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ORIGINAL ARTICLE

Added Value of Paria Cheese in the Lake Zone of the Titicaca Basin

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Abstract

This article analyzes the value added (VA) generated in four plants in the lake zone of the Titicaca basin in Peru. For this purpose, three links with their corresponding linkages and restrictions were determined: provision of cattle feed, dairy cow breeding and cheese manufacture. The market price was considered as the equivalent of the gross value of production (GVP) of the final product and intermediate products. The VA, in each link of the chain, was broken down into labor, capital, land, taxes and producer surplus; and intermediate consumption (IC) was broken down according to origin: national (N) and imported (M). The VA, per kilogram of final cheese product, at April 2020 prices, was determined at 10.68 soles in Acora, 9.30 in Plateria, 11.51 in Huata and 10.31 in Taraco; that, the magnitude of VA is conditioned by the placement price of the final product, and this in turn is constrained by income, willingness to pay (WTP), consumer tastes and preferences in the usual local market niches; and that, over the 84.5% of the VA is carried out at the local level.

Keywords: paria cheese, Lake Titicaca, value added.

1. Introduction

In the domestic market, fresh cow's milk is the most important raw material in cheese production. In this market there is unsatisfied demand for quantity and quality. In 2015, the country's trade balance shows that cheese imports amounted to US$23.8 million, while exports did not reach US$0.4 million. Puno is currently the sixth most important dairy basin in the country with an approximate production of 200,000 liters/day, destined to the processing of dairy products, among which cheese stands out clearly. In this context, in the Puno region and in the lake zone of the Titicaca basin, due to the need to increase their income, the rural population has reoriented their economic activities, clearly highlighting among them, the breeding of "improved" dairy cows, milk production and its transformation into cheese. Paria or Paria-type cheese is being recognized in the national context and is positioned as one of the flagship products of the Puno region; however, what is now marketed is a cheese made exclusively from cow's milk, known as "Paria-type" since the authentic "Paria" cheese incorporates a proportion (5 to 10 percent) of sheep's milk. However, economic growth in cheese production is generated by family microenterprises, producer associations and cooperatives, with inappropriate management of resources and poor disposal of whey waste. Therefore, such growth is unsustainable in the context of a competitive market economy and demanding consumers.

2. Materials and methods

The study corresponds to the sphere of influence of four production plants located in four different districts, in a non-probabilistic and discretionary manner: Eco Aroma Women's Cooperative in Caritamaya - Acora, Eco Andina Dairy Producers' Association in Plateria, Ecolácteos Municipal Company in Huata and Ima Sumac Siachi Individual Company in Taraco. The area of influence mainly includes cattle ranchers who supply milk to the plant and farmers involved in dairy farming.

The following information-gathering instruments were used: proximity survey of the cheese production plants and their environment, interview guides with professionals and technicians involved in the field, cattle ranchers and farmers linked to the milk production plants, and technical personnel from the milk production plants. In addition, life stories of representative personalities were collected and some sessions of the Puno dairy roundtable were attended.

It was considered that the market price of the final cheese product contains values that are added to the IC of various goods (raw materials, inputs or energy). However, these intermediate goods are also the result of other production processes that also involve VA and IC.

$$Price_X = GVP_X = IC_Y + VA_Y \tag{1}$$

The IC of good Y, for the production of other products, can be of national origin (ICYN) or imported (ICYM), equation (2).

$$IC_Y = IC_{Y\,N} + IC_{Y\,M} \tag{2}$$

The VAX, equation (3), was considered as the sum of remunerations to the labor factor (Rw)in the form of wages and producer surplus; remunerations to the capital factor (RK) in the form of interest on money capital, depreciation for the use of infrastructure, machinery, equipment and biological assets; remunerations to the land factor (RT) in the form of rents and opportunity cost of land; and finally, remunerations to (from) the government in the form of taxes or subsidies (T).

$$VA_X = R_W + R_K + R_T + T \tag{3}$$

In order to homogenize market prices obtained at different times and make them comparable, it was necessary to deflate or update them with the consumer price index (CPI). Infrastructure, machinery, equipment and livestock were considered as assets and depreciated on a straight-line basis for replacement purposes.

3. Results and discussion

In the Lake Titicaca basin, the rainfall, climate and temperature regime is variable due to geographical factors: altitude, latitude and longitude. Altitude determines the amount of precipitation (less on the east side than on the west) and the form (rain, hail, snowfall and fog). In terms of latitude, precipitation and humidity are higher in the north than in the south. Regarding longitude, on the east side the eastern mountain range generates a barrier effect; but in the west, the western mountain range causes an increase in rainfall as it discharges the rest of the humidity that passed the eastern barrier and that generated by Lake Titicaca. During the day, air moves from the lake to the grassy plains and at night the process is reversed. According to Andrade (2018) rainfall is concentrated between the months of December to March, in November and December the maximum temperatures during the day are the highest and reach 19° C and, between June and July night temperatures are the lowest of the year, they can reach 4° C below zero.

Castellano and Goyzueta (2015) consider that the VA is the difference between production and intermediate consumption and represents the contribution of labor and capital to the productive process, they point out that its link with the concept of Gross Domestic Product (GDP), is literally one of identity, recalling that for Marx there are three original sources of value: labor, capital and land,

emphasizing that capital is nothing more than "saved labor", in a preterit form. Recalling Aristotle, Smith, Ricardo and Marx, Salvador (2016) points out that VA is the amount by which the value of the product is added at each stage of its production. Four dimensions are recognized in the value chain: the input-output structure, the geographical coverage of the product, governance and the institutional framework (Oddone et al. 2014). Through these procedures, the sources of VA, GVP and GDP are clearly obtained. The positive participation of productive units in value chains can strengthen productive activity, generate employment, increase competitiveness and productivity, attract capital, increase tax revenue and improve the relationship between the public and private sectors of the economy (Oddone et al. 2014).

In the value chain, milk was previously identified as the main IC of the cheese product. In the intermediate product milk, pasture and forage crops and the dairy cow were identified as the main ICs. Cultivated pasture and forage also incorporate seed and fertilizer ICs among the most notable; but, the exchange value of seed and fertilizer is small and external to the field so it was considered irrelevant to disaggregate them. The cow, as a product, is also the result of IC, among which pasture and cultivated fodder stand out. For the quantities of feed and inputs required, productive and reproductive indexes were assumed based on consultation with specialists, local research, dialogue with producers and direct observation. Total milk production was obtained by interpolation on lactation curves from Vilca (2018) for Brown Swiss PPC cows in Chuquibambilla, Apaza et.al. (2016) for Holstein crossbred cows with Criollas in Achacachi - Bolivia and Bueno (2018) in Cajamarca.

The agricultural units near the lake are more benign for agriculture, but also smaller and more densely populated. In the study area, there is no division of labor in the sense of specialization, with some considering themselves exclusively agricultural and others livestock farmers. The district of Acora has four zones differentiated by altitude: low, medium, high and mountain range; Platería does not have a mountain range; Huata has two zones: little in the low zone and more in the medium zone; on the other hand, in Taraco, there is a certain territorial equivalence between the low and medium zones. The district rural population growth rates, inter-census, are negative for the period 2007-2017, which denotes an absolute decrease in population, especially in rural areas, but not due to a decrease in the birth rate, but due to emigration. The population from 20 to 60 years old is lower with respect to children, adolescents and older adults. Lifetime migration statistics from 1940 to 2017 indicate that Puno is a net expeller of population.

3.1 VA in the agricultural phase

The cultivation of pasture and forage crops, at the district level, during the last 20 years, with respect to the 1996/1997 season, grew exponentially (INEI 2013); likewise, the number of producers using fertilizers in sufficient quantity is in the range of 1.62 percent to 2.21 percent and, in small quantities, in the range of 15.59 to 48.16 percent (INEI 2013). In the study area, it was found that producers preferably fertilize their soils with manure, in decomposed and semi-dry form. The scarcity of manure conditions that each producer prefers it for their soils rather than for commercialization. The preparation of compost from organic residues, worm humus and biol is not unknown by the producer, but its practice is not usual.

The IC of national origin mostly comes from the local sphere and corresponds to soil analysis services, rental of agricultural machinery and transportation of inputs; but each service incorporates VA since the IC itself is reduced to reagents, fuel and lubricants. This is a positive situation since it increases the VA. The IC of inputs of foreign origin corresponds to imported seeds and fertilizers, which implies the sacrifice of foreign currency, economic and technological dependence since it generates employment, income, higher consumption and welfare abroad.

In terms of VA, the land resource is a source as an object of human appropriation and productivity, its value was calculated as an opportunity cost linked to the rental price in a market with distortions since any outsider cannot have access to a plot of land, the owner prefers to rent to his family and relatives. In addition, this is a hedonic price because its formation involves various environmental attributes

such as: access to water and roads, soil fertility and microclimate, among the main ones. In rural areas, the organization of producers is strong, and not assuming the position of lieutenant governor or abandoning it can result in the loss of possession and use of the land. Agricultural machinery is in short supply, particularly at planting time, and service providers are not interested in small landholdings, so they require some form of association on the part of the interested parties, otherwise the price of the service is unaffordable.

Natural pastures, harvest residues from agricultural crops, mainly quinoa and beans, also constitute livestock feed, available after the January, February or March harvests; however, they do not constitute VA since they are not cultivated or traded in the market and, in addition, their low economic value is already incorporated in the market price of the main product.

3.1.1 Special features of the VA of the alfalfa + dactylis association product

Regarding the use of the alfalfa + dactylis and white clover + rye grass associations, the producers prefer to graze their cattle on the pastures cultivated for direct consumption and in green, for which they fasten the cow with a rope to a stake for 3 to 4 hours. In the case of pure alfalfa, the producer is more careful, previously giving his cows a dry forage ration. In the VA, the largest component corresponds to the labor factor (75 percent) in the form of wages and producer surplus, followed by the land factor contained as an opportunity cost valued at the rental price. Thus, the proportion benefiting the producer amounts to 86 percent of the GVP since, generally, he is the owner, possessor and usufructuary of the land he works. But, there are social and environmental costs to consider. Alfalfa seed is imported, transgenic, sterile, and is supplied in monopolistic and oligopolistic markets, generating technological dependence; it can also generate negative externalities on soils. However, for local conditions, there are no known VA studies on alfalfa, much less social profitability or valuation of externalities.

Table 1. VA of one hectare of alfalfa + dactylis crop for eight years average life, average technology, green matter and April 2020 prices.

	Soles	Percentage
INTERMEDIATE CONSUMPTION	4,230.6	11.4
Non-traded inputs	1,290.0	3.5
Traded inputs (foreign exchange)	2,940.6	7.9
ADDED VALUE	32,874.2	88.6
Taxes	232.3	0.6
Labor factor	27,818.2	75.0
Capital factor	823.7	2.2
Land factor	4,000.0	10.8
GROSS VALUE OF PRODUCTION	37,104.8	100.0

Source: own elaboration.

3.1.2 VA peculiarities in the cultivation of forage oats.

In the case of forage, oats are preferred in the departmental context; but, in the local context, barley is equally preferred, with a slight advantage for oats in Huata and Taraco and forage barley in Acora and Plateria. The scarcity of irrigation infrastructure means that the supply of fodder is highly dependent on rainfall and one harvest per calendar year. The preferred varieties are several, generally imported, with similar yields; of these, the most accepted is Tayko because of its great adaptation and yield. The VA of oats, in proportional and absolute terms, per hectare cultivated, is much lower than that of alfalfa due to the annuality in CI for machinery, equipment and seed transportation services. Economic studies of forage oats are limited to the calculation and discussion of production costs. In that approach, Mamani (2016) considers that the cultivation of forage oats in large producers is more efficient and profitable than in small and medium producers, mainly due to lower costs for the use of agricultural machinery and technical assistance. The merit of Mamani (2016) is that he approaches the concept

of VA by disaggregating the market price into marketable costs, production factors and profits with which the VA for the province of Puno represents 37.3 percent of the market price, lower than our calculation; however, he does not show which cost concepts, direct or indirect, variable or fixed he considers inputs or factors because there are inputs that are not traded and there are traded factors that do not constitute inputs.

Table 2. VA of one hectare of rainfed fodder oat crop, one crop year per year, average technology, green matter and April 2020 prices.

	Soles	Percentage
INTERMEDIATE CONSUMPTION	1,895.10	58.5%
Non-traded inputs	1,529.0	47.2%
Traded inputs (foreign exchange)	366.1	11.3%
ADDED VALUE	1,345.0	41.5%
Taxes	96.4	3.0%
Labor factor	499.1	15.4%
Capital factor	249.5	7.7%
Land factor	500.0	15.4%
GROSS VALUE OF PRODUCTION	3,240.1	100.0%

Source: own elaboration

3.2 VA in the livestock phase: fresh milk

At the district level, according to the last agricultural census (INEI 2013), the cattle capital is almost exclusively Brown Swiss and represents 59.9 percent of the cattle herd in Taraco, followed by Huata (37.7 percent), Acora (20.9 percent) and Plateria (9.2 percent). The differences are reduced if the territory is narrowed down, excluding the high and puna zones in Acora and high in Plateria because of the higher risk due to the altitude factor; also, the census results ignore the levels of cattle "improvement". The "improvement" of cattle via artificial insemination in Creole cows is the most usual practice (INEI 2013), highlighting Taraco, where 50 percent of farmers have improved cows which explains why in that area there is a greater amount of milk, in addition to more than 70 formal and 40 informal dairy plants. Insemination services are provided by the government and private companies, with prices varying according to who performs the service, distance, trust, semen quality and guarantee. The replacement of assets with calves from the herd itself is the preferred option. For animal health, in some cases, the same producer is in charge of the service. The distance between farms reduces the transmission of diseases. Thus, there is an unsatisfied demand for services in terms of quantity, opportunity and quality. The trend is to rescue the productivity and size attributes of Brown Swiss and the hardiness and longevity of Criollo cattle. In terms of sex, males represent less than 30 percent of cattle (INEI 2013). In this regard, Marca (2008) reports that in the 1980s, milk production was a secondary activity, as cattle fattening for beef was preferred.

When reviewing various studies on milk production, the following particularities were observed: the analyses are inclined and limited to production costs, the calculations ignore the useful economic life horizon of the asset, the data correspond to records of herds of pure cattle of medium and large properties, they ignore the depreciation of the biological asset and do not add as income the residual value of the cows or calves as by-products.

In the GVB for dairy cows, the highest IC corresponds to feed, followed by replacement of the biological asset and health. In the calculation of the GVP, the depreciation of the biological asset (the cow), the replacement cost (breeding and rebreeding of dairy calves), feed, opportunity costs of labor and land were incorporated. Berra et al. (2012) consider that the depreciation and replacement of the asset represents from 8% to 25% of milk production costs, which implies 15 to 20% in replacement cost in heifers.

In the middle and lower zones, natural pasture is scarce, so producers use a lot of natural grasses.

0.30 to 0.40 hectares for alfalfa, as well as forage oats or barley. The cow and her calf are generally managed together, tied to different stakes. For Taraco, Estofanero (2015) indicates that producers prefer the association alfalfa with dactylis glomerata. In Huata, it was found that the alfalfa varieties available are: WL 320, WL 325 and WL 350. Additionally, cattle are provided with quinoa, fava beans and cañihua (Ojeda 2017) weeds according to the time of year. Weeds from agricultural crop weeding are distributed between January and March, at the conclusion of the harvests. From June to August, cattle are moved to the cultivated areas to take advantage of the residues of panllevar crops: potato, quinoa, broad beans and oca mainly. In the areas surrounding Lake Titicaca, families can extract up to 4.6 tons of fresh totora per year, 96.7 percent of which they use as fodder for cattle Avalos (2015). Fodder consumption is 25 to 35 kg per day, for this they have, on average, three thousand to four thousand 18 kg bales per season, for self-sufficiency. Exceptionally, some producers with more land produce surplus fodder and offer it during the lean season. Balanced feed in the region is supplied by the companies Tomasino, Purina, Alicorp and Mercedes, but consumption is marginal.

The GVP of a dairy cow is expressed in three products: milk, calves and cull cow. The VA of the milk product is part of a cow's VA and a proportion of its corresponding GVP, calculated via economic allocation. It represents at least 34.8 percent (Taraco) of the GVP. In absolute terms, it means milk income of at least 6,818 soles per cow in Plateria during her entire lifetime (10.19 years), which is equivalent to 669.1 and 55.8 soles per cow per year and month respectively. Thus, it is concluded that the income of small landowners for the milk product is too low, which requires technological innovation from the producer and, in addition, the incorporation of other products with new value. The results of VA of milk are not strictly comparable with other studies because the VA approach incorporates utility as opposed to the cost approach. With these limitations, Sanchez (2012) points out that milk gives a profitability of 14 percent, disaggregates costs into fixed and variable costs incorporating reproduction and replacement as fixed costs (FC), with which he concluded that the VC of dairy cow feeding represents 47.7 percent of the total cost. But, in detail, reproduction and replacement FCs are not always purchases, they also incorporate feed, in the case of rebreeding, thus increasing the proportion of feed to total cost and price. Therefore, our IC results would be close to the CVs found by Sanchez (2012). A detailed look at the IC shows that feed represents more than 97 percent of that item, which suggests that the activity generates high VA to the extent that the producer produces his own feed.

In the VA, the greatest proportion corresponds to the labor factor, followed by the land and capital factors. In the labor factor, there was a strong participation of elderly women, which was valued as opportunity cost; besides, there are merit goods that the rural population values (tranquility, freedom), defensive expenses that are deducted (contamination, damage to health), public services, usable by-products (sweet whey, harvest residues); additionally, the rural producer is self-employed, stable, part-time and can engage in other activities at the same time. Regarding the capital factor, most producers have corrals and sheds built with local materials: stone and mud, roofed with calamine, but not very thermal. They also have drinking troughs and feeders made of noble material, which allow for better ration management.

The biological asset market is dynamic and takes place in the so-called "k'atos", starting at 4 and 5 o'clock in the morning. These "k'atos" are cattle marketplaces where producers take previously fattened cattle and surplus weaned calves. There are few female cattle, except if they are for best specimens of a cattle ranch.. The relevant places in the area are: Saturday in Acora and Sunday in Ilave for Plateria and Acora cattle ranchers; Paucarcolla, on Wednesdays, the closest for Huata producers; and, finally, on Thursdays in Taraco and Sundays in Huancane and Juliaca. The buyers, known as "rescatistas" (middlemen), are local, use the local language and act as an oligopoly by not allowing other buyers to participate, distorting prices against cattle ranchers. The stockpiled cattle are transported to extra-regional markets (Arequipa, Tacna, and Lima for a second fattening stage) and local markets for direct slaughter (Ilave, Puno, and Juliaca).

Table 3. VA of the production of an "improved" dairy cow during the whole life cycle at April 2020 prices.

	Soles				Percentage			
	Ácora	Platería	Huata	Taraco	Ácora	Platería	Huata	Taraco
INTERMEDIATE CONSUMPTION	18,692	14,897	16,964	18,692	65	61	60	65
Non-traded inputs	18,692	14,897	16,964	18,692	65	61	60	65
Traded inputs (foreign exchange)	0	0	0	0	0	0	0	0
ADDED VALUE	10,173	9,389	11,251	9,970	35	39	40	35
Taxes	7	7	7	7	0	0	0	0
Labor factor	8,477	7,714	9,540	8,238	29	32	34	29
Capital factor	679	649	694	724	2	3	2	3
Land factor	1,011	1,019	1,011	1,011	4	4	4	4
TOTAL, GVP	28,865	24,286	28,215	28,672	100	100	100	100
Raw milk	21,835	17,636	20,995	21,072	76	73	74	73
Hatchlings at birth	3,330	3,150	3,420	3,600	12	13	12	13
Residual value of cow	3,700	3,500	3,800	4,000	13	14	13	14

Source: own elaboration.

3.3 VA in the manufacture: paria type cheese

In terms of IC we observe that it represents more than 74.2 percent of GVP. The purchase of milk represents 84.2 percent to 94.7 percent of the IC. Another important part of the IC corresponds to the fuel required, both in the collection of milk and in its preparation for cheese production. Other inputs (rennet, salt and others), in relation to the IC, are not significant. The price of milk IC in each area is configured in a particular way: in Huata, the municipality is a monopsony, an unfair competitor of other private cheese producers, causing their exit from the market and distorting the role of the State; in Acora and Plateria the situation is not very tense, there is mutual agreement on the price, since the farmers are also owners of the cheese plants; and in Taraco, the plant has a certain advantage over the farmers and conditions the price downwards. In any of the scenarios, we are facing captive markets.

The highest VA is generated in Huata (25.8 percent), followed by Acora (25.6 percent), then Taraco (24.6 percent) and finally Plateria (13.7 percent). In a way, the VA reflects the profitability and economic efficiency of the activity. In the case of Huata, the higher VA corresponds in part to the larger scale of production, which may decrease if the company ceases to be subsidized and its accounting becomes more honest. In Acora, the VA expresses real profitability., it is explained by greater efficiency, better quality, higher-priced product placement and better market positioning. In Taraco, its VA is explained by its better roadside location, direct retail sales and strictly private management. In Platería, its VA is lower because it pays 10 cents of sol more per kilogram of milk than the other plants. Regarding the components of the VA, we observe that the labor factor is remunerated in more than 64.5 percent, which indicates that the activity is intensive in the use of labor, generating employment and self-employment at the local level.

3.4 VA synthesis in pariah type cheese

Adding value implies transforming inputs into more valuable intermediate and final products (Coltrain et al. 2000). The total VA of pariah cheese is shown in Table 4, which details the VA generated in each link of the production chain. The total VA fluctuates between S/. 9.30 in Plateria and S/. 11.51 in Huata, per kilogram of cheese, which represents more than 77.5 percent of the GVP. The ratio of VA to GVP reflects the level of disaggregation of final product prices into prices of the most relevant intermediate products. That means that, if the other local inputs are identified and disaggregated, the proportion of local VA would increase; and, additionally, if we disaggregate the other non-local inputs the IC would be a value close to zero (Castro and Mokate 2013), because in essence everything is VA.

This VA expresses the level of transformation at origin, enables dynamism in the local economy, vertical integration and development with social inclusion (Bragachini 2010). From the perspective of

Table 4. VA in the manufacture of pariah type cheese by daily production, production unit and prices for April 2020.

	soles				Percentage			
	Ácora	Platería	Huata	Taraco	Ácora	Platería	Huata	Taraco
INTERMEDIATE CONSUMPTION	2,132	1,017	7,269	348	74.4	86.3	74.2	75.4
Non-traded inputs	2,132	1,017	7,269	348	74.4	86.3	74.2	75.4
Traded inputs (foreign exchange)	0	0	0	0	0	0	0	0
ADDED VALUE	735	162	2,531	114	25.6	13.7	25.8	24.6
Taxes	107	21	254	3	3.7	1.8	2.6	0.7
Labor factor	510	104	2,222	102	17.8	8.9	22.7	22.1
Capital factor	108	27	45	5	3.8	2.3	0.5	1.1
Land factor	10	10	10	3	0.3	0.8	0.1	0.6
TOTAL, GVP	2,868	1,179	9,800	462	100	100	100	100
% milk / intermediate c.	84.2	93.0	94.7	94.1				
Kg milk/kg cheese	7.8	8.1	8.3	8.3				
% respect of VA					69.3	64.5	87.8	89.9

Source: own elaboration.

a geographic region (Kraybill and Jhonson 1989), the high proportion of local VA expresses the level of sales of a territory with respect to its purchases, which translates into higher income for the area and benefits for all the families involved in the entire chain.

Remuneration to the labor factor is the most significant part of the VA since it represents more than 72.4 percent of what is obtained in this item for cheese, which ratifies the concept that labor is the source of value creation because it has the virtue of transforming nature and raw materials into goods for the satisfaction of human needs. Thanks to labor, part of the VA is destined to taxes for the benefit of the sectors of the population considered by the government, another part can be used for the renovation of the economy of the capital. Furthermore, considering that the land is owned by the rancher, who does not pay rent to another, the benefit linked to the rural population involved amounts to more than 76.0 percent of the VA.

VA is subject to appropriation, there are generally problems of intersectoral inequity (Gaudin and Padilla 2020). Although VA is generated in all links, the agricultural sector has a relative advantage, from 35.8 (Huata) to 43.3 percent (Plateria); in second place, the livestock phase and, finally, the manufacturing phase, which participates in a smaller proportion. Between the livestock and manufacturing phases, a certain equity is perceived, which in some way expresses intersectoral competition, that profit rates in more competitive markets tend to converge. The particularity is Plateria, the manufacturing phase participates in a smaller proportion in the distribution of VA because the farmers and ranchers control the manufacturing phase for themselves through their association, which allows them a more direct control, although not necessarily more efficient.

In absolute terms, VA is limited by price. The highest VA is in Huata (S/. 11.51) and the lowest in Plateria (S/. 9.30); this is partly explained by the higher placement price in Huata (S/. 14.00) than in Plateria (S/.12.00). The higher price in Huata is partly explained by its greater proximity to the urban markets, Puno and Juliaca; this also occurs in Taraco where the company's point of sale is on the roadside. Market positioning is another variable that explains the higher price. In Huata, the company, being state-owned, indirectly supports its product because consumers perceive it as serious and of high quality; something similar occurs in Caritamaya, where its product is positioned but the greater distance from the highway and urban markets detracts from its advantage. The opposite is true for Plateria, since it is a new business and the product is not yet positioned in the market.

The VA in the manufacture of cheese can be increased because there are sub-products that were not included in the calculation, such as butter and yogurt, which do not necessarily require more milk input but additional processing, as in the case of Acora and Plateria. However, these products are not in high demand so their production is eventual and on demand; strengthening these sub-products

Table 5. VA contained in a kg of cheese product according to production factor, cheese plant and prices forApril 2020.

	soles				Percentage			
	Ácora	Platería	Huata	Taraco	Ácora	Platería	Huata	Taraco
Taxes	0.61	0.34	0.48	0.21	5.7	3.6	4.1	2.1
Labor factor	7.80	6.73	9.20	8.13	73.0	72.4	79.9	78.9
Capital factor	1.04	0.87	0.63	0.70	9.7	9.3	5.5	6.8
Land factor	1.23	1.37	1.21	1.26	11.5	14.7	10.5	12.2
VA total cheese	10.68	9.30	11.51	10.31	100.0	100.0	100.0	100.0
VA total cheese	10.68	9.30	11.51	10.31	80.8	77.5	82.2	81.0
Total IC cheese	2.53	2.70	2.49	2.42	19.2	22.5	17.8	19.0
GVP = Price of cheese	13.21	12.00	14.00	12.73	100.0	100.0	100.0	100.0

Source: own elaboration.

would increase the VA, reducing the environmental impact and making the activity more profitable. At Taraco, part of the salted whey is used to produce yogurt. The sweet whey is a waste that can be used throughout the area; it is mostly given away and returned to suppliers who prefer to use it for raising pigs and even to mix it with fodder.

The IC also explains the amount of VA. The IC states that purchases of extra-local origin are in the range of 17.8 (Huata) to 22.5 percent (Silverware) of the cheese product's GVP. This means that there is a significant margin to reduce these purchases in favor of local development; purchases that are not easy to reduce as in the case of certified seeds, SFT, fossil fuels and semen straws; however, it is strategically appropriate to reduce this IC since it involves technological independence and food security.

In the input-output (I/O) model, the multiplier makes it possible to analyze the impact of cheese production on the regional economy (Cabrera et al 2008). The value of the multiplier is a quotient between the value of the impact of cheese production and the value of the final cheese product, it expresses the direct drag capacity of the sectors linked to it, the magnitude in which cheese production stimulates the market of the linked ICs: milk, pasture and fodder, cattle, seeds and others. In Huata, the multiplier is the lowest, expressing that the product of all sectors linked to cheese production increases by 1.3 soles when cheese production grows by one sol per kilogram of cheese. This shows that the agricultural sector is highly inclusive, labor intensive; therefore, highly socially profitable since it generates self-employment with little capital. In this scenario, MINAGRI (2017) identified that the technical coefficient of fresh milk is 36.1percent. That means that the Peruvian dairy industry, for every 100 soles of sales of its processed products (cheese, yogurt and milk) retribute only 36.1 soles to its suppliers, appropriating for itself 63.9 percent of the GVP, highly beneficial for the oligopoly to the detriment of primary producers.

Table 6. Final product multiplier for pariah-type cheese by value chain and geographic area

	Ácora	Platería	Huata	Taraco	Unidad
Price of a kilogram of cheese	13.2	12.0	14.0	12.7	soles
Demand for milk and other cheese supplies	9.6	10.1	10.2	9.4	soles
Demand for pasture and fodder grown for milk	5.9	5.8	5.8	5.9	soles
Demanda de semillas y otros insumos para forrajes	2.4	2.9	2.1	4.1	soles
Impact of the increase in cheese production	31.1	30.8	32.0	32.0	soles
Input-output multiplier	2.4	2.6	2.3	2.5	

Source: own elaboration.

Therefore, we consider that the simple rentier analysis of benefit-cost, neutered and limited to income and expenditure, is inappropriate and clumsy because it has led some to point out that the activity is not profitable (Sánchez 2012). False, the activity is profitable, given the opportunity cost of labor. That is why producers persist in the activity, they are not fools, they would have already migrated and abandoned the business completely. Obviously, the activity is not very profitable and the

technical and economic challenge is precisely to make it much more profitable.

4. Conclusions

In the value chain analysis, a low total local VA was found, ranging from 9.30 (Plateria) to 11.51 (Huata) soles per kg of product, mainly due to technological, vertical integration and territorial limitations limited to the local market. Of the total percentage of VA, more than 35.8 percent of VA is generated in the agricultural phase and at least 72.4 percent is linked to the labor factor. The milk supplier-cheesemaker relationship requires better integration. In addition, the following can be appreciated:

a) Agricultural activity generates VA from alfalfa + dactylis and forage oats, although without the use of chemical nitrogen fertilization. Production is limited by the size of the property, seasonal rainfall, under-employment of labor and low use of agricultural machinery.
b) In livestock farming, milk is the major source of VA. More than 90 percent of the product goes to cheese in each area. Ranchers improve their Creole cattle with Brown Swiss; however, they do not keep records and link to the market mainly to access artificial insemination and animal health services.
c) In the cheese manufacturing process, more than 64.5 percent of the VA corresponds to the labor factor. It is also observed that fresh milk from the environment fully covers the demand of the plants, there is underutilization and inappropriate disposal of whey; and, the cheese product is sold at the plant to the collectors.

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