



The vegetable value chain: considerations for local development from the producer

La cadena de valor de hortalizas: consideraciones para el desarrollo local a partir del productor

Blanco-Capia Luis Edgar*

Data of the Article

Oruro Technical University.
Faculty of Agrarian and Natural Sciences.
Agriculture Department.
Dehene avenue University Citadel.
Oruro, Plurinational State of Bolivia.
Telephone: +591 2 52 64677.
Fax: +591 2 52 61645.

***Contact address:**

Luis Edgar Blanco-Capia
Oruro Technical University.
Faculty of Agrarian and Natural Sciences.
Agriculture Department.
Dehene avenue University Citadel.
Oruro, Plurinational State of Bolivia.
Telephone: +591 2 52 64677.
Mobile: +591 718 84968.

E-mail: luis.blanco.capia@gmail.com

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Abstract

The value chain approach, implemented in agricultural production systems, generates an increase in value for production and consequently local economic development, however, this transformation in agriculture implies an interrelation between its actors. In the present study, the value chain (VC) in the producer link was analyzed, this will allow to critically review the producer's scenario and the characteristics of participants in the VC of the agricultural production system, seeking local development, because of the innovation in the production system and necessary in the recovery process from the producer. The results infer that the source of problems in the functioning of the structure, among others, is the ineffectiveness in the interrelation of the links in the VC, the producer faces a scenario with many weaknesses and threats.

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Resumen

El enfoque de cadenas de valor, implementado en los sistemas de producción agrícola, genera incremento de valor para la producción y consecuentemente desarrollo económico local, sin embargo, esta transformación en la agricultura supone una interrelación entre sus actores. En el presente estudio, se analizó la cadena de valor (CV) en el eslabón productor, esto permitirá revisar críticamente el escenario del productor y las características de participación en la CV del sistema de producción agrícola, buscando el desarrollo local, como consecuencia de la innovación en el sistema de producción y necesario en el proceso de valorización a partir del productor. Los resultados hacen inferir que la fuente de problemas del funcionamiento en la estructura entre otros es la ineficacia en la interrelación de los eslabones en la CV, el productor enfrente un escenario con bastantes debilidades y amenazas.

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Introduction

The agricultural sector and agri-food industry have strategic importance for most nations, which in recent years have expanded their harvested area, with greater use of science and technology, achieving increases in their yield and productivity. In Bolivia in the last twenty years, the cultivated area has tripled to 3.3 million ha¹, this growth represents an opportunity². A trend that offers new opportunities to enter the international market for peasant producers from developing economies³.

Currently, various diets recommend the consumption of fresh fruits and vegetables to promote health⁴. The process is being driven by changes in consumer demand, which in addition to worrying about their health and the environment³. In Bolivia, vegetables are an alternative, as they are a source of nutrients of excellent quality, coupled with the fact that our country has potential for their production, however, most Latin American countries, especially Bolivia, present a series of limitations to mass production, as an alternative to lower costs, giving rise to a great external dependence and fragility of the system. Limitations such as climatic, scarce water availability, poor soils, cultural aspects and inadequate productive infrastructure, incipient organization of producers, among others, negatively affect agricultural production processes. On the other hand, food markets have been affected by weather conditions and in many cases, political tensions in the region indirectly affect the increase in the price index⁵. Even under these adverse conditions, the Bolivian rural producer must produce food for consumption.

The territory is not only a piece of land where people live⁶, linked to their environment (people, houses, farms, etc.), resources, and relationships between them. When applying the value chain tool (VC) at the local level, allows knowing, identify, coordinate, and

plan the necessary activities in the agricultural production system to make them more efficient⁷, in addition to the generation of jobs and income⁸, emphasizing the producer link, is this one who has the greatest need support.

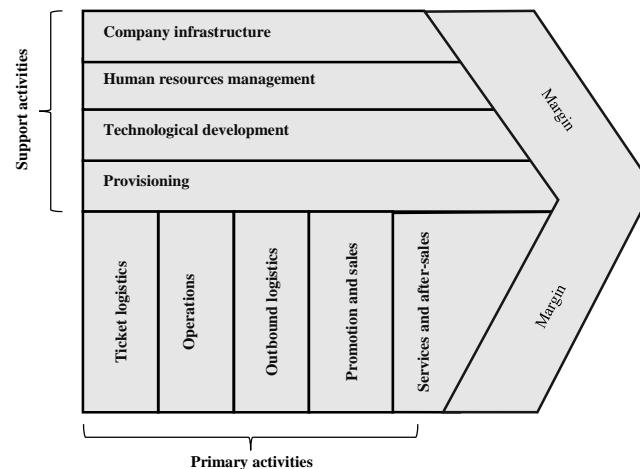
Although some authors point out that Bolivia is the poorest country in South America, with more than 80 % of the rural population below the poverty line⁹ and that agricultural productivity has a close inverse correlation with poverty in rural areas. Data from the Ministry of Rural Development and Lands of the Plurinational State of Bolivia¹⁰, show that the agricultural production of some industrial crops is remarkable, such as sugar cane and soybeans, on the other hand, in terms of non-industrial crops, there are potatoes, bananas, sorghum, among others. Regarding vegetables, we have carrots, onions, among others. The carrot between 2011 and 2016 there was a total increase of 36 %, on the other hand, the onion increased 18.4 % in that five-year period. This growth, which on average per year was 5.3 and 3.1 %, is due to the yields in t / ha reached up to 10.3 and 14 % for onion and carrot respectively, growth that is assumed to increase in the surface between 7 to 16 %. In the Oruro department, food production is summarized in non-industrial crops, highlighting quinoa, which accounts for about 40 % of national production, as well as departmental production of broad beans and onions, contribute to the country with 12 and 8 % respectively. Having a productive agricultural and livestock vocation, as far as agricultural production is concerned, in fact, there is a greater production capacity of vegetables, commercialized in markets of La Paz, Cochabamba, and even in the city of Santa Cruz.

We know the VC approach, an instrument for the design and implementation of policies for agriculture⁵,

from the initial idea of Porter, “as a network of companies in which the relationships that are established... are of great importance in competition with other chains...”, it is possible to identify sources of

competitive advantage, examining the activities and their interrelation in a system^{11,12}. Therefore, VC allows to increase planning efficiency¹³, but at the same time makes its operation more complex¹⁴.

Figure 1 The generic value chain proposed by Michael E. Porter¹⁵



On the other hand, VC is considered a strategic analysis tool to determine competitive advantage¹⁶. Among other uses, this approach helps to perceive the economic activities that take place in each territory⁶, as they interrelate with markets in other territories, in turn, mapping the activities of the production systems¹⁷, that their actors identify their capacities, develop actions and improvement policies. It is clear that information¹⁸ is necessary so that the actors of a territory can plan development strategies¹³, so that there is the interrelation between producers, leaders, transformers, that is, VC actors, that generate integration of productive processes in production primary and secondary¹⁹.

Consequently, it is necessary to carry out a diagnosis to identify the dynamics of the territory, in the case of the producer the conditions of primary production, the technology used, market demand, financial capacity for maintenance and investment, among others, that are adapted to the specific conditions of the

territory²⁰. Agricultural production in the study area is a very important activity for the communities since it fulfills a primary function in their economy, so it is necessary to characterize the development of the activities that contribute to agricultural production⁷. To achieve the development of a community, development theory can be applied, which allows us to analyze how development processes have been taking place, that is, to identify the mechanisms that directly affect the increase in productivity²¹. This situation in relation to the agri-food sector is a common denominator in Latin America, requiring the constant search for alternatives that improve the quality of life of the producer and his family²².

The success of a production system is in the formation of VC, considering that all the links are important, sufficiently integrated²³. On the other hand, the analysis proposed by the VC from the producer link due to its importance in the production processes⁷ allows knowing, identifying, coordinating,

and planning all the activities necessary in the production process, to optimize them, making them more efficient, with the to increase production in quantity and quality, generating a higher profit margin for producers.

Due to the considerations carried out, this research was proposed to evaluate the VC of vegetable production, with a greater incidence in the producer link, and to diagnose through a SWOT analysis, the vision of the producer and its interrelation in the primary production processes.

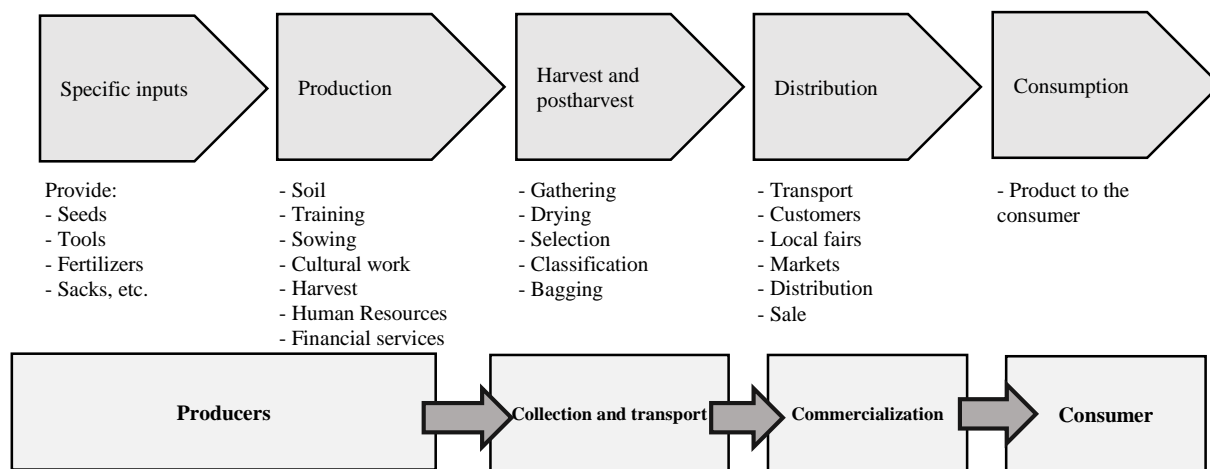
Materials and methods

The study area comprised the Guardaña Basin, located in the Soracachi Municipality of the Cercado Province of the Oruro Department of the Plurinational State of Bolivia, it is a characteristic area of the Central Altiplano of Bolivia, considered as a micro basin and categorized as a pedagogical basin. It has an area of 52.57 km² and a population of 3233 inhabitants, more than 75 % is dedicated to agriculture. The basin has agricultural production as the basis of its economy, with a variety of agricultural products

such as carrot, onion, potato, lettuce, broad bean, barley, among others. Food products that reach the local markets of the city of Oruro, as well as cities in the interior of the country, such as La Paz, Cochabamba, and Tarija. The research began. in the agricultural cycle 2017/2018, from August 2017 to April 2018. In the non-experimental and descriptive research with a qualitative and quantitative approach, the selected sources of information were of a primary nature such as interviews and surveys in a sample of 160 producers of a study population made up of 16 communities, which involves 446 producer families. The variables considered for the VC analysis were: i) agricultural production system, ii) technology used, iii) area dedicated to vegetable production, iv) crop management, v) product objective, vi) environmental care environment, and finally the vii) analysis of the strengths, opportunities, weaknesses, and threats in the producer link was evaluated. On the other hand, secondary information was used, such as reports, and statistics published by the Ministry of Rural Development and Lands and the National Institute of Statistics.

Results

Figure 2 Value chain in horticultural products of the Guardaña basin, Central Altiplano of Bolivia



Horticultural production value chain. The horizontal flow model diagram (figure 2) of the VC shows the stages of the entire process. The initial stage is the selection of inputs necessary for the implementation of the crop in the environmental conditions of the area. The second stage is the implementation of the crop, taking care that all agricultural factors (soil, irrigation, cultural work, and human resources) are optimal for the proper development of the crop. Later the harvest of the product and postharvest is the third stage. This is followed by distribution and finally marketing.

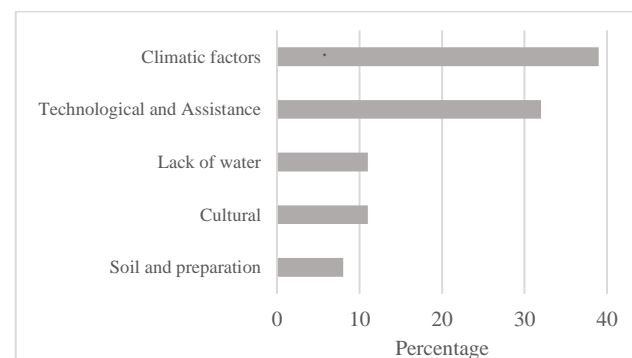
The first link of analysis is constituted by the producers, economic actors intervene such as suppliers of inputs (seeds, fertilizers, etc.), tools, financial services (formal and informal), and transport. Whose characteristics are summarized as follows:

i) The agricultural production system is characterized as mixed and diversified, instead it is intensive for vegetables. ii) Crop management is done mainly with traditional technology, without much technical assistance. iii) Vegetable production, its main characteristics are the diversified use of resources and a production schedule adapted to the variability of environmental conditions in the area. iv) The area to produce vegetables is smallholder, reaching about 90 % of the producers up to 5 ha, this fragmentation does not allow to improve their economy. v) Caring for the environment, most do not carry out any activity, they only provide organic fertilizer to the soil for production. vi) Nearly 40 % of the producers do not store their products for later commercialization, the rest are stored in some space in their rooms or on the same land (traditional underground silos). vii) 92 % of the producers cultivate for purely commercial purposes. viii) Around 63 % produce carrots as the main crop, followed by onion (26 %), the rest is between broad beans, lettuce, or potatoes. ix) The combination in its

agricultural production is between carrot, onion, and broad bean. x) Most of the production is done individually. xi) The harvest is manual, taking care that the maturity index is adequate, in order to guarantee the useful life that allows it to reach the consumer's table. xii) They present serious deficiencies in the post-harvest processes of the vegetables, which influence the quality of the product.

The production of vegetables in the study area is closely related to the environmental conditions where it is grown, as well as the climatic factors (thermal and humidity conditions) that must be optimal for the cultivation, figure 3, it was determined that close to 40 % of those surveyed affirm that climatic factors determine the success or otherwise of the production system. On the other hand, 32 % indicate that technological factors influence the system. Finally, 30 % affirm that it is the lack of water for irrigation, the characteristics of the soil and the preparation technique, as well as cultural aspects that affect horticultural production.

Figure 3 Environmental factors that affect the horticultural production system in the Central Altiplano of Bolivia



The second link of the productive chain corresponds to the collection and transport, in this are the collectors or intermediaries (local and regional), who oversee buying and selling the harvest. The way of trans-

port allows the product to reach the distribution centers, they are from the producers, suppliers of inputs, or third parties who offer them for rent.

The third link is the commercialization of the product, the preferred markets in order of importance most frequently are in the community or in the capital of the municipality and the cities of Oruro, Cochabamba, Santa Cruz, and La Paz, that according to the producers the prices are not fair. In the consumer link, those who purchase products intervene, located in the final section of the chain.

SWOT analysis of the VC. It made it possible to collect strategic information that will make it possible in the future to generate action plans. Below lines, obstacles have been identified that stand in the way of achieving the objectives and the positive conditions that favor said achievement.

Internal environment, Strengths: i) Favorable soil, ecological and climatic conditions, with respect to the rest of the Bolivian Altiplano. ii) Farmers with experience in cultivation and practical knowledge to improve the quality of the horticultural product. iii) Sustainable potential of crops with agroforestry systems. iv) Willingness to incorporate technological development in their crops. v) Generator of labor, mainly family that enables rural development. vi) Existence of markets for commercialization. vii) Supplies available locally. viii) Training and constant support in the production system by the University and other institutions or non-governmental organizations

Internal environment, Weaknesses: i) Producers with limited access to financial services and credit. ii) Limited articulation and integration with public and private institutions in the sector. iii) Limited road infrastructure, rural roads. iv) Low levels of technology adoption throughout the process, mainly in post-harvest. v) A limited number of producers apply integrated pest and disease management. vi) High level of informality in marketing. vii) Inadequate quality of seed available for the area. viii) Little increase in

the yield obtained per area. ix) There is no transformation of agricultural products.

The external environment, Opportunities: i) Vegetables are an important food for humanity. ii) Growing interest by consumers in organic and ecological products. iii) Generates family employment and others. iv) Existence of training projects in soil recovery and water catchment. v) Local and inter-departmental market expectations. vi) Opportunity for crop rotation. vii) Low presence of pests and diseases, due to environmental conditions. viii) State support for food security policies at the national level.

The external environment, Threats: i) Excessive intermediation. ii) High volatility and price fluctuation in local markets. iii) Continuous increase in imports, unfair competition. iv) Vulnerability to natural phenomena and effects of climate change. v) Global recession and contraction in demand for derivative products for substitutes. vi) Inadequate supply of resistant varieties of excellent quality.

Discussion

The findings of this study are in line with previous ones, however, it is highlighted that very little information regarding the approach and analysis of VC in the Bolivian Altiplano, consequently, reference is made to studies carried out in other latitudes.

The production system in the study area is smallholder, mixed and diversified, intensive for vegetables. However, this economic activity has potential for local development, even though the area is in the Bolivian Altiplano²⁴, that is, it is highly vulnerable²⁵. Being agricultural production important for the area, as for the country, since agriculture contributes significantly to the provision of food, employment, and income generation for rural producers.

The benefits for agricultural producers are not those expected in the study area, probably due to interme-

diaries and the absence of the use of the VC approach²⁶. It is understood that the current marketing mechanisms are the ones that most affect the performance of the VC, then, the suppliers or the supply process, is vital for the development of production, added by the discontent of the producers in relation to the price that does not is fair^{24,27}. On the other hand, falling prices and high input costs affect the competitiveness of its products, that is, the price dynamics throughout the VC is very important²⁸, which aims to meet consumer expectations²⁰, it should be taken into account that the sector's policies have effects on the entire VC, which will allow the producer to capture the value addition.

The agricultural VC of the area does not have the transformation link into by-products, so its incorporation would give the possibility of better consolidating the chain with greater added value²⁹, developing actors that transform the product, nor do they have cooperation mechanisms or agreements between actors, that show a favorable interaction in their roles and determine processes of territorial rural development³⁰, this is evidenced when about half of the producers in the area consider that it would be beneficial from the economic point of view to enter the transformation (agroindustry) of subproducts, coupled with the link between rural and urban markets, would represent promising opportunities to increase rural incomes by adding value to food products²⁴. That is, to achieve differentiation and innovation strategies for its products, to achieve sustainable competitive advantages. It is clear that the study of agrifood VCs seeks the socio-economic improvement of the population²⁸, in fact, comparing with traditional production systems, VCs allows a better structure, interrelating the links of the productive chain, thus improving the information flow^{20,24,31,32}, to more effectively meet the needs of consumers³², maximizing profits through increases in the added value of products³³.

However, the present research emphasizes the importance of the producer in the VC of vegetables,

production is the fundamental factor that affects consumer satisfaction²⁷, consequently, to improve the functioning of VC in agricultural systems should raise production levels and increase yields per area². The problems mentioned above highlight the little attention that the producer receives from its actors and academic institutions, which contribute to low productivity³⁴, findings that are evident at the level of several developing countries. The joint effort of actors such as the government, municipality, community authorities, producers, input suppliers, transporters, financial entities, non-governmental organizations, Higher Education institutions (universities), among others, would positively impact the development of the agricultural sector and non-agricultural². This is evident since research in the field of agricultural production systems is aimed at reducing costs in the acquisition of inputs and the different processes of the production chain¹⁴. In other words, the adoption of VC could improve the distribution and accessibility of food, reducing losses in productivity, improving income levels^{26,35}, giving priority to the producer link⁵.

On the other hand, the excessive intermediaries between the producer link and the commercialization reduce the profitability of the crop, also making the product more expensive along the commercialization channel³⁴. When the agri-food VC actors interrelate more effectively, they will be able to generate an institutional environment that works for the benefit of these vulnerable groups³⁶⁻³⁹, such as farmers, with inclusive policies for the progressive participation of small producers in the VC^{40,41}. Definitely, the success of this production system is in the formation of VC, there all the links (producers, services, transformation, commercialization, and consumers) are important and must be sufficiently integrated²³.

This approach allows us to understand the role of the actors, their interrelation, their dynamics in the process, which should be considered as the starting point

to investigate in greater detail these agricultural production systems¹⁴ in the Bolivian Altiplano, seeking to ensure the addition of value in the marketing channels. On the other hand, like some researchers, we agree that it is difficult to predict and control VC, due to fluctuations in production volumes, product quality, seasonality of supply, and uncertainty in market demand^{19,20,34}. However, there is a strong interest of producers in the study area, in being part of the VCs, considering the advantage of added value in the price of the product, such as collateral services that improve productivity^{23,25}. In another study it was concluded that it highlighted important challenges to be tackled in production and commercialization, it also considers that it is in a sustainable way with beneficial economic, social and environmental impact for the producer⁴².

One strategy to improve agricultural VC is to consider the redesign of production and marketing activities, to ensure a better distribution of food, reduce losses in the production and marketing process²⁶. Planning in the study area would be able to broadly identify the dynamics of the study area, considering aspects such as the size of the producers' surface, conditions in primary production, the technology used, market demand, financial capacity, among others, that are adapted to the conditions of the territory²⁰.

It is important to strengthen the capacities of producers in matters of technological innovation and processing of agricultural products in the post-harvest phase, which would allow increasing the useful life of the product until the consumer's table. Likewise, support associativity, integration, and social cohesion among producers, to strengthen their capacity for self-management and joint negotiation of financing options, prices of inputs and products, administrative and legal aspects^{26,41}, which together would contribute to the development of producers agriculture⁴³. In this sense, and given the will of the produc-

ers in Guardañá, it would be feasible to assume associative to integrate producers, seeking the competitiveness of their production²².

There is little financing, considered a limitation to invest in technology or working capital, the difficulty of access to technical assistance is also a limitation that was generally mentioned both in the work sessions and in the surveys⁴¹. In fact, agricultural production in the study area is a very important activity for its economy, therefore, applying for technological advances together with technical assistance would allow increasing its productivity and the yield of its production, for the benefit of improving the quality of life of producers⁷. On the other hand, when conceptualizing the agricultural VC of the area, the transformation link was not identified, therefore there is the possibility of consolidating the chain and giving added value to the product, developing actors that play the role of the transformation link²⁹.

The results suggest that the source of operating problems in the structure is the ineffectiveness in the interrelation of VC, particularly in low productivity, intermediation between the producer and the availability of products to the consumer, low adoption of technology, and lack of suitable packaging to attract the preference of the final consumer. In the study area, in some way and with the resources they have, associated or not, they produce agricultural products, as raw material for transformation or offered to consumers. Consequently, the present study shows that the links between the producer and the VC are very weak, which prevents small farmers from entering larger and more profitable markets, on the other hand, the adequately interrelated VC would allow linking Rural and urban markets, in addition to incorporating agribusiness in the producer link, would give a greater opportunity to increase rural income by adding value to their agricultural products²⁴, achieving growth or, failing that, maintaining the local economy and the well-being of producers individual⁴⁴.

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Conflicts of interest

This research was carried out in the Directorate of Postgraduate and Scientific Research of the Faculty of Agrarian and Natural Sciences - Oruro Technical University and there is no conflict of interest.

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Ethical considerations

The research has been approved by the Directorate of Postgraduate and Scientific Research of the Faculty of Agrarian and Natural Sciences. Of Oruro Technical University, and followed the guidelines established for this process.

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