneurs as driving agents of continuous transformation processes in the organization of production, which leads to a non-linear advancement of society. Meanwhile Michelacci (2003) stressed this figure as a model of endogenous development, in which the new ideas are transformed in economically viable operations.

In this century, the involvement of entrepreneurs in the models of economic growth (Minniti & Lévesque, 2008) is being accepted. This is the time when central and local governments in Latin America should give real support to entrepreneurs through training, counseling, and funding.

Sustainable enterprising is the process of discovering, evaluating, and using economic opportunities present in market flaws (inappropriate allocation of resources) that hinder sustainability, including those relevant for the environment, such as public property, externalities, the power of monopoly, inappropriate government intervention, and faulty information.

To accomplish the maximum expression of sustainable development, it is important to analyze ways to run markets of environmental goods and services toward the benefits of environmental, social, and economic objectives. Environmental services can be defined as a benefit received by the community from direct or indirect use of natural elements, which may be seen as different uses of the land (Zequeira, 2007).

Strategies and alternatives of development of a territory depend on the capacity to improve and promote the available resources (Iglesias and Ramírez, 2008), thus, there is a need to identify beforehand the potentialities of a territory. The study of ecosystemic potentialities is indispensable for sustainable use of ecosystemic resources and services. These potentialities refer to local natural conditions that become choices for sustainable development, with intelligent management. Institutional will and education of stakeholders are necessary to make changes of attitude in the community, along with efficient use to transform resources that do not compromise the future.

Short characterization of Tayacaja province

Tayacaja is located on the north of Huancavelica, Peru. It covers a surface of 3 564.5 km², equivalent to 16.1% of the total area of the region. It comprises 21

districts, and a population of 81 000 inhabitants; the illiteracy rate is 13.1% (Ortecho Medina, Sánchez, Prieto, and Salgado, 2020). The main activities of the population are agriculture, trading of goods and services, and arts and crafts inherited from ancient cultures.

Several ecosystems and natural resources co-exist, enriching the landscape, as it becomes an attractive ecological destination.

Tayacaja is a prominently agricultural area; however, according to a diagnostic and zoning study of the province (Regional Government of Huancavelica, 2006; Department of Territorial Delimitation and Organization, 2007), though there are conditions to grow coffee, peaches, avocados, oranges, bananas, lemons, mangoes, and others, the lack of technologies for optimum use, along with inadequate practices of soil fertilizing, the absence of technical knowledge of the population, and cultural resistance to assimilate new and better practices, are factors affecting proper utilization of ecosystemic resources.

Information collected from estimations and population projections by INEI in 2007-2018 (INEI, 2020) evidenced some of the issues observed in this province. Illiteracy, the lack of basic services, and access to new technologies have a significant burden in the increase and deepening of poverty, and the exclusion of the population from development processes, which hinders the solution of problems related to climatic change significantly and directly, affecting ecosystems. The reduction of these socioeconomic gaps involves, among others, responsible and sustainable use of the local resources, and the promotion of more promising economic and ecologically friendly activities.

The diagnostic of Ortecho *et al.* (2020) showed that crop farming and stockbreeding are the most important economic activities in the province; however, production is low, since it is more directed to subsistence. Livestock and general goods from adjacent districts are sold in local fairs. Commercially processed dairies from Huancayo and Lima are also sold in these fairs.

Tayacaja is an eminently agricultural area, though the trading of goods is also important. According to a recent study (Ortecho *et al.*, 2020), these three types of activities account for 79% of the economic activity in the province (Fig. 1).

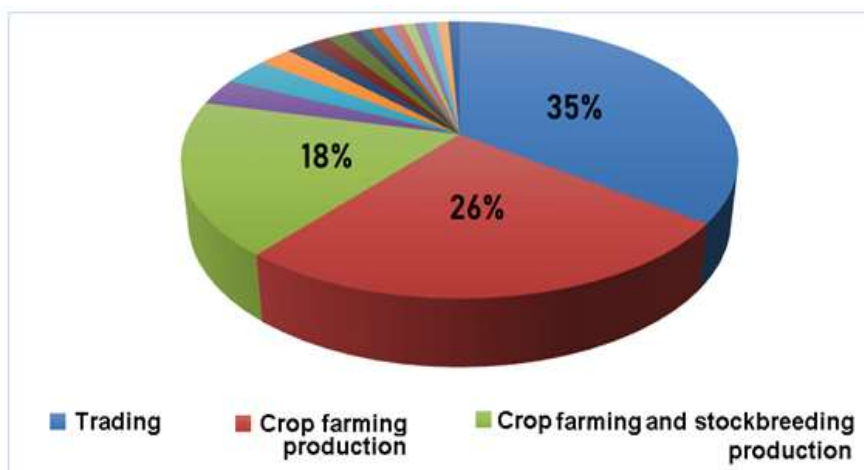


Fig.1. Main economic activities in the province of Tayacaja

Source: (Ortecho *et al.*, 2020).

Ortecho *et al.* (2020) revealed several results, which led to the conclusion that the biodiversity characteristics of ecosystems, cultural identities, and the fact that these activities have been favored by local development projects, were determining elements of greater development of these activities in the province. The same study ran a SWOT matrix (Table 2).

Table 2 SWOT matrix of Tayacaja province

STRENGTHS	OPPORTUNITIES
Diversity of soils	Potential touristic resources
Agriculture is the main economic activity	Reassessment of a living culture
Proximity and interconnection to the city of Huancayo	Existence of a legal frame developed by the Ministry of Tourism of Peru
The existence of a university	Arts and craft development in the province
Existence of entrepreneurial organizations	Existence of livestock raising and cropping associations
First organic region of Peru	More active role of women in local development
Diversity of ecosystems	Promotion of Huancavelica as the first organic region of Peru
	Announcement of IFOAM (International Federation of Organic Agriculture) 2019, on the sale of environmentally-friendly chemical-free foods.
WEAKNESSES	THREATS

Emerging businesses	Terrorism
Absence of quality services	Proximity to the Valley of Apurimac, Ene, and Mantaro Rivers (VRAEM), known as a zone of terrorism and drug trafficking.
Absence of sustainable agriculture	
Absence of lodging facilities	Migration of the young population
Shortage of food-related services	Climatic change and environmental pollution
Lack of technological support	
Illiteracy and low quality primary and secondary education in rural areas	
Absence of basic services (water and sewage)	

Source: Ortecho *et al.* (2020)

A research study done by Ortecho *et al* (2020) revealed that 18 associations in Tayacaja are concentrated in the district of Nahuimpuquio; 45 in Acostambo, and 84 in Daniel Hernandez, particularly related to agriculture. Likewise, these associations are linked to local development projects funded essentially by local governments.

Concerning the study of ecologically friendly enterprising, a district by district analysis concluded that Pampas had the largest number of businesses, followed by Acraquia, Ahuachia, and Pasos. These four districts comprised 49% of businesses in the province.

Meanwhile, by district, most new proposals were in the area of trading. This type of business was suggested for several crops (peaches, potatoes, bruise, hot pepper, and orchids); however, the most frequently requested area was the sales of dairies and eggs.

A comparative analysis revealed the advance or not of districts in relation to the newly requested businesses compared to the already developed ones. In that sense, Pampas stood out, followed by Pichos, Sacabamaba, Quichuas, and Santiago de Tucuma, as shown in Fig. 2. In all these districts, a significant growth in the number of proposed businesses was evidenced. However, districts like Acrapia and Pasos had setbacks.

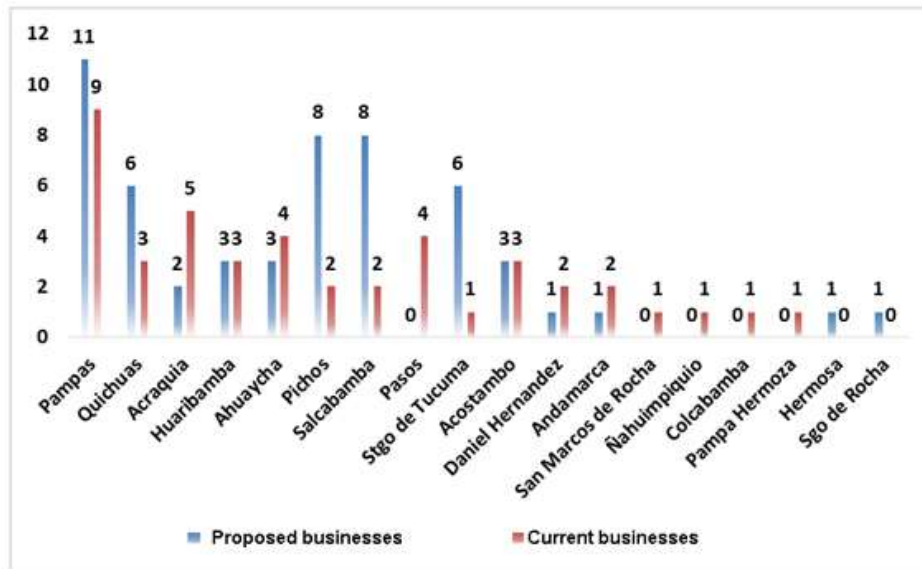


Fig.2. Businesses proposed in the districts of Tayacaja province

Source: (Ortecho *et al.*, 2020)

The diagnostic performed showed the existence of human potential with the necessity and will to start up actions that provide better living standards. There is also a potential to develop nature and adventure tourism in the region, along with better use of the local food industry. Farmer communities should be strengthened.

Performance model for sustainable endogenous development in Tayacaja

To reach local development in constantly changing contexts, it is important to promote innovation, entrepreneurial capacity, quality of human capital, and the flexibility of productive systems (Méndez & Lloret, 2004).

Meanwhile, the design of any development strategy requires knowledge of community characteristics within their context, their needs, preferences, potentialities, material resources available, and the conditions of natural resources. It involves better use of physical space, economic management, and assessment of community initiatives as substantive elements of local development (Miranda, Suset, Cruz, Machado, and Campos, 2007).

In keeping with these assertions, some elements were considered, which properly articulated, ensure a synergy that can boost sustainable endogenous development. In that sense, the following is stated: 1) a triple helix model comprising university-government-community; 2) education of human

resources; 3) identification of the potential; 4) business incubator; 5) production chains (Fig. 3).

From now on, these methodological elements are explained.



Fig.3 Logical-methodological scheme of the model (triple helix) for sustainable development

Source: Made by the authors.

Element 1 Triple helix

The links among state, university, and company is a model made by Leydesdorff & Etzkowitz (1998), known as triple helix. It is aimed to promoting university-society relations, characterized by the intervention of higher education centers in economic and social processes.

The function of a university is expected to be the creation of knowledge that plays a key role as the interface between productive and service entities and the government; particularly to enhance businesses and innovation.

As the university-company relationships become stronger, the ties between universities and government diversify. The former cooperate as partners, whereas the government will play a regulating-facilitating role (Salgado, González, García, and González, 2018). Then these three actors will need conditions to implement —coherently and objectively— sustainable development plans, programs, and projects conceived in their strategies.

Local governments and the Ministry of Agriculture —by co-funding rural business initiatives with the Project of Sustainable Territorial Development—

offer incentives to attract the engagement of contesting funds, but the expected results have not been achieved yet.

Tayacaja has a new university; the interviews and surveys reveal this as a strength, which is also a claim from other areas where there is none. This institution must take the lead in endogenous sustainable development, and business development.

To achieve endogenous development in the region, this research stemmed from the integration of business groups, the government, and the university, in the already mentioned triple helix model.

Universities play a very important role in the socioeconomic activities of nations, since they generate —apart from teaching-learning—, research and development inside their premises, so they engage in the creation of new companies or the promotion of spin offs (Chang, 2010).

In Peru, the canon law (Congress of the Republic of Peru, 2001), provision 6.2, states that regional governments will deliver 20% of the total perceived by canon to public universities in their jurisdictions, to be used exclusively for scientific and technological research that promotes regional development.

The *government* participates actively through the legislation of instruments and fiscal incentives that promote and dynamize university-company relationships. On January 23rd, 2020, the executive government published in *EL Peruano*, an emergency decree (Congress of the Republic of Peru, 2020) to improve access to funds by SMEs, businesses, and startups, giving them better conditions to obtain liquidity, and enable the expansion of production. Likewise, actions were taken to enhance mechanisms like factoring, leasing, crowdfunding (micro patronage), and the Growing Fund.

The *community* is the set of people that share a geographical space, and are associated by common characteristics and interests (RAE, 2020). According to Etzioni (1999), a feature that distinguishes the community is their commitment to a set of shared values, standards, and meanings, along with a shared history and identity.

Chang (2010) stated that when a close tie is established between a higher education school and the companies, based on the former's initiative, it is known as an enterprising university engaged in sales, conversion of knowledge into merchandise (patents, licenses or startups). The roles of universities,

communities, and governments were explained above. Hence, several contributions and research projects are created seeking to define the way in which these three components can harmonize their strategies depending on the definition and management of factors of strategic alignment that permit the convergence of local universities, governments, and governments (Salgado *et al.*, 2018).

Social integration, on the other hand, looks to articulate efforts by fusing entities known as helices: university, government, and community. Municipal development requires of interaction, dialog, and concerted efforts of all committed sectors of society, where the university is a catalyzer and promoter of such process from communities (Ramos, Artigas, Fundora, and Martínez, 2019).

The development of this model of performance is not linear at all; it has a spatial functionality; all the other elements are developed as well alongside with the triple helix.

Element 2 Training of human resources

Training personnel means providing them with basic information so that they learn new attitudes, solutions, ideas, and concepts that change their habits and behaviors, and allow them to be more effective in their activities. This offers individuals the opportunity to be what can be, according to their own potentialities, either innate or acquired (Chiavenato, 2002). It also teaches, develops systematically, and places any person under circumstances of competence (López, Reyes, and Molina, 2017).

The accelerated pace of technology demands the acquisition of new techniques, methods, and processes; therefore, an iterative system of training and studying that responds to individual needs (De Armas and Tamayo, 2019) is required.

The most important resource is the one that creates value, the one that is enterprising and innovating, the only one that is capable of concluding this project successfully, and to transform the province of Tayacaja into a sustainable endogenous region, increase the GDP, reach similar HDI to the rest of the country, reduce the migration of youngsters, and to attain a decent living standard for all the inhabitants of the region; that resource is Tayacaja's own

inhabitants. However, this is not possible with a fifth of the population who cannot read or write, and education of the young generations —especially in rural areas, where most of the population of the province lives— without the necessary resources.

On November 14th, 2019, during the 40th Meeting of the General Conference of UNESCO, in Paris, the member states approved a new strategy to eliminate illiteracy in youth and adult people, for the 2020-2025 period. It comprises four strategic priority aspects (UNESCO, 2019):

- To back the member states in the creation of national policies and strategies to eliminate illiteracy.
- To tackle the needs of learning of unprivileged groups, particularly women and girls.
- To use digital technologies in order to broaden access and improve learning results.
- To monitor the progress, and evaluate the competences and programs in terms of literacy.

Peru has fought against this scourge for years. According to the literacy program and educational continuity in VRAEM (started in 2012), “In Peru, until 2011, literacy programs consisted in short-duration campaigns that promoted the permanence in illiteracy, due to the lack of sustainability of such initiatives” (Ministry of Education, 2017, n.a). The above mentioned program defines literacy as a continuous process whose main objective is to increase the rate of literacy in the VRAEM area. As part of social inclusion, there is a commitment to pacify the area through an integrated intervention strategy that includes education, and mainly literacy as one of its main axes. The area where Tayacaja is located was considered, then demonstrated in surveys of this study, to be forgotten and cast aside by the state and society. Basic issues of this program include: the territorial approach, engagement of all district governments, the commitment of communities to assist students, and to provide suggestions to improve the program.

If the local governments, university, and communities create awareness of this situation, they should work on this program or other initiatives, which are always costly and time consuming, with high sacrifices, and endless efforts, under *sine*

qua non conditions, to increase the living standards, understanding of environmental preservation, production and utilization of organic foods, and the application of novel ways of management; in other words, sustainable endogenous development.

Element 3 Identification of the potential

The development strategies and alternatives of territories depend on the capacity to improve and enhance the resources available (Iglesias & Ramírez, 2008), thus creating a need to identify the potentialities of a territory in order to project its development.

According to Barragán & Ayaviri (2017) associativity and supportive economy, joined to innovation and enterprising are among the most important contributing elements to local development. Without an effective organization of collaboration relations, the links in the value chain weaken, and as a result, all the elements are less effective in their individual functions, which makes cooperation one of the most important factors. (Tapia, Aramendiz, Pacheco & Montalvo, 2015)

According to Toure (2016), for sustainable use of ecosystemic resources and services, it is important to study the ecosystemic potentialities (locally inherent conditions), which are choices that favor sustainable development.

The search for sustainability goes through deep knowledge of the climatic conditions, the physico-chemical conditions of the soil, the application of fertilizers (including natural ones) to suffice the shortages, and the local farming traditions. Pilehforooshha, Karimi & Taleai (2014) proposed a model for land use planning, depending on the characteristics of the soil, in order to identify the proper crops in each area.

Given the characteristics of the Pampas district, in terms of micro and small farmers, and the diversity of soils and conditions, precision agriculture allows for plot management, with the application of necessary amounts of inputs at the proper time and place, soil and crop management, depending on the variety found in a plot.

Thanks to precision agriculture, it is known that productivity of farming systems has high spatial and time variabilities. Spatial heterogeneity is caused by different environmental factors, including soil quality, the presence of weeds,

diseases or pests. This is done by internal identification of homogeneous and different units, each of which is managed differently (for instance, different fertilization dose). The successful application of precision agriculture practices elevates the efficiency of processed production, reduces costs, and diminishes pollution.

The utilization of GIS (geographic information system), and spatial statistical techniques are fundamental to design a map of homogeneous units of management. When the product is achieved, agronomic knowledge is equally important; it allows for characterization of productive limitations in each location, to improve individual management, which is the ultimate goal of precision agriculture.

Element 4 Business incubator

One of the main actors of local development, particularly enterprising, is universities or higher education institutions. They are in charge of providing education to individuals capable of creating businesses, which has an influence on social and economic development (Aguilar, Enríquez, Quintero, Zepeda, and Carmona, 2019).

Universities have strengths in infrastructure, human talent, and technical and technological resources, which support new businesses, and create a convenient relationship among the business sector, universities, and the society in general (Guerra, Hernández, and Triviño, 2015).

In enterprising processes, entrepreneurs, together with other social agents, generate wealth, which will be dealt out among the different components of the society (Galindo, Méndez, and Castaño, 2016). The integration of local organizations through entrepreneuring, the promotion of community tourism businesses, fair local and international trade, permanence, and technology transference from farmer to farmer, will contribute to local development, and to improve the life quality of inhabitants (Mata, 2014)

Spin offs and universities, and strategic alliances between large and small firms (companies), government, and university research groups, and other centers of science, technology, and innovation will provide an innovating environment (Díaz, Casas, and Giráldez, 2019), and the startup of new enterprises.

During the diagnostic, the university of Tayacaja was recognized as one of the strengths of the province. The model suggested (triple helix) considers that this high education institution should play a more significant role in the region that goes beyond teaching and researching.

The extracurricular work in an institution of this type not only consists of dancing and sports events to offer entertainment to the population; it is the socio-economic development leader, along with the power of its youth, who must receive most of their training outside the facilities, in touch with the surrounding reality.

No other institution in the province is better prepared or trained to boost enterprising, innovation, and sustainable endogenous development, disinterestedly. Therefore, it is the venue of business incubators. Also, inside universities, it sets teaching-production ties, to graduate enterprising professionals with the values demanded by the society, and capable of addressing environmental issues, and contributing to economic and social development of the community, the region, and the country.

These companies, which stemmed from other institutions and take from them some major elements that makes them distinct, with a normally acquired leading role, are formed by members of a research facility, a faculty or some specific academic area (García, Ramírez, González, & Patricia, 2017).

Assisting in the creation and development of new companies is the main purpose of universities in order to play an active role in society, providing their agents with counseling and training in technical and financial services.

To achieve that goal a new group of work should be set up based on the following elements:

- Three university professors with experience in agronomy, local development, law, business, and finances.
- Three municipal, provincial, and district officials.
- Three community leaders.

The team will be led by an experienced professor.

The team work done in the business incubator must begin with a self-training process that links the Locally Concerted Development Plan to the results of the study of ecosystemic potentials.

The locally or regionally Concerted Development Plans (PDC, in Spanish) are instruments resulting from the implementation of strategic planning in the territory, which aims to direct integrated development in the territories, and runs regional government managing in the mid and long terms. It demands the efforts from several actors, and focuses on the resources of society (individual and institutional), from the private sector, the academic area, and the state, for the welfare of the population, and harmonic and sustainable development of the territory and the country (CEPLAN, 2020).

PDC is important, since it provides a guide that orients the investment of municipal resources, such as those of the population and institutions. Hence, all efforts converge toward the development goals of the community, and the good municipality government. The association with GIS will allow for objective analysis to evaluate further enterprising.

The group tasks are:

1. Training. Short courses will be delivered on enterprising, innovation, and project design.
2. Project compilation. Project will be submitted and reviewed, then new elements can be recommended for improvements.
3. Evaluation of improved projects.
4. Funding. Proposal of possible funding sources.
5. Business startup counseling.
6. Follow-up: to recommend good sustainable development practices.
7. Evaluation: to recommend correction actions in the search for efficiency and sustainability.
8. Training: crop farming, stockbreeding, touristic management (and other emerging needs).

An adequate group performance will contribute to the spread of businesses associated to regional development, with a harmonic integration, and greater chances of success. From the start, a new business is associated to risk, which can be administered and minimized using these means, but it will never be totally eliminated.

Element 5 Production chains

The diagnostic showed that the results in stockbreeding and crop farming are little productive, and they are focused on a subsistence economy, including a weak association with farmers, and few cooperation relations. Also important, is that without effective organization of collaboration relations, the value chain weakens. As a result, every component is less effective individually, which evidences that cooperation is one of the most important factors for the operation of market economies (Tapia *et al.*, 2015). Should this situation continue, regardless of the emergence of new entrepreneurs in the region, the objectives of the Locally Concerted Development Plan or sustainable endogenous development will be at stake. The living standard will stay low, and the exodus of young people to more favored locations will continue.

When several farmers live in the same space, confronting a logistic and administrative situation, operating in the same local scenario, demands their articulation based on common interests.

Depending on that articulation, a higher articulation can be generated, which is organizational, and requires other conditions to form. An organization of farmers is created when new interests should be added, and when greater objectives are necessary (both for the existing members and the sector) (Durán, Fuenmayor, Cárdenas, and Hernández, 2016).

Iraizoz, Gorton & Davidova (2007) used analysis of variance to identify six types of clusters in Navarra, Spain. Mid-sized farms seeking expansion, small mixed farms, clusters of small stockbreeding farms, large cropland farms depending on subsidies, small stockbreeding farms in the mountains, and the cluster of intensive stockbreeding.

In the Peruvian case, the trend to follow should be carefully weighted. Cooperation with certain degree of integration is necessary, but farmers must have some level of independence; oligopolies should be avoided since they transform entrepreneurs into salaried farmers.

The improvements of local environments such as the potentiality and strategy of endogenous development, stem from the availability of local resources, factors, conditions, and capacities, though this combination is hard to be perfected to increase competitiveness efficiency. One of the requisites to achieve that is through production chains, which promote every link in the production chain to

work in coordination to achieve common, concrete, and measurable plans that will be directly and proportionally reflected in individual results.

The reality of micro, small, and mid-sized farm companies in Latin America: sales never generate the expected results as a result of intermediating, limiting access to funding, restricted administrative capacity, lack of knowledge of the legislation, bargaining methods, innovation, and novel techniques, irregular quality of products, the lack of capacity for proper delivery (volume, time, form). All this hinders development, and on many occasions, leads to simple subsistence or bankruptcy.

Different contexts are referred to with several intentions of sustainable development, but continued, coordinated, and controlled efforts are required to attain success.

As a concluding remark, to bear a current demand local production chaining is a need. In view of this research, it is considered as the articulation of productive and service actors, resulting in conscious engagement of the community by flexible strengthening and integration of local development initiatives, that in the form of controlled networks, makes use of the potentialities provided by these organizational forms in territorial productive clusters (Martínez, 2016). A distinctive trait is that they share benefits and risks proportionally, which strengthens the existing relationships in the chain, and therefore, the feeling of belonging and interest in all the process through the sales of goods.

Specialized individual work, included as an element of the system (chain), contributes to more efficient and effective group work, reducing risks, and increasing the results in each link.

CONCLUSIONS

The sustainable development context and intentions are varied, but the results are moderate and punctual.

Triple helix is intended to foster enterprising, research, and innovation as ways to obtain better results in the region, and to elevate life quality.

The university plays a pivotal role in human resources training, the evaluation of the ecosystemic potential, and the encouragement of entrepreneurship.

The procedure proposed includes painstaking and complex stages, but each of them has been successful; integrated, they make the proper synergy that leads to sustainable endogenous development.

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Conflicts of interest and conflict of ethics statement

The authors declare that this manuscript is original, and it has not been submitted to another journal. The authors are responsible for the contents of this article, adding that it contains no plagiarism, conflicts of interest or conflicts of ethics.

Author contribution statement

Ronald Ortecho Llanos. Theoretical rationale, development of the procedure, and graphics.

Darío Emiliano Medina Castro. Analysis of results, redaction of conclusions.

Antonio Sánchez Batista. Design of the manuscript, redaction of results, and summary.

Damián Manayay Sánchez. Redaction and proofreading.

Gino Paul Prieto Rosales. Redaction and proofreading.

Luis Taramona Ruiz. Proofreading of the manuscript and redaction of the conclusions.

NOTES

¹Human development index (HDI): Indicator created by the United Nations Development Program (UNDP). It is based on a social statistic indicator made of three parameters health (life expectancy at birth); education (adult illiteracy rate, and combined gross rate of primary, secondary, and higher education enrollment; and wealth (*per capita* GDP).