

# Strategies for Olive Oil Producers in Overcoming Weaknesses in the Supply Chain of Local Farms: Case of North-East Algeria

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**Abstract.** The Algerian olive oil program, launched in 2000 with the objective of planting 2000 hectare/year has seen regional differences emerging. The region of Jijel has seen an increase in installed oil mills, with the intention that these installations would lead to a significant increase in local oil olive and a more permanent local source of supply. Some such investments maybe challenged with troubling realities, some of which adversely affect their profitability. In order to avoid the risk of ceasing their activities, the oleifactors have adopted strategies to ensure constant stream of supplies, either through purchase from direct producers, or from suppliers. These transactions are strongly influenced by several factors including: the experience, the know-how, the financial means and the technological status of the equipment, the quality of the olives, the produce price and the business confidence.

**Key words:** olive oil, oil mills, supply, strategy, profitability.

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## Introduction

In the region of Jijel, the local olive industry is the most important link in the value chain for olive producers, moving them from a generic state of low market value to a specific state of higher market value. The production of olive oil and the profitability very much depends on the availability of olives during the period of oil refining activity.

The regions of more intense refining activity are those regions which have significantly higher olive growing potential that is regions in which the topography, soil and climatic conditions are conducive to olive production. The olive production volumes are very variable depending on the climate, the biological alternation of the olive tree and the mode of land management, whether irrigated or not (Agrosynergie, 2009). However, olive production in the region remains persistently

low despite the efforts and incentives made for its growth. The growth in olive farms in the region since the start of the planting program shows their regularity over time and the limitations of the program that is in place (Lachibi et al, 2019).

According to the Food and Agriculture Organisation of the United Nations, 2.7 million tons of olive oil are annually produced worldwide, 76% of which are produced in Europe. Other olive oil producers are Africa (12.5%), Asia (10.5%) and America (0.9%) (Ameziane et al, 2020). On the other hand, Morocco is one of the major olive oil producing countries with an annual production of 300,000 T (Ameziane et al, 2020).

In Algeria, this sector is showing signs of crisis with a duality between a traditional system, that is not very competitive due to geomorphological and institutional conditions and a modern system intended mainly for the production of table olives (Hadjou et al, 2013).

In Algeria, the region of Jijel by virtue of its geographical position, has significant olive growing potential which places it among the regions of north eastern Algeria that are the most productive in olives. As a result, it is also has potential as an area for industrial olive crushing, which has been an important source of income for stakeholders in the region.

The olive-growing farms in the region constitute an important source of supply for a local industry comprising 157 units scattered throughout the territory of the wilaya (province). The crushing capacities of these units are important, in particular with the installation of modern units in parallel with the establishment of the national olive oil development program in the year 2000, This provided for an increase in olive oil production and in raising the national oil olive sector to first-rate levels of international competitiveness. Studies developed by several authors (Uceda & Hermoso, 2001; Gimeno and al., 2002; Tamendjari 2006; Baccouri et al., 2008; Lachibi et al., 2019), allowed to focus on the central character of the quality as a factor of development of the sector "Olive Oil". The significant economic importance attributed to this cultivation in the regions where it is practiced justifies the extensive research efforts aimed at addressing production-related challenges (Abenavoli & Proto, 2015). According to these studies, the quality depends on several factors such as the harvest period, the region, the variety, the cultivation techniques, the mode of harvesting and storage of olives and oil as well as the mode of crushing of olives. All this in order to guarantee the food safety, optimize and adapt the production chain in case of problems or risks (Abenavoli, 2016) While the number of oil mills is increasing with significant crushing capacities, on the other hand, the production of olives on farms in the region remains low and unstable over time. This is despite the planting efforts undertaken since 2001 (Lachibi et al, 2019). Despite the increased shortfall in production from local olive farms, the oil mills continue to operate. These are two of the main questions we need to address, as to why the oil mills continued to operate, and what are the strategies developed by the oleifactors to ensure the continuity of their activities ?

## Materials And Methods

Our study consists of an evaluation of the olive oil sector in the Jijel region in northeastern Algeria. This includes monitoring progress of this industry in the region. The research work made

it possible to understand the strategies and behaviors adopted by olive oil producers to remain active in the crushing production activity, despite the weakness and instability of supply from olive farms in the region. This research work informed by two sources of information:

1 / Information forthcoming from surveys conducted of oil refineries in the region using a questionnaire. This choice experiment questionnaire supports the following methodological arguments: Identify the oil refineries having a socio-economic acceptance in the region and which better answer the specific requirements of the olive growers, and an important and relevant information source based on the declarations of the actors concerned.

2 / Information collected from public administrations: to include the agricultural services directorate (DSA) of the wilaya region of Jijel.

These methodological considerations facilitated in the final selection of a representative sample of 28 oil mills scattered throughout the territory of the wilaya (province) that is oil mills, which are legally registered in the performance of the activity. The primary challenges identified during this phase primarily revolved around the complications associated with synchronizing the shaker's operation with the movement of the workers responsible for handling the nets, primarily due to the weight and size of the nets (Abenavoli & Proto, 2015).

## Results And Discussion

### First results

#### The capacity of processing units

The number of oil mills is resultant of the observed need in the market and the financial returns, the volume of olive supply from farms in the region and the ability of players to invest. The current installed capacity of the processing units is shown in the table below (Tab 1).

Number of units	Daily capacity (quintal (Q))	Seasonal capacity (quintal)/ 3 months	Olive production
			Q/year
157	7 918	712 620	182 812

Source: Calculated from survey data. 2018

However, the peak in the creation of oil mills was recorded during the decade 2000-2009, which was characterized by the National Agricultural Development Plan (PNDA). This enabled several investors to benefit from state subsidized equipment for the creation and/or renovation of 50 units. A remarkable decline has taken place since 2010, with only 21 units created in 2013 and a further one in 2014 year.

Some of the reasons cited for this recorded decline include:

- The establishment of specifications obliging the investor to comply with the environmental and technical conditions imposed. For several applicants this imposed an additional cost on investment which was seen as a handicap for such an investment;

- insufficient local olive production to supply a large number of competing crushing units, some of which are only operating at a third of their capacity, which is a cause for mistrust;

The total crushing capacity of these units is about four times greater than the farms' supply; it covers 25% of the requirement needs for full crushing capacity. However, it must be noted that these capacities were calculated based on the assumption that each unit operates only with one shift for eight hours per day. In fact, some units operate with two shifts per day, which further reduces the real level of coverage of the needs of the oil mills by the local supply of olives, with a further shortfall in operational capacity, (unused capacity).

The volume of olives crushed during the main olive growing season is one of the predominant factors in the on-going profitability and sustainability of the activity. This is in addition to the increasing level of use and availability of olive oil which is also growing in economic importance. Based on the data provided by the oil refineries surveyed, research presented in the following table highlights the capacity of the local farms supply in meeting the demand and needs of the local oil mills (Tab. 2).

**Table 2. Coverage level of oil mills needs from local olives**

	Installed capacity Q/Day	Capacity of use Q/ Day	%
Traditional motorized (TM)	27.60	22.70	78%
Press (pressure < 400 kg/cm <sup>2</sup> ) (S)	37.00	35.00	95%
Press (pressure > 400 kg/cm <sup>2</sup> )	45.00	30.00	67%
Continuous chain of 2 phases	64.00	50.00	78%
Continuous chain of 3 phases	76.67	51.67	67%
Continuous chain of 4 phases	160.00	80.00	50%
Average	51.64	38.29	74%

Source: Calculated from survey data.

The analysis of these data confirms that the daily crushing capacities of the oil mills surveyed are under-utilized; the average utilization rate of these capacities is 74%; so that the increased use of this crushing capacity is important. This underutilization situation particularly affects the modern units with added production capacity. According to the oil mills, the low capacity utilization rate of the units surveyed is due to:

a) **The high number of crushing units**, which largely exceeds the natural supply capacity of local farms, especially with the introduction of state-supported modern equipment with a high crushing capacity. These investments are mainly with the intention of achieving a higher

production level, expected after the application of the national olive oil program in 2000, an objective which has not yet been reached.

b) **The weakness of olive production:** the low olive production levels observed in recent years has led to a significant drop in supplies at the level of the crushing units, which has made their operation only at partial capacity;

c) **Consumption habits:** local olive oil is well anchored in the diet of citizens, which makes it difficult to crush other "non-local" olives, given not only the risk of reduced demand for the product and the likely occurrence of mistrust to all of the produce of the unit, with a preference for local produce.

During our research investigation, the olive oil producers were asked if they considered their supply of olives to be sufficient. In response to this question, the vast majority that is 96.4% of the olive oil producers in the region replied that their supply of local olives was insufficient. These research results are further summarized in the following table (Tab. 3)

**Table 3. Appreciation on supplies**

Response	Number	%
Yes	1	3.6%
No	27	96.4%
<b>Total</b>	<b>28</b>	<b>100.0%</b>

source: Calculated from survey data.

#### Coverage rate for local olives

In principle, the level of operation of oil mills and their profitability are strongly linked to the volume of production of local farms and the coverage rate of the different types of oil mills. This is shown in the following table (Tab. 4).

**Table 4. Oil mills coverage rate by local production.**

	Number of days with local olives	Coverage rate	Hours / day
Traditional motorized	36.90	41%	8.60
Press (pressure < 400 kg/cm <sup>2</sup> )	45.00	50%	11.60
Press (pressure > 400 kg/cm <sup>2</sup> )	45.00	50%	8.00
Continuous chain of 2 phases	44.00	49%	11.40
Continuous chain of 3 phases	46.67	52%	8.17
Continuous chain of 4 phases	8.00	9%	16.00
Average	40.96	46%	9.79

Source: Calculated from survey data.

The data in the Tab. 4 show us the inability of local olive farms to cover the needs of olive oil mills for the entire olive season. Local olive production only runs these units for just under 41 days (40.96), on average. However, the coverage rates vary from one oil mill to another, the highest rate is up to 52% for the group of 3-phase continuous chain oil mills while the group of traditional oil mills (TM) records the lowest rate (41%). This is with the exception of a case of a continuous chain oil mill. This continuous chain oil mill had to stop production after eight days of activity following the injunction of the competent departments for non-compliance with the regulations.

However, we must take into account that the daily hourly volume of trituration differs from one olive oil mill to another as shown (Tab. 5).

Table 5.Hourly volume of trituration per day

Oil mill type	Hours / day
Traditional motorized	8.60
Press (pressure < 400 kg/cm <sup>2</sup> )	11.60
Press (pressure > 400 kg/cm <sup>2</sup> )	8.00
Continuous chain of 2 phases	11.40
Continuous chain of 3 phases	8.17
Continuous chain of 4 phases	16.00
Average	9.79

Source: Calculated from survey data.

It is evident that the quantities crushed depend closely on the production capacities of the oil mill as well as on the hourly volume produced per day. Generally, under normal conditions, the latter is regulated at eight hours per shift. The analysis of the number of hours of crushing per day of the different types of oil mills shows a significant variation. We note that some oil mills operate 16 hours per day with two teams of workers; this case is recorded in modern 4 phase oil mills with a significant crushing capacity of 160 quintals per day, which is eight times the capacity of a traditional motorized oil mill. The others record a daily hourly volume, which fluctuates between 8 and 11 hours.

Hourly volume is an important factor for the profitability of oil mills, but it depends on several considerations such as:

a) **The small quantities delivered** constitute a major constraint in achieving the daily objectives, insofar as each crushing tower is conditioned by a fixed hourly volume and a fixed output; the small quantities of 0.5, 1 or 2 quintals consume a lot of time and are not profitable. This leads the oil producers to try to obtain arrangements between the olive growers, so that they combine their deliveries in order to reach a sufficient quantity, but these required or optimal delivery arrangements are not always accepted.

b) **The condition of the equipment:** the age of the equipment, especially in traditional units, reduces the performance and is the cause of frequent breakdowns during full operation. This results in an increase in the crushing time for the same quantity of olives;

c) **Breakdowns related to spare parts:** oil producers complain about the lack of spare parts, which forces them to resort to modifications to their equipment for traditional oil mills or to purchase from abroad, paid for in foreign currency from overseas suppliers, , especially for modern units.

#### The strategies adopted by the olive oil refineries

Appropriate strategies are the most important tools in oil refineries for facilitating a well-calculated manoeuvre while maintaining a competitive advantage in the market.

#### Procurement strategies

The supply of olive oil mills is essential in the development of the crushing activity. With the increase in the workforce of the oil mills at the local level, the drop in production is causing serious competition for olives. These oil producers use two types of strategies to ensure a maximum supply of olives, depending on whether they are local olives or olives from outside the region.

Olives acquired outside the region occupy significant shares in the crushing volume of oil mills in the wilaya. Various strategies are adopted by oil producers to ensure the desired quantities of local verses non local; these strategies differ mainly by the channel chosen for their purchases as shown (Tab. 6).

**Table 6. Supply sources of olives outside the region.**

Supply	Frequency	%
Suppliers	18	58,10%
Producers	11	35,50%
Market	2	6,40%
<b>Total</b>	<b>31</b>	<b>100%</b>

Source: Calculated from survey data.

Depending on the olive oil industry, the supply of olives outside the region is completed through one of three potential channels: suppliers, olive growers or markets.

a) **Suppliers:** 58.1% of oil refineries (or oil refractories) declare that their transactions are carried out by group of actors who are distributors of olives on a national scale. They buy the olive groves in different production regions and then pick the olives, which they then sell to the olive oil producers.

b) **Olive growers:** 35.5% buy olives direct from olive growers. They pick and collect the harvest themselves on the farm after negotiating the price directly with the olive growers. This behaviour allows them to ensure the consistent quality of the olives purchased and to obtain them at lower prices. This opportunity has led some oleifactors to seek to rent the entire olive groves from the owners and to exploit them to supply their oil mills at low prices.

c) **The market:** direct recourse to markets for supply remains low and concerns only 6.4% of oil producers. Transactions within these markets are carried out through agents, who collect the olives from olive growers before reselling them to oleifactors.

This oleifactors strategy is based mainly on the following factors:

- The sale of olives: in some regions of the country, olive growers market their olives after harvest, particularly in regions where there is no heavy consumption of olive oil;
- Presence of an olive market: some regions have a regulated wholesale market for olives where agents ensure the collection and purchase of olives from local olive growers, thus allowing olive producers to obtain their supplies directly from them in sufficient quantities and at reasonable prices;
- The development of distribution channels in recent years by suppliers offering olives to local olive producers, which has prompted them to use these olives to meet their oil needs, especially during periods of low production;
- The low prices offered for non-local olives relative to those of local olives, which allow them to draw significant margins.

Two types of strategies adopted by olive oil companies when buying olives in other regions:

1. **Price strategy:** adopted by the oleifactors who market oils at low prices compared to the prices of local oils, without a great emphasis or concern for quality. They do not target a particular category of consumers but the general public, their oil mills generally being located along national or municipal roads.

2. **Strategy of a good value for money:** it is adopted by the oleifactors who have loyal customers preferring the oil of the region or oil that most closely resembles it, in particular for the taste and the viscosity. These oleifactors are elders, possessing a perfect knowledge of the regions and areas where the olives have a similarity with the local product in terms of quality and yield.

However, some oleifactors choose olives of foreign origin. This practice is confirmed by the oleifactors themselves, 28.6% of them claim to have used foreign olives, especially Tunisian ones. According to the oleifactors surveyed, the main reasons for purchasing Tunisian olives to supply their oil mills are as follows:

- **Availability:** Tunisian olives are generally delivered to the national market before the start of the harvest in Algeria with large quantities allowing local oil mills to start crushing with these olives;
- **The price:** the prices of olives from Tunisia are lower than those of local olives, which attracts oil producers allowing them to make their activity as profitable as possible;
- **Yields:** oil producers claim that the yields of Tunisian olives are higher than average yields from national olives acquired on the local markets.

a) **Transporting olives:** This method allows, depending on the olive oil industry, to provide a service to olive growers who have difficulties in transporting or accessing their farms while guaranteeing the oil mill considerable quantities of olives. This strategy has enabled oleifactors with adequate means of transport to take significant market shares, unlike those who have not invested well in this niche transportation market, who have lost potential customers and consequently has led to a drop in their level of production.

b) **Restricting crushing to local olives only:** this strategy is observed in certain olive oil producers who do not purchase olives outside the region despite the low crushing rates. This is



because they consider that the use of olives acquired outside the region can lead to the loss of the confidence of customers who are very sensitive to this kind of behaviour.

c) **Separation of transformation processes:** three types of methods can be adopted to achieve this objective. The first is to set aside a period of time only for olives acquired outside the region, either at the start or at the end of the season, depending on the intensity of the activity. The second consists in recruiting a second processing team, which works the period after the period of time devoted to the local olives by a first team. The third is to start two chains of crushing at the same time, one dedicated to olives outside the region and the second to local olives.

d) **Price of the service provided (crushing price):** modulating the prices of the crushing service is also a strategy to attract olive growers. We can thus confirm that different prices are applied at the level of oil mills in the region and that these prices vary between 700 Algerian Dinars (DA) and 1200 DA per quintal (Q).

### Marketing strategies

We have observed that 78.57% of the surveyed oleifactors declared the strong demand for olive oil, in particular in recent years, verses 14.28% of them which consider it average and only 7.14% of them consider it weak. Therefore, the analysis of the arguments put forward by the oleifactors declaring the weakness of the demand on the market, shows that the latter have automatic oil mills having difficulties in the sale of their products and which produced large quantities of olives oil. Generally, and dependant on the oleifactors, the low flow of oils from certain oleifactors and sellers is due to the presence of one of the following factors:

- **Lack of an organized olive oil market:** with the absence of a regulated and organized olive oil market capable of absorbing large volumes, oil mills with significant production capacity, producing oils on their own account, each year have encountered difficulties in selling their products. This has created a major constraint in setting the most economical annual production objectives despite the presence of financial and managerial resources to accomplish them;
- **Quality of olive oil:** generally, oils obtained from olives outside the region were in low demand among consumers in the region even though the price is cheaper than the prices of local oils;
- The presence of a large number of olive growers in the activity area ensuring their annual self-consumption;
- The distrust of local consumers in oil mills that sell oils from olives outside the region;
- In recent decades, this increase in production and the introduction of modern oil extraction technologies have placed the olive tree in a delicate position as a potential polluter.(Doughmi et al,2022)
- **The location of the oil mill:** the oil mills located in places far from major road networks recorded a low level of marketing of their product, on the other hand, the oil mills located on the side of the roads where there was passing trade of road users recorded a good flow of their products.

Survey data indicates that 96% of olive oil producers sell olive oils that are available to them. Depending on the origin of the oils, there were two types of sale:

- **Sale of oils specific to the olive grower:** These are oils obtained from olives specific to the olive grower or those resulting from crushing on its behalf and which were in part used to pay in kind for the crushing service provided to the olive grower;

- **Sale of oils from olive growers:** These are oils that belong to olive growers and which are entrusted to olive producers so that they sell them at the level of the oil mill with a negotiated margin.

The selling prices of olive oils differ from one olive oil market to another; several factors adjust the price setting namely: the origin of the olives; the quality of the oil and the quantity supplied.

We note that some prices reach the bar of 1000 DA per liter and the lowest 650 dinars, a difference of 350 DA. The prices most often displayed at the oil mills surveyed are those of 700 and 800 dinars, which respectively represent 55.6% and 22.2% of frequencies. On the other hand, the selling prices of oils from other regions are found to be lower than those of oils from the region, the highest price is 700 DA and the lowest is 600 DA. The price differences between the two oils vary from one oleifactor to another; some apply the same price regardless of the origin of the olives; on the other hand, some make a distinction and apply higher prices for local oil, the difference varying from 50 DA to 300 DA.

Regarding the average storage times, we noticed that the interval of availability of olive oil intended for sale is not the same. For this purpose, we can identify three distinctive classes:

- **Class 1:** these are the oil mills that managed to sell their oils quickly in less than a month, generally these oil mills having a good reputation of high quality oils among customers by offering quantities between medium and low depending on the year. The flow time of this class is the most frequent and largely represents the commercial reserve that the local market can offer, that is to say that for 82% of the oleifactors their flow takes place in this interval.

- **Class 2:** these are the oil mills which record a flow time of their medium oils which varies between two to four months, this class is specific for the oleifactors having automatic oil mills and super-presses, the oleifactors of this class represent 17.85% of the total.

- **Class 3:** includes oil mills with a flow time of more than four months. This class has a single oil mill, which is the largest in capacity, 160 quintals per day. In one quote it was said that “she struggles with her sales in some years and has had one-year slumps”.

### **The strategic positions of the oleifactors**

The analysis of the strategies adopted by the oleifactors in the region (Figure 3) led us to undertake more in-depth analysis by deducting the impacts on their profitability (Figure 1 and 2) and their ability to remain in business. To this end, three aspects were analysed to compare the effectiveness of its strategies, namely costs, margins and sustainability.

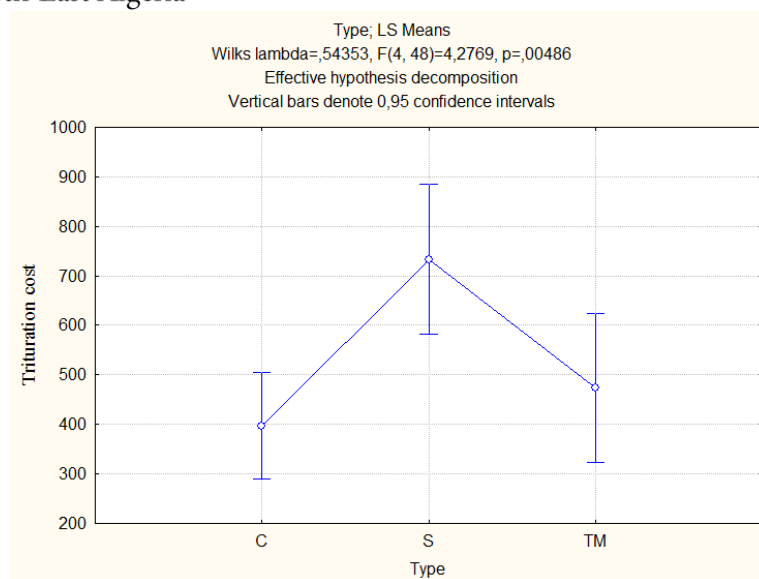


Figure 1. Analysis of variance of trituration costs according to the type of oleifactor.

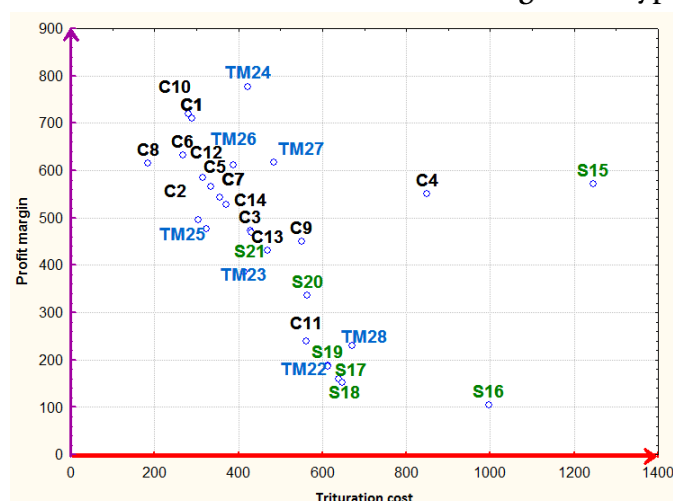


Figure 2. Projection of oleifactors according to costs and profit margins.

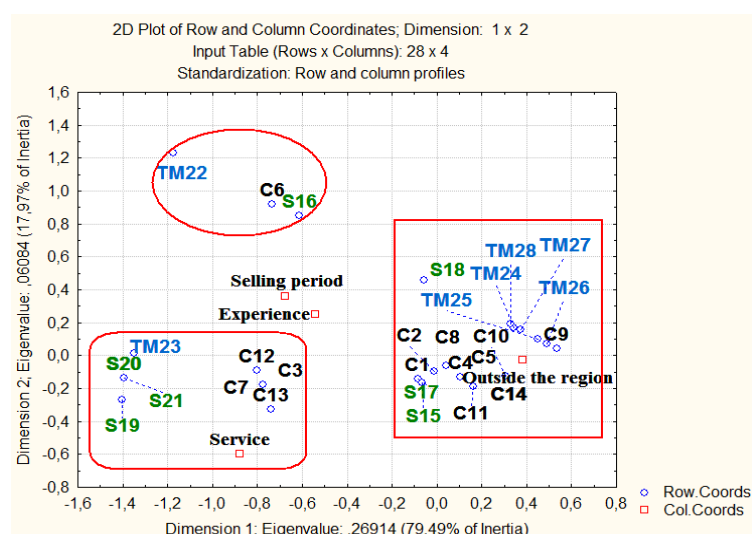


Figure 3. The strategic positions of the oleifactors.

1) **The first group:** this group shows significant economic results for the cost-margin differential, the costs of which are lower than the overall average and the margins are higher. We note that this group is comprised of the three types of oil mills of different technologies, including 70.58% of chains, 23.52% of traditional and only 5.88% of semi-automatic. To this end, the presence of traditional low-tech oil mills in this group such as TM 24, TM 25, TM 26 and TM 27, giving the effectiveness of the strategies adopted by these oleifactors, thus managing to serve them better in a harsh competitive environment marked by the installation of technologically modern units with high crushing capacity. The main strategies for these oleifactors (TM) focus on the following points:

- Strong use of olives from outside the region with rates ranging from 30% to 60% by extending the duration of the activity and producing oil for commercial purposes;
- Highest price of crushing services in the group from 1000 DA to 1200 DA, with average crushing costs not exceeding 500 DA/ql, which allows for a good remuneration;
- A large part of the workforce is family, a means of avoiding issues with the availability of labour, and to meet the continuous requirement for the availability of workers throughout the season.

However, the presence of 85.71% of (modern) chains in this group is considered logical given the specificities granted to this type of investment, based mainly on scale production in order to amortize costs and maximize profits. We note for the latter that the profitability is unequal between them, some of which record significant margins such as C10, C1 and C6 where the margins are respectively 719.45; 710.72 and 633.10 DA/ql.

2) **The second group:** Shows very appreciable signs of continuity, for which the use of supplies from outside the region has greatly supported their continuation in activity. This strategy allows them to have significant oil availability at their level for commercial purposes. The flow of their oils registers a slow but a longer period of supply compared to others. The price of the crushing service applied is average, of which the chain of olives outside the region intended for sale is an essential component to alleviate competition and make the activity more profitable. As a result, this group recorded average economic results in terms of crushing costs and margins.

3) **The third group:** this point to an outcome showing significant signs of continuity with significant economic results. It resorts to ensuring the transport of olives from olive growers in the region with high crushing service prices in kind, either a sample of 1 liter out of 7 liters or 2 liters out of 10 liters. It restricts their activity only to local olives; these strategies allow them to ensure sufficient quantities and to generate significant margins.

4) **The fourth group:** displays weak economic results, recording very high crushing costs and very low margins. These units have supply constraints given the increase in the number of units installed, especially modern ones. These oleifactors consider the crushing activity to be secondary.

### Conclusions

The crushing of olives constitutes the most profitable segment of the olive oil sector; it makes it possible to transform a generic product into a specific product with high added value.

The local olive industry has a large number of units with crushing capacities, which largely exceed the natural supply capacity of olive farms in the region. This has resulted in a drop in the operating rate of the oil mills as well as the profitability of the activity.

The weakness of olive production in the region and its instability has led to the emergence of adapted behaviours with regard to the volume offered and a growing demand for oil. Oil producers have restricted their activities only to olives in the region despite the low operating rate they record; these oleifactors generally have other sources of income and consider crushing as a secondary activity, possibly a source of income. Other oil producers are seeking to maximize their profitability by filling the weak local supply by sourcing olives from outside the region, allowing them to stretch out the production cycle and capacities for a longer period of time.

The different behaviours developed by these oleifactors such as add on services, purchasing outside the region, modernization, location, adaptations to consumer preferences, and the sale of oils are rewarding strategies by effectively contributing to maintaining (and increasing ) the market crushing activity in these areas.

The analysis of the levels of profitability between the oleifactors surveyed in relation to the technology of the equipment used shows that the technological level is not an absolute determinant in the profitability of the activity, as proof of the registration of traditional and semi-oil mills operate at higher profitability levels than modern ones (automatic mills) The olive industry, located mainly in rural areas with high olive production, is experiencing difficulties which hamper its development. In particular the absence of technical supervision, and the absence of a professional collective organization which watches over the general interest of all the players in the sector. This could be achieved by defining long-term objectives and by targeting the international market which is more buoyant and would make it possible to raise the level of competitiveness of the entire industry. However, the presence of an important industrial fabric dedicated mainly to the promotion of an agricultural product located in rural areas constitutes a well-developed achievement and an important economic advantage, resolving the problems of rural employment and allowing for the dynamic growth and the economic development of these regions.

Therefore, the sector shows insufficiencies and incompleteness as well as organizational deficiencies handicapping the efforts and the expectations of a good valorisation following the example of the market systems of the developed countries where the market plays a capital role to bring up the local products to high levels of valorisation. However, the presence of an important industrial tissue dedicated mainly to the valorisation of local agricultural products in rural areas constitutes an important economic advantage that solves the problems of rural employment and allows the economic dynamics of these regions.

## References

- [1] Abenavoli, L. M., Cuzzupoli, F., Chiaravalloti, V., & Proto, A. R. (2016). Traceability system of olive oil: a case study based on the performance of a new software cloud. *Agronomy Research*, 14(4).
- [2] Ameziane, H., Nounah, A., & Khamar, M. 2020. Olive pomace compost use for fenugreek germination. *Agronomy Research* 18(3), 1933–1943, 2020 <https://doi.org/10.15159/AR.20.198>
- [3] Ameziane, H., Nounah, A., Khamar, M., & Zouahri, A. 2020. Composting olive pomace: evolution of organic matter and compost quality. *Agronomy Research* 18(1), 5–17, 2020 <https://doi.org/10.15159/AR.20.004>
- [4] Aybar, V. E., De Melo-Abreu, J. P., Searles, P. S., Matias, A. C., Del Rio, C., Caballero, J. M., & Rousseaux, M. C. 2015. Evaluation of olive flowering at low latitude sites in Argentina using a chilling requirement model." *Spanish Journal of Agricultural Research*, 13(1), 1-9. <https://doi.org/10.5424/sjar/2015131-6375>
- [5] Baccouri, O., Guerfel, M., Baccouri, B., Cerretani, L., Bendini, A., Lercker, G., ... & Miled, D. D. B. 2008. Chemical composition and oxidative stability of Tunisian monovarietal virgin olive oils with regard to fruit ripening." *Food Chemistry*, 109(4), 743-754. <https://doi.org/10.1016/j.foodchem.2008.01.034>
- [6] Belhouadjeb, F. A., Boumakhleb, A., Toaiba, A., Doghbage, A., Habib, B., Boukerker, H., Murgueitio, E., Soufan, W., Almadani, M. I., Daoudi, B., & Khadoumi, A. 2022. "The Forage Plantation Program between Desertification Mitigation and Livestock Feeding: An Economic Analysis. *Land*, 11(6), 948. <https://doi.org/10.3390/land11060948>
- [7] Brahim, M. B., Nasr, J. B., Zaibet, L. 2021. "Characterization of Rural Organizations in a Forest-Based Economy: A Socio-Institutional Approach." *Asian Journal of Agriculture and Rural Development*, 11(2), 156–162. <https://doi.org/10.18488/journal.ajard.2021.112.156.162>
- [8] Dominguez-Garcia, M. C., Laib, M., De La Rosa, R., & Belaj, A. 2012. Characterisation and identification of olive cultivars from Northeastern Algeria using molecular markers." *Journal of Horticultural Science and Biotechnology*, 87(2), 95-100. <https://doi.org/10.1080/14620316.2012.11512837>
- [9] Doughmi, A., Benradi, F., Cherkaoui, E., Khamar, M., Nounah, A., & Zouahri, A. 2022. Fertilizing power evaluation of different mixtures of organic household waste and olive pomace. *Agronomy Research* 20(S1), 913–937, 2022 <https://doi.org/10.15159/AR.22.049>
- [10] Ekobi, G., Mboh, L. 2018. An Exploratory Study in to the Benefits and Challenges Facing Small-Scale Farmers in the Taung Irrigation Scheme, North West Province, South Africa." *Asian Journal of Agriculture and Rural Development*, 8(1), 28–39. <https://doi.org/10.18488/journal.1005/2018.8.1/1005.1.28.39>

- [11] Emmanuelle, P. 2009. Promouvoir les filières secondaires en milieu rural par une approche entrepreneuriale : une expérience en pays Androy (sud de Madagascar)." Get/direction scientifique. Rapport n°64.
- [12] Gimeno, E., Castellote, A. I., Lamuela-Raventós, R. M., De la Torre, M. C., & López-Sabater, M. C. 2002. The effects of harvest and extraction methods on the antioxidant content (phenolics,  $\alpha$ -tocopherol, and  $\beta$ -carotene) in virgin olive oil." *Food Chemistry*, 78(2), 207-211. [https://doi.org/10.1016/S0308-8146\(01\)00399-5](https://doi.org/10.1016/S0308-8146(01)00399-5)
- [13] Hadjloune, H., Kihal, O., Kaci, A. & Belhouadjeb, F. A. 2021. Quel avenir pour la filière huile d'olive fraîchement introduite dans une zone steppique ? Cas de la région de M'Sila." *New Medit*, 20(2). <https://doi.org/10.30682/nm2102i>
- [14] Jean-Philippe, R. 2000. Contribution à l'analyse empirique des processus de croissance endogène : une approche méthodologique centrée sur les entreprises, les régions et les territoires." Thèse de doctorat, Université de Neuchâtel. Neuchâtel. [http://doc.rero.ch/lm.php?url=1000,40,4,20050928093408-OW/2\\_these\\_RudolfJP.pdf](http://doc.rero.ch/lm.php?url=1000,40,4,20050928093408-OW/2_these_RudolfJP.pdf)
- [15] Kamiyama, H., Kefi, M., Kashiwagi, K. 2021. Irrigation Water Use Efficiency in Olive Trees in Kairouan, Tunisia. *Asian Journal of Agriculture and Rural Development*, 11(3), 255–261. <https://doi.org/10.18488/journal.ajard.2021.113.255.261>
- [16] Lachibi, M., Chehat, F., Belhouadjeb, F. A. 2019. Les facteurs influençant le rendement oléicole: cas de la région de Jijel du Nord-Est algérien. *OCL* 26: 12. <https://doi.org/10.1051/ocl/2019008>
- [17] Moustier, P. 2006. Organisation et performance des filières (et chaînes de valeur): diversité des cadres d'analyse et exemples d'application au Vietnam." CIRAD/MOISA/MALICA Présentation à la formation sur l'analyse de filières, 16-19 octobre, Montpellier.
- [18] Oubraham, F., Bédrani, S., Belhouadjeb, F. A. 2021. Does interest rate subsidy really promote the financing of farms? The case of the wilaya of Laghouat in Algeria." *Cah. Agric.* 30: 23. <https://doi.org/10.1051/cagri/2021008>
- [19] Raikes, P., Friisjensen, M., Ponte, S. 2000. Global Commodity Chain Analysis and the French Filière Approach: Comparison and Critique. *Centre for Development Research (CDR)*, Copenhagen. URL: <http://www.inti.gov.ar/cadenasdevalor/wp-00-3.pdf>
- [20] Roux, E., Vollet, D., Pecqueur, B. 2006. Coordinations d'acteurs et valorisation des ressources territoriales. Les cas de l'Aubrac et des Baronnie. *Économie rurale* [En ligne], 293 | Mai-juin 2006, mis en ligne le 05 juin 2008, consulté le 11 octobre 2012. <http://economierurale.revues.org/776>
- [21] Tamendjari, A. 2006. Impact de l'attaque du ravageur *Bactrocera oleae* sur la qualité de l'huile d'olive de variétés locales (algériennes)." (Doctoral dissertation, INA). [http://dspace.ensa.dz:8080/jspui/bitstream/123456789/2393/1/TAMENDJARI\\_Abderezak.pdf](http://dspace.ensa.dz:8080/jspui/bitstream/123456789/2393/1/TAMENDJARI_Abderezak.pdf)

- [11] Emmanuelle, P. 2009. Promouvoir les filières secondaires en milieu rural par une approche entrepreneurial : une expérience en pays Androy (sud de Madagascar)." *Get/direction* XXXI: 2 (Summer/Été 2008).
- [23] Torre, A. 2000. Economie de la Proximité et Activités Agricoles et Agro-alimentaires." *Revue d'Economie Régionale et Urbaine*, n° 3, 407-426.
- [24] Torres, M., Pierantozzi, P., Searles, P., Rousseaux, M. C, García-Inza, G., Miserere, A., Bodoira, R., Contreras, C., Maestri, D. 2017. Olive cultivation in the southern hemisphere: flowering, water requirements and oil quality responses to new crop environments." *Frontiers in Plant Science*, 8: 1830. <https://doi.org/10.3389/fpls.2017.01830>
- [25] Tounsi, K., Gammoudi, L., Clouet, Y. 2008. Le zonage à dire d'acteurs un outil cartographique pour la confrontation des savoirs et pouvoirs endogènes et exogènes à propos du développement local : étude de cas en Tunisie centrale." *Revue Sécheresse* vol. 19, n°. Tunisie. [http://www.john-libbey-eurotext.fr/e-docs/00/04/3B/DE/vers\\_alt/VersionPDF.pdf](http://www.john-libbey-eurotext.fr/e-docs/00/04/3B/DE/vers_alt/VersionPDF.pdf)
- [26] Uceda, M. y Hermoso, M. 2001. La calidad del aceite de oliva. En *El cultivo del olivo*, D. Barranco, R. Fernández-Escobar y L. Rallo (eds.), MundiPrensa, Madrid, p. 589-614.
- [27] Wiesman, Z. 2009. *Desert Olive Oil Cultivation: Advanced Biotechnologies*. 1st Ed. Academic Press, Cambridge, US, 416 pp.