

Analysis of the coffee production chain in the Amazonas Region in 2023

Manuel Antonio Morante Dávila¹, Alex Javier Sánchez Pantaleón², Maritza Revilla Bueloth³, Omer Cruz Caro^{4*}, Ariel Kedy Chichipe Puscan⁵

^{1,2,3,4} Instituto de Investigación de Economía y Desarrollo (IDED), Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas, Perú

⁴ Sierra y Selva Exportadora SD Amazonas, Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas, Perú

*Corresponding author E-mail: omer.cruz@untrm.edu.pe

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Abstract

Analyzing the local value chain in coffee-producing regions can help identify obstacles and opportunities for economic development and growth. Faced with this, the objective of the study was to analyze the value chain in the Amazon region. For which, the survey was used to collect information from producers and those involved in the value chain. To map the chain, the GIZ Value Links methodology was used; the study population was 34 producers and representatives of organizations and institutions. The coffee value chain in the Amazon region is made up of producers as the first link, after them the local collectors such as associations and cooperatives are present and in turn free trade who are the intermediary buyers. Government institutions. The main international export markets are Canada, the United States, and Germany. The main difficulty for producers is the constant coffee pests that prevent good production, along with the lack of irrigation in the plots.

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1. Introduction

Currently, the coffee production chain plays a fundamental role in the global economy [1]–[3]. The economic performance and development prospects of many developing countries depend heavily on commodity exports [4]. The heavy dependence of these countries on a few basic products has generally had an adverse economic impact, with detrimental consequences for growth and poverty reduction [5], [6]. Coffee represents a particularly important share of developing countries' export earnings, and the large number of producers who depend on coffee for most of their income is severely affected by price declines [7].

The coffee value chain begins with the implantation of the coffee bean to the methods of cultivation, harvesting, preparation, packaging, and consumption [8]. Includes farmers/producers; intermediaries that store, select, and export coffee beans, and roasters and mills that define the value proposition to the final consumer [9]. This process determines the value appropriated by all stakeholders based on their position/role and their contribution to the value of the end user [10]. Unfortunately, coffee is mainly exported or sold earlier in the value chain, leaving producing countries with less value added [11]. Most coffee producers do not develop in-depth knowledge about the origin and quality assurance of their coffee and end up selling their beans to intermediaries

or consumers at a lower price [12]. In reality, the coffee market is characterized by a prevalent imbalance between supply and demand and an asymmetric distribution of income between its different actors [13].

The coffee market is characterized by low and volatile market prices, and production suffers from labor shortages, low wages, and a lack of investment in technology and knowledge that increases productivity (for example, through extension and training activities) of farmers, which reduces the economic sustainability of coffee cultivation [14]. Coffee supply chains involve numerous actors (small farmers, cooperatives and middlemen, exporters, logistics and transport companies, roasters and retailers) and cannot be easily segregated, as products from hundreds or thousands of producers are mixed during processing stages, obscuring any information from earlier stages in the supply chain [15], [16].

Analyzing the local value chain in coffee-producing regions can help identify obstacles and opportunities for economic development and growth, improve access to markets, especially for small-scale coffee producers, and ensure that the production of coffee is economically, socially, and environmentally sustainable [17]–[19]. For this reason, the implementation of strategies and policies designed to address the specific needs of the coffee production chain would be essential to promote economic growth [20]–[22]. Furthermore, it is crucial to promote and support research that contributes to a better understanding of the participants in these productive chains, their strategies, and the guidelines they follow in making decisions, as described in the study [23].

Coffee is a key player in Peru's agricultural exports, employing over two million Peruvians across the production chain. Currently, Peru is recognized for its exceptional production of high-quality specialty coffees. The coffee industry engages 230,000 families, and thanks to collaborative efforts from both the public and private sectors, there has been a significant boost in productivity and an enhancement in the quality of the coffee beans [24]. In 2021, the cultivation of coffee covered 440,000 hectares, constituting 6% of the national agricultural area and playing a vital role in the country's development and social inclusion.

The average yield of coffee is low when compared to that of other producing countries: the national average reaches just 13qq/ha (quintals per hectare). However, in some coffee-growing areas that have a better level of development (such as Jaén, Bagua, San Ignacio, or Villa Rica, among others), production levels range between 30qq/ha and 80qq/ha [25]. Low productivity is compensated by the opening of new plantations, which affects the loss of forests [26]. Most coffee producers manage small plots [27]. Like tens of millions of other small farmers involved in the production and export of tropical products, coffee producers sell their products at commodity prices [28].

Nevertheless, Peru leads in the number of organic producers, boasting 107,367 registered, surpassing Mexico with 45,954 and Brazil with 24,975 [27]. In 2021, the National Agrarian Health Service (SENASA) reported 594 thousand hectares of organic crops in Peru, managed by over 118 thousand farmers, of whom 94% are small-scale producers dedicated to family farming. The majority are organized in cooperatives or associations, facilitating their access to group certification. Presently, Peru's coffee cultivation spans over 660 thousand hectares involving more than 236 thousand producers, supporting nearly one million families. While production is distributed across 11 regions, the primary concentrations are observed in San Martín, Junín, Cajamarca, Amazonas, and Cusco [29].

The objective of the study is to analyze the coffee production chain in the Amazonas Region, Peru. For this purpose, a survey was carried out among coffee producers in the region and representatives of organizations such as Cooperatives, associations, and companies linked to the coffee value chain. It is necessary to strengthen the demands of social services for coffee growers, access to quality education, health, and food security. It is also necessary to improve public and private financing strategies, access to information, technologies, and innovation, agricultural and ecological practices, and access to varieties that are more adaptable and resistant to climatic variations, to discourage the abandonment of coffee production. In addition to articulating the work of the university with the productive agents, to opt for the transfer of technology in favor of the social, economic, and environmental development of coffee producers.

For this reason, the aim is to identify the institutional framework and how it benefits the development of coffee growing in the region. However, it is necessary to strengthen the services offered to coffee growers through coordinated interventions between the public and private sectors, which should share the vision of a coffee industry that attracts direct foreign investment, has competitive prices, presents uniform quality, is linked to the global value chain, with quality institutions and guaranteed infrastructure.

Improvement approaches in the coffee sector of the Amazon region and globally must face several intertwined global realities; such as the economic realities of international markets that speculatively set coffee prices, the social realities of migration that result in higher local labor costs, and the realities of climate change that require more agricultural inputs and drive production [30], [31].

1.1. Coffee value chain

Coffee is the main agricultural export product in Peru [32]. It is undoubtedly one of Peru's flagship products that also has strong social capital [33]. Apart from delighting with its comforting aroma and flavor, Peruvian coffee is the livelihood of 223,000 producing families and directly involves 2 million people who are part of the value chain, generating 1/3 of agricultural employment in our country [34].

Coffee is the crop with the greatest coverage in the Amazon (it occupies 25% of the area used for agriculture). The rapid ungoverned agricultural expansion has occurred in areas of primary forest (45%), with 25% of new coffee plantations being established [35]. The viability of the coffee chain depends on its ability to anticipate and react to changes in context, in particular, agro-climatic conditions and market trends; this dynamically affects their territories: produced in micro-basins, often on hillsides, in shaded systems and with a post-harvest process that includes washing, coffee production makes intensive use of natural capital [36].

Northeastern Peru is one of the main nodes of coffee production nationwide [32]. The actors and the links between them are the basis of the functioning of the value chain [37]. Throughout the different stages, they contribute to moving coffee from production territories to export [38]. According to the proposed capacity approach, it is important to understand the functioning of the chain from 1) the actors and the resources that allow them to participate in the chain and 2) the relationships between the actors, which can modify the resources and influence their ability to participate in the chain [36].

Producers carry out primary production, including the purchase of seeds or seedlings, crop management, harvesting, primary processing (pulping, fermenting, washing, and drying), transportation, and sale [39], [40]. In general, the main objective of the producer is to obtain a profitable and quality product to sell at the best possible price and thus be able to support his family [41]. They may or may not be associated with a producer organization that facilitates the production and sale of coffee [42].

In general, non-associated producers sell coffee to intermediaries [43]. They can sell the coffee locally, in the town center, to collectors, local organizations, or microenterprises, or market it at the district level or in another province if they can cover transportation costs [27]. In many cases, the sale consists of an opportunistic combination of these sales options [44]. In some cases, intermediaries offer their coffee suppliers short-term credit, and in others, technical assistance and transportation [26].

Through their links with coffee cooperatives and associations, associated producers can have more marketing options (for example, selling in certified coffee markets, including organic, fair trade, Rainforest Alliance, and UTZ) and access to services for coffee production (e.g., technical assistance and inputs) than those not associated [45], [46]. Not all associated producers sell their total production to a cooperative, considering that sales in the local market offer certain advantages, such as immediate payment, and that producers need to finance the activities of the coffee campaign with the sale [40]. In this way, the associated producers choose to sell to private companies or intermediaries, since, in some cases, these actors pay a higher price in the local market than cooperatives for quality coffee [27]. There is also the option of selling certified coffee through small local associations that have agreements with private companies [45]. Among the associated producers, some

participate in markets for certified coffee, while others sell their coffee without any certification seal or through a combination of the two [47]. Of these, only 11% of producers are associated with a cooperative or association, and of this percentage 32% sell certified coffee [36].

From a producer's perspective, each type of buyer brings different advantages and disadvantages in terms of services and inputs offered, requirements (for example, volume and quality), prices, and incentives, as well as the transaction costs that are part of the business relationship [48], [49]. Three groups of local intermediaries can be distinguished; first, the micro collectors from the villages, who in turn are producers, collect coffee to sell to the other two groups, the local and district collectors. The latter often have agreements with private, national, or foreign exporting companies and receive advances of money for coffee purchases. The micro collectors, on the other hand, provide the producer with advances in the form of food [36].

Organizations must comply with the commercial agreements they maintain with the companies that buy their coffee, which may be national roasters or companies that export raw materials [50]. When organizations cannot complete the volumes committed to deliveries from supply partners, they buy coffee from non-associated producers [51]. Likewise, for the marketing and sale of coffee in the national market, cooperatives create local companies through their commercial management. In cases where the organization does not have sufficient capacity to manage the entire transformation and export process, it seeks the logistical support of a commercial agent who helps in marketing (broker) [52]. The brokers provide their service to the cooperative in the different stages of the process until shipment at the port (transportation, processing of parchment coffee into green coffee, customs) [53]. In other cases, cooperatives sell their coffee to a trader (immediate marketer) [54].

Access to the right services at the right time is key to coffee production [55]. Suppliers of inputs and services intervene in the chain without being directly linked to the purchase, transformation, and sale of the product [56]. Inputs are understood as all the material used for production, such as fertilizers, guano, tools, agrochemicals, seeds, coffee seedlings, and machinery [57]. It is possible to differentiate categories of input suppliers, at the local level, there are agricultural input stores, tools, and seeds, among others, as well as rural wineries [58]. On the other hand, wholesale stores provide inputs directly to cooperatives and associations [36].

Certification service providers are private companies that specialize in evaluating conformity in meeting the requirements defined in the standards of the aforementioned certification seals [59]. Their work is carried out under different types of contracts with organizations or private companies [60]. Additionally, representatives of the standards provide promotional services, training producers, and their organizations in the different requirements promoted [61]. It is important to distinguish that certification companies are not those who promote the seals or standards [62]. Certain public institutions provide services to producers and in this way, contribute to the construction of the enabling framework for the promotion of the sector. This group of actors includes municipalities, regional governments, and ministries such as MINAGRI, MEF, MINCETUR, SUNAT, and Customs. Also included in this group are the unions of organizations such as the National Coffee Board, the Peruvian Chamber of Coffee and Cocoa, and NGOs [27].

1.2. Sustainability in coffee production

One of the objectives of the International Coffee Agreement (ICA) 2007 is to encourage Members to develop a sustainable coffee sector in economic, social, and environmental terms. This objective is reinforced by Article 36, which refers to the principles and objectives of sustainable development contained in Agenda 21, adopted by the United Nations Conference on Environment and Development, and those adopted at the World Summit on Sustainable Development [63].

The contribution made by coffee growing and trade to environmental and social issues is extremely positive, certainly when compared to most other economic activities [64]–[66]. On the environmental side, coffee is an evergreen shrub, therefore, an important contributor to carbon sequestration, and is effective in stabilizing soils [67], [68]. It also allows the conservation of much of the original biodiversity of the areas in which it is cultivated

[69]. It is also very important to highlight that coffee production in the Amazon region is carried out under shade, that is to say, perennial, trees that help to diversify the biodiversity of crops [70].

To ensure sustainability, it is of decisive importance that the production and processing of coffee, take into account environmental needs [1]. It is also necessary that the economic environment encourages stability and a reasonable standard of living for the populations involved in coffee, and ensures the maintenance of quality [54]. In practical terms, the International Coffee Organization (ICO) encourages the improvement of coffee quality through projects dedicated to improving cultivation, processing, storage, transport, and marketing practices [63].

Coffee also makes a positive contribution in social terms; in that it maintains substantial rural employment and stable communities [71]. Improving the standard of living of coffee producers, especially small-scale coffee farmers, is a priority for governments [72]. Relevant ICO activities in this regard include building the capacity of institutions, improving access to credit and risk management mechanisms, reducing vulnerability to income volatility, and promoting gender equality [73].

The marketing of coffee as sustainable is a relatively new idea for the coffee industry [74]. For less than two decades, they have generally been available in very small quantities in a handful of countries. In the past, these coffees were inconsistent in both quality and availability [71]. Sales growth occurred almost exclusively within a relatively small core market of specialty retailers, social organizations, and cause-conscious consumers [75], [76]. In recent years this has begun to change dramatically and these coffees are now at a crossroads with many opportunities in new high-volume distribution channels [66].

Fairtrade, organic, and ecological coffees occupy a niche market that is still small in volume, on average less than 2% of consumption in most developed markets, but offers attractive benefits not only to around $\frac{3}{4}$ of a million farming households but also to the entire industry in terms of increased sales of these coffees and higher profits along the entire supply chain [63]. The sustainability of coffee cultivation in the region is closely linked to the improvement of farm productivity and cup quality, as well as the early attention to the consumption trends of the industry that require responsible and environmentally sustainable coffee. In this regard, it is essential to have quality technical assistance providers, backed by basic and applied research in coffee production, processing, and marketing [70].

2. Research method

The research was explanatory, with a non-experimental design. The methodology for the analysis of the coffee value chain was used, the GIZ ValueLinks methodology, whose objective is to promote economic development with a value chain perspective, from a participatory learning approach [70], [77].

To do this, the following steps were carried out:

Step 1: Identify the final product and the final market.

Step 2: Establish the stages of the chain.

Step 3: Establish the main sequence of operators.

Step 4: Differentiate the chain into channels.

Step 5: Map support service providers.

Step 6: Regulatory institutions and government programs.

Step 7: Prepare supplementary maps with thematic details if necessary.

The information was collected through the application of surveys and interviews with actors in the coffee value chain in the region. A non-probabilistic sample was made with convenience, selecting only representatives of producers and those knowledgeable about the entire production chain.

The surveys were applied to producers and representatives of organizations (associations, cooperatives, and companies) that attended the Coffee Festival held in the city of Chachapoyas from August 16 to 21. The survey

was made up of the main activities carried out throughout the production chain, as well as market access and the main deficiencies found in coffee production. The survey was carried out with the managers of the cooperative to learn about the national and international coffee market. Regarding data analysis, SPSS was used for descriptive statistics, since the study focused on the analysis of the main distribution channels of the coffee value chain throughout the Amazon region, using the GIZ ValueLinks methodology.

3. Results and discussion

The coffee value chain in the Amazon region was analyzed based on the application of the GIZ ValueLinks methodology, the following was found:

Table 1. Analysis of the production process

	Variables	%	Total
Sex	Female	35.3%	22
	Male	64.7%	12
Age	20 years - 30 years	47.1%	16
	31 years - 40 years	35.3%	12
	41 years - 50 years	11.8%	4
	51 years - 60 years	5.9%	2
Transportation	Van	21.4%	7
	Pack animals	50%	17
	On back (same producer)	28.6%	10
Raw material and materials	<i>Costales</i>	22%	7
	Plastic bags	13%	4
	Duffle Bag	7%	3
	Organic fertilizer	22%	7
	<i>Pesetillas</i>	11%	4
	Shades	26%	9
Activities by harvest	Renewal	7.6%	3
	Shadow management	8.2%	3
	Pruning coffee trees	9.5%	3
	Control of pests and diseases	7%	2
	Apply organic fertilizer	8.2%	3
	Coffee cutting	7.5%	3
	Pulped	8.9%	3
	Fermentation	9.5%	3
	Washed	9.5%	3
	Shaken	7.6%	3
	Drying	9.5%	3
Productivity	Selection	7%	2
	1 to 5 quintals	5.9%	2
	6 to 10 quintals	29.4%	10
	11 to 15 quintals	11.8%	4
	16 to 20 quintals	11.8%	4
Quality	20 to 25 quintals	41.2%	14
	Organic coffee	64.70%	3. 4

According to Table 1, in a population of 34 people, women constitute 35.3%, while men represent 64.7% of the population. The majority of people are in the age group of 20 to 30 years, with a percentage of 47.1%, which

indicates a mostly young population. It is important to highlight that the most common means of transportation used in the coffee production process is pack animals, representing 50% of the population.

A diversity of materials and raw materials used in daily activities is observed. Sacks and organic fertilizer are more used by 22% of producers, plastic bags are used only by 13% of the population, and plastic bags by 11%, this may indicate that plastic bags are used for shopping or storage, while pesetas can be related to specific activities. *Petate* is used by 7% of the population, which reflects the preservation of traditional practices.

There is a variety of activities related to the coffee harvest, with the equitable distribution of participants in each activity, with percentages ranging between 7% and 9.5%. Activities such as shade management and the use of organic fertilizer with a percentage of 8.2% of the population and coffee selection is carried out by 7%, which represents a significant part of the participation. These activities are related to the production of high-quality coffee. In addition, there are several stages of the process such as washing and drying that have a 9.5% participation, which suggests a comprehensive commitment to obtaining an exceptional final product. Some activities, such as pest and disease control, have 7% participation, which indicates the need for technical training.

A group with high productivity stands out, representing 41.2% of the population that achieves between 20 and 25 quintals of coffee. 64.7% is classified as organic coffee. This reflects a commitment in the Amazonas Region to the production of high-quality coffee.

Table 2. Sustainability analysis

Variables	%	Total	
Permanence in the market	1 to 2 years	17.6%	6
	3 to 4 years	17.6%	6
	5 to 6 years	11.8%	4
	7 to 8 years	17.6%	6
	9 or more years	35.3%	12
Cost effectiveness	Low	17.6%	6
	Regular	35.3%	12
	Good and excellent	47.1%	16

According to table 2, 35.3% of the companies in the study have maintained their presence in the market for 9 years or more, which indicates that there is stability in this business segment, possibly related to continued success in your activity. Company profitability shows that 47.1% are classified as good and excellent, indicating that there is a significant group of companies with strong financial performance.

Table 3. Market analysis and marketing

Variables	%	Total	
Competitiveness	Customer loyalty	100.0%	3.4
Prestige	Low	5.9%	2
	High	94.1%	32
Distribution	Transport for transfer	24.2%	8
	Package registration	33.3%	11
	Delivery compliance level	42.4%	15

Table 3 shows that competitiveness in terms of customer loyalty is notable with 100.0% of the companies in the study showing a solid focus on customer retention and satisfaction. 94.1% are classified as companies with high prestige, which indicates that the vast majority enjoy a solid reputation in the market. Having methods to manage your logistics operations. 24.2% depend on transportation for the transfer, while 33.3% focus on package

registration as part of their distribution process. Furthermore, 42.4% consider the level of delivery compliance as a crucial aspect of their logistics operation.

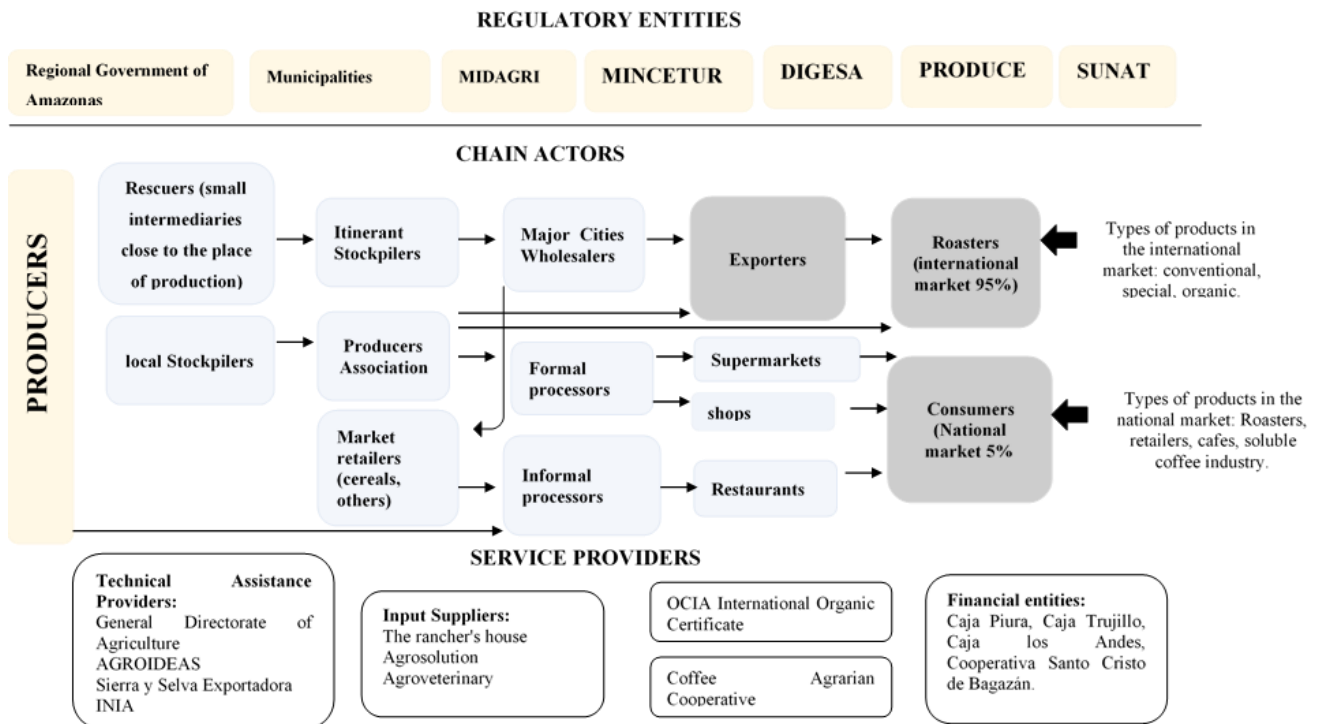


Figure 1. Coffee production chain in the Amazon region

Figure 1 shows the institutions in charge of supervising the coffee value chain in the Amazonas Region in the upper segment, the chain participants in the central segment, and the related service providers in the lower part. Regarding regulatory entities, it is important to highlight that GOREA is related to the value chain through the allocation of competitive funds granted by PROCOMPITE, where coffee is presented as one of the priority chains. Likewise, the Municipalities continue to follow a similar strategy through their economic development management, providing technical assistance to improve quality practices in the production of specialty coffee, also incorporating new activities related to management.

MINCETUR carries out training initiatives aimed at improving skills related to the sale, logistics, and export of coffee. In addition, they develop the directory of Amazonas exporters and maintain a commercial observatory for the region that focuses its attention on coffee as one of the priority value chains.

DIGESA is integrated into the coffee value chain through the issuance of health registration certificates, which are granted at the request of interested parties. They allow you to meet the requirements for the export and national marketing of coffee in the Amazonas Region.

Through its information systems on foreign trade and Peruvian exports, PRODUCE offers the possibility of consulting important official data and information. This information includes market access requirements, market research, logistical tools, maximum pesticide residue limits, benefiting customs officials, and other relevant aspects for those involved in trade and exports.

SUNAT provides training on export regimes and makes tools such as “Exporta facil” available. It also develops actions to streamline the customs clearance process, maintains a directory of exporters, and offers advice on product billing and the formats required for export, among other services and resources.

Regarding service providers, it was identified that the main providers of technical advice are: the General Directorate of Agriculture, AGROIDEAS, Sierra y Selva Exportadora, and INIA.

Concerning input suppliers, the main ones were found to be: La Casa del Ranchero, Agroolucion, and Agroveterinaria. Regarding the organic coffee certificate, the supplier is the OCIA International company, together with the coffee cooperative.

Finally, in the field of financial institutions, those that operate through their branches in the Amazonas Region have been identified, which include Caja Piura, Caja Trujillo, Caja los Andes, and Cooperativa Santo Cristo de Bagazán. All of these entities offer financing services for agricultural producers.

3.1. Discussions

Regarding coffee production, most producers mainly use pack animals for transportation. The most common materials are sacks and organic fertilizer, highlighting the importance of sustainability. The activities per harvest are varied, which demonstrates attention to quality in the production process. Most focus on producing 20 to 25 quintals of coffee, indicating a focus on larger-scale production, and organic coffee production is the norm, reflecting the growing demand for sustainable coffee in the market. Many of them are associated with an organization to facilitate the marketing of coffee. These findings are similar to the research carried out by [36] where it shows that producers are responsible for carrying out the primary activities in coffee production, which include acquiring seeds or seedlings, managing the crop, harvesting, carrying out the initial stages of coffee processing (such as pulping, fermentation, washing, and drying), as well as transportation and marketing. In general terms, according to [39]. Its main objective is to achieve profitable and high-quality production, intending to sell it at the best possible price and guarantee the livelihood of its families. According to [46] these may vary depending on whether they are affiliated with a producer organization that facilitates both the production and sale of coffee.

Cooperatives and associations support their members in the production and marketing of coffee [45], to ensure that the coffee reaches the collection center and is not lost through other channels, organizations often provide transportation from the field to the collection center [40]. They also provide their partners with access to technical assistance, plant materials, technologies, and technical training [27]. In some cases, organizations can facilitate obtaining credit or advances [24].

Organizations typically certify their operations and those of their partners with one or more certification seals or programs, for example, Fair Trade, organic, or UTZ [27]. In general, [76], [78], [79] the certified and collected coffee is separated according to the seal and exported directly to customers abroad according to its traceability chain, following the transformation process from parchment coffee to green coffee and shipping at the port to its destination abroad.

The involvement of institutions is key to strengthening the productive chain. Consequently, with this, [36] mentions that certain public institutions provide services to producers and in this way, contribute to the construction of the enabling framework for the promotion of the sector. This group of actors includes municipalities, regional governments, and ministries such as MINAGRI, MEF, MINCETUR, SUNAT, and Customs. Also included in this group are the unions of organizations such as the National Coffee Board, the Peruvian Coffee and Cocoa Chamber, and NGOs.

4. Conclusions

The coffee chain in the Amazon region is made up of producers as the first link, after them the local collectors are present as associations and cooperatives and in turn free trade who are the intermediary buyers. In the transformation link, there are few companies or producers that carry out this transformation to their products, the best-selling being parchment coffee. Institutions are also present in the chain, as shown in Figure 1, where in addition to them there are input marketers such as fertilizers and seeds. The main international export markets are Canada, the United States, and Germany.

From the perspective of the analysis, the majority of producers dedicated to coffee production are made up of young people, mainly between 20 and 30 years old. Furthermore, there is equality in the distribution of participants in a wide range of activities related to coffee production, from shade management to coffee selection and processing. This indicates a great commitment to the quality and comprehensiveness of the production process. The choice of sustainable materials, such as sackcloths and organic fertilizer, along with the predominant use of pack animals as a means of transportation highlight a commitment to sustainable practices in coffee production. Furthermore, the diversity of materials used in daily activities reflects an adaptability to diverse needs and some respect for traditional practices.

On the other hand, there is a considerable group of producers (41.2%) who achieve high productivity in the coffee harvest, generating between 20 and 25 quintals. At the same time, more than 64.7% of production is classified as organic coffee, indicating a commitment to quality and reflecting a positive response in markets that value high-quality and sustainable products. Finally, companies show notable stability, as 35.3% have maintained their presence in the market for 9 years or more. Additionally, almost half (47.1%) of these companies are considered financially sound. The competitiveness of companies stands out for their customer loyalty, and a large majority (94.1%) enjoys high prestige in the market. Logistics management and transportation care, package registration, and delivery compliance are essential to maintain high standards of customer satisfaction.

5. Limitations and recommendations

The limitation of the study was the availability of access to the producers and the distance of location between the actors in the provinces of the region. In addition, the variety of crops and the variety of products for commercialization, as well as the market, were the main limitations to uniformizing the mapping of the chain.

A recommendation would be to conduct research to evaluate demographic trends, opportunities, policies, the application of the SDGs, and identify barriers to the participation of the youth population and gender-linked factors in the production, processing, and distribution of coffee cultivation in the region and the country. Furthermore, it is advised to develop and apply methodologies aimed at determining the profitability of coffee production and the costs and benefits of climate change in the coffee value chain of small producers to seek sustainability throughout the value chain.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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Author contribution

The authors note that all participated in the research: DSMF, review and drafting of the survey; AJSP, writing the first draft; MRB, editing and proofreading; OCC, development of the survey and methodology; AKCP, conducting and writing the survey.

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