FEASIBILITY STUDY

Multifunctional Processing Centre for Nuts

This study was funded by People in Need Innovation resources, supporting locally-led, innovative solutions to global challenges. Chișinău, 2024.

Elaborated by the NGO ”Alternative Internaționale de Dezvoltare”

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Content

The main purpose of the feasibility study - Evaluation and analysis of opportunities for the creation of a Multifunctional Center for nut processing in the central area of the Republic of Moldova.

The idea of the study consists in the analysis and implementation of an investment project for the creation of a Multifunctional Center for the processing of nuts in the central area of the Republic of Moldova. The document analyzes the need and effectiveness of creating or developing the processing, business and marketing infrastructure for the nut sector. The final goal is to demonstrate its importance for ensuring the competitiveness of local nuts (walnuts, hazelnuts, almonds) both on the local market and on export.

Republic of Moldova has a great potential for the production and selling nuts. Today, we have about 18,270 ha of nut plantations registered within agricultural enterprises, of which about 14,439 ha are in fruit. The amount of nuts produced in 2023 was about 21 thousand tons, exports being about 9 thousand tons. Most of the production of nuts is done in shell, as we do not have an adequate infrastructure for processing nuts.
In the framework of this feasibility study, the opportunity to create a Multifunctional processing center with a total processing capacity of about 1500 tons of nuts in shell in the first year of activity is analyzed, with the ultimate goal of reaching a capacity of up to 4500 tons of nuts starting with the 4th year of activity. The analysis of the sector shows that today we only have post-harvest infrastructure, covering 30% of the sector's needs. In order to become competitive, local producers must ensure a quality product, homogeneous quantities and packaging according to market standards.

The need for the creation of the Multipurpose Center

The main goal of creating a Multifunctional Processing Centre for Nuts can be approached from several perspectives, and its benefits can be considerable for both producers and consumers. Here are some of the main objectives of such a center:

1. **Production efficiency and quality:** A multifunctional center can be designed to optimize nut processing processes, leading to an increase in efficiency and quality of final products. By using modern technologies and efficient processing practices, faster and more consistent production can be achieved.
2. **Product diversification:** Such a center can facilitate the diversification of the range of products derived from nuts. For example, oils, butter, nut milk, pastries and other nut-based food products can be produced. This provides opportunities for increased revenue and market competitiveness.
3. **Full utilization of resources:** The multifunctional center can be designed to ensure full utilization of the resources from nuts. For example, shells and other components can be used to produce compost or other by-products, thus contributing to the sustainability of the production process.
4. **Standardization and certification:** By concentrating processing in a single center, standardization of processes and products can be pursued. This can facilitate obtaining quality and food safety certifications, which can increase consumer confidence and access to international markets.
5. **Local economic development:** A multifunctional nut processing center can contribute to local economic development by creating jobs, stimulating the agricultural sector and promoting local production in regional and international markets.

Overall, a Multifunctional Processing Centre for Nuts has the potential to bring multiple benefits, including increased efficiency, product diversification, full utilization of resources and contribution to local economic development.

For the launch of the investment project, it is estimated that the financial resources will be attracted in the total amount of about 2 million euros, allocated for the following investments:

Table 1. The structure of the investment project and the amount of the necessary investments

#	Investment articles	Cant.	Amount	Amount
			EUR	MDL
1	10 ton Walnut drying line	1	600.000	11.640.000
2	90 tons drying line	1	400.000	7.760.000
3	5 tons per hour Calibration line	1	125.000	2.425.000
4	Hulling Line Conversion Kit for Walnut & Hazelnut processing	1	100.000	1.940.000
5	500 lbs/hr Shelling Line for walnuts	1	180.000	3.492.000
6	1,000 lbs/hr Shelling Line for hazelnuts	1	250.000	4.850.000
7	Construction of building for drying line	1	135.000	2.619.000
8	Construction of a processing building (shelling, washing, calibration, packaging)	1	135.000	2.619.000
9	Repairs the existing building (storage spaces)	1	75.000	1.455.000
10	Costs of certification and implementation of quality and safety standards for the multifunctional Center (ISO 9001, 14000, 2200, HCCP, IFS food)	5	15.000	291.000
subtotal				
			2.015.000	**39.091.000**
Total investment (absolute value)			**2.015.000 €**	**39.091.000 MDL**
Total investment (relative value)			**100%**	**100%**

Source of financing – donor grants, Fruit Garden of Moldova Project (EIB), other funding.

The investment payback period is estimated at 7.1 years and reflects, in the conditions when the discount rate would be equal to 10%, the period of time in which Processing Centre would cover all its costs with the investment made from the income obtained following the investment data.

Table 2. Payback of investment, thousand EUR

Payback period	**Ta**	**7,1 years**
Net Present Value	**NPV**	**163.920 EUR**
Internal Rate of Return	**IRR**	**11,89%**
Profitability index	**PI**	**1,08**

Therefore, the financial results recorded by the Processing Center demonstrate its ability to meet the assumed financial obligations as well as to accumulate its own resources for their investment in the perspective of the investment development of the operational activities. As can be seen from Table 24, the net profit shows an increase of 117% in the 10th year of operation compared to the 3rd year (the first full year of operational activity).

Table 3. Financial results

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net sales	-	509.040	1.282.432	1.305.182	2.139.917	2.139.917	2.139.917	2.139.917	2.139.917	2.139.917
Cost of sales	-	464.313	941.649	952.924	1.376.398	1.376.398	1.376.398	1.376.398	1.376.398	1.376.398
Depreciation	-	86.590	86.590	86.590	86.590	86.590	86.590	86.590	86.590	86.590
Profit before taxation	-	44.727	340.783	352.258	763.519	763.519	763.519	763.519	763.519	763.519
Income tax, 12%	-	5.367	40.894	42.271	91.622	91.622	91.622	91.622	91.622	91.622
Net income	-	39.360	299.889	309.987	671.897	671.897	671.897	671.897	671.897	671.897
EBITDA	-	131.317	427.373	438.848	850.109	850.109	850.109	850.109	850.109	850.109

1.1. THE PURPOSE AND OBJECTIVES OF THE FEASIBILITY STUDY

The main purpose of the feasibility study - Evaluation and analysis of opportunities for the creation of a Multifunctional Center for the processing of nucifera in the central area of the Republic of Moldova.

The idea of the study consists in the analysis and implementation of an investment project for the creation of a Multifunctional Center for the processing of nucifera in the central area of the Republic of Moldova. The document analyzes the need and effectiveness of creating or developing the processing, business and marketing infrastructure for the nut sector. The final goal is to demonstrate its importance for ensuring the competitiveness of domestic fruits (walnuts, hazelnuts, almonds) both in internal and export markets.

The need for the creation of the Multipurpose Center
The main goal of creating a multifunctional nucifera processing center can be approached from several perspectives, and its benefits can be considerable for both producers and consumers. Here are some of the main objectives of such a center:

- **Production efficiency and quality:** A multifunctional center can be designed to optimize nut processing processes, leading to an increase in efficiency and quality of finished products. By using modern technologies and efficient processing practices, faster and more consistent production can be achieved.
- **Product diversification:** Such a center can facilitate the diversification of the range of products derived from nucifera. For example, oils, butter, nut milk, pastries and other nut-based food products can be produced. This provides opportunities for increased revenue and market competitiveness.
- **Full utilization of resources:** The multi-functional center can be designed to ensure the full utilization of resources from nucifera. For example, peels and other components can be used to produce compost or other by-products, thus contributing to the sustainability of the production process.
- **Standardization and certification:** By concentrating processing in a single center, standardization of processes and products can be pursued. This can facilitate obtaining quality and food safety certifications, which can increase consumer confidence and access to international markets.
- **Local economic development:** A multifunctional nucifera processing center can contribute to local economic development by creating jobs, stimulating the agricultural sector and promoting local production in regional and international markets.

Overall, a multifunctional nucifera processing center has the potential to bring multiple benefits, including increased efficiency, product diversification, full utilization of resources and contribution to local economic development.

The objectives of the feasibility study are:

- argumentation the necessity of the investment;
- demonstrating the sustainability of the project from an economic-financial point of view;
- presentation of the main technical characteristics of the investment;
- the presentation of the main economic characteristics of the investment, which ensures the rational use of assets and the efficiency of capital and the coverage of material expenses in a way that satisfies economic and social requirements;
- estimating the costs of implementing the investment project;
- project benefits.

2.1. BRIEF PRESENTATION REGARDING THE EXISTING SITUATION

BRIEF PRESENTATION OF THE NUTS SECTOR IN THE REPUBLIC OF MOLDOVA

In Republic of Moldova, nuts, or more specifically walnuts, hazelnuts and almonds and their production, have had an interesting evolution in recent years. The nucifera sector in Moldova has suffered from issues such as climate change, disease and marketing and export issues. However, there have also been efforts to revitalize this sector and promote nut production.

Table 4. The total area of nut plantations (walnuts, hazelnuts, almonds) in agricultural enterprises and peasant households (farmers) in territorial profile, hectares

	2016	2017	2018	2019	2020	2021	2022	2023
Total per country	16785	17511	18311	19967	20154	20920	21090	21192
Chisinau municipality	23	40	27	27	27	27	27	27
North	1975	2427	2687	3001	3048	3015	3050	3025
Center	4470	4686	4820	5565	5870	6496	6599	6729
South	1843	1856	1995	2225	2232	2247	2334	2331

Source: National Bureau of Statistics

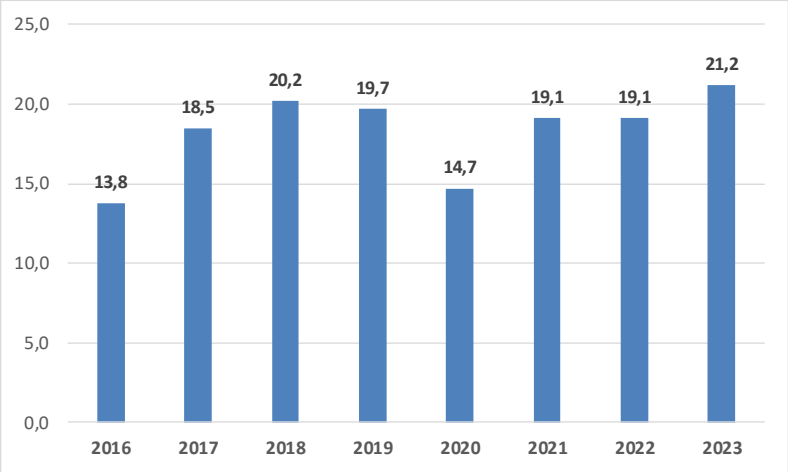
As can be seen, we have an increase in the area of nut plantations from about 16.7 thousand ha in 2016, to about 21.2 thousand ha in 2023, or an increase of about 26%. Most plantations are located in the center of the country, mostly due to the more favorable climate, but also due to better developed logistics.

Table 5. Yielding area of nut plantations (walnuts, hazelnuts, almonds) at agricultural enterprises and peasant (farmer) households, thousands of hectares

	2016	2017	2018	2019	2020	2021	2022	2023
Total per country	9438	10370	11121	11211	11850	12328	12900	14439
Chisinau municipality	23	27	20	20	20	20	20	20
North	363	753	917	1148	1518	1489	1556	1583
Center	463	769	1255	1119	1160	1520	2019	3388
South	551	600	713	659	858	909	915	1159
U.T.A Gagauzia	38	221	216	265	294	390	390	289

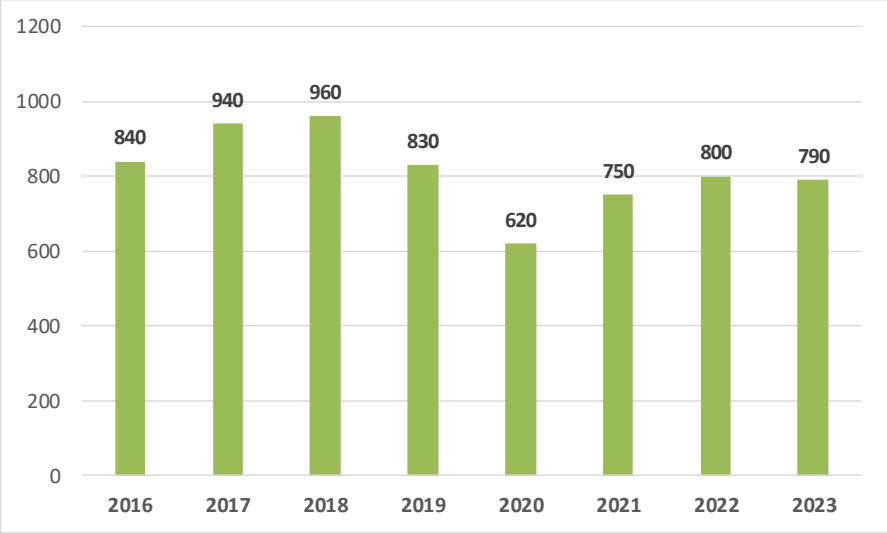
Regarding the evolution of nut production, there is an increase in interest in Moldovan nuts, both locally and internationally. Moldovan farmers and producers have begun to pay more attention to modern nut cultivation and plantation management technologies to increase crop quality and yield.

Fig. 1. Global harvest in Moldova, thousands of tons



Also, in recent years, efforts have been made to promote and export Moldovan nuts on international markets. This was also facilitated by the trade agreements concluded by the Republic of Moldova with various countries, which opened new opportunities for exporters.

Fig. 2. Average yield per hectare, tons



As can be seen from the data presented in Fig. 2, we currently have a low productivity, of around 800 tons per ha, compared to farms in other countries, especially in the European Union, where an average productivity of around 2500 tons per hectare is attested. In this chapter, several measures have been undertaken in recent years, namely the modernization of existing plantations, the planting of varieties with higher productivity, the installation of irrigation systems in orchards and the use of modern maintenance technologies.

In conclusion, although the nut sector in the Republic of Moldova had and still has challenges to overcome, there are also positive perspectives for its evolution, thanks to the efforts to modernize and diversify production, as well as the increased interest in quality agricultural products.

Sector trends

In Moldova, the cultivation of nut trees has seen certain trends and developments in terms of the technologies used, the varieties planted and the subsidization of nut and almond businesses. Here are some relevant aspects in this regard:

- **Modern cultivation technologies:** Many farmers in the Republic of Moldova adopt modern technologies in the cultivation of nucifera, such as the use of efficient irrigation systems, the application of fertilizers

and phytosanitary treatments in an adequate manner, the use of modern agricultural machines and equipment for maintenance and harvesting works.

- **Organic farming:** A significant trend is the growing interest in organic farming, including walnut and almond crops. Farmers adopt organic farming practices such as the use of natural fertilizers, biological pest control and compliance with organic certification standards.
- **Varieties adapted to local conditions:** Farmers prefer to plant nucifera varieties that are adapted to local climatic and soil conditions, thus ensuring more stable and higher quality production. Examples of popular varieties include English walnuts (Juglans regia), almonds, Persian walnuts (Juglans sigillata), American walnuts (Juglans nigra), etc.

Subsidy and government support

The government of the Republic of Moldova provides subsidies and financial support for the agricultural sector, including the nut and almond business. These subsidies can cover the purchase of planting material, the installation of irrigation systems, the use of modern technologies and other investments necessary for the growth and development of agricultural businesses. The size of the subsidies varies depending on the value of the investments made, the stage of production (establishment of plantations, post-harvest), the maximum value of an annual subsidy for a farmer being about 50%, but which will not exceed the amount of 7 million lei (the equivalent of 340 thousand Euros).

Export promotion

In the context of increasing demand on international markets for walnuts, hazelnuts and almonds, farmers from the Republic of Moldova are encouraged to associate and promote the export of these products. Government and other institutions can provide logistical and commercial support for accessing foreign markets and developing international trade relations. These trends and initiatives reflect the efforts made to modernize and develop the nut industry in the Republic of Moldova, with an emphasis on sustainable technologies, adapted varieties, government support and orientation towards the domestic and foreign market.

PRODUCTION POTENTIAL OF NUTS (WALNUTS, HAZELNUTS, ALMONDS) IN THE REPUBLIC OF MOLDOVA

- **Walnuts.**

Republic of Moldova has favorable climatic conditions for the cultivation of walnuts, different varieties adapted to the temperate-continental climate of the region.

Walnut varieties used in modern plantations.

In Republic of Moldova, several varieties of walnuts are cultivated, such as the local ones (Pesceanski, Kostiujeni, Cazacu, Kogâlniceanu), but also international varieties such as Chandler, Fernor, Franquette, Lara, Pedro, Howard, etc. In Republic of Moldova, the most known and used varieties are Pesceanski, Kostiujeni, Chandler, Franquette, Fernor, Lara. These varieties have different characteristics in terms of nut size, resistance to diseases and pests, as well as ripening time.

Cultivation regions: The most suitable regions for the cultivation of walnuts in Republic of Moldova are those with a temperate-continental climate and fertile and well-drained soils. The areas in the south and southeast of the country, such as Gagauzia, Cahul, Ștefan Vodă, but also some parts of the north and center-south of Moldova are favorable for the cultivation of walnuts.

Production potential: Republic of Moldova has a significant potential for walnut production, with possibilities for export and capitalization on the domestic and foreign markets. These walnuts are prized for their taste, size and kernel quality.

- **Hazelnuts:**

Hazelnuts are crops adapted to the temperate climate, and Republic of Moldova has the potential to cultivate various varieties of hazelnuts. Depending on the cultivation area and proper management of the crop, the production potential of hazelnuts can be considerable, ensuring a valuable contribution to the diversification of agricultural production.

Hazelnut varieties grown in Moldova:

Trapezun
Catalonskiy
Mcdonald
Yamhill
Nochione
Tonda Gentile
Romano
Gifoni
Barselona
Adîgheiskii (Moldova)
Ata-baba (Moldova)
Cercheskii (Moldova)
Shedevr (Moldova)

- **Almond:**

Almonds are more temperature-sensitive crops and require specific climatic conditions for optimal production. In Republic of Moldova, the southeastern part of the country, with a warmer climate and suitable soils, may offer a modest potential for almond production, but a careful assessment of local conditions is necessary to ensure the success of almond cultivation.

In conclusion, we say that the greatest production potential in Republic of Moldova is given by the cultivation of walnuts and hazelnuts, the cultivation of almonds presupposing certain risks.

According to statistical data, Moldova currently has a production potential of about 21 thousand tons, of which about 16 thousand tons of walnuts and 3000 tons of hazelnuts and about 1000 tons of almonds. The forecasts show us that we have a production capacity of around 40-50 thousand tons, once all the nut plantations come into fruition, but also as a result of the replacement of old non-productive plantations with new varieties, in demand on the market, with a higher productivity large, but also a faster fruit entry.

PRICE ANALYSIS OF WALNUTS, HAZELNUTS AND ALMONDS

The price policy for walnuts, hazelnuts and almonds in Moldova can be influenced by several factors, including market supply and demand, product quality, harvest season, climatic conditions and general economic developments. Although exact prices may vary depending on these aspects, they can provide a general picture of industry trends. Here is an analysis of the average prices for walnuts, hazelnuts and almonds in R. Moldova:

- **Walnuts:**

Walnuts prices may vary depending on variety, quality and degree of processing (fresh,dried, kernels, etc.). In general, average prices for fresh walnuts can be in the range of about 30-50 lei/kg, while prices for walnut kernels can vary between 100-200 lei/kg, depending on quality and packaging. Price variability can also be influenced by market demand, harvest season and available supply.

- **Hazelnuts:**

Hazelnut prices can be influenced by the type of hazelnut (in shell, without shell), quality and provenance.
On average, prices for in-shell hazelnuts can vary between 40-60 lei/kg, and for unshelled hazelnuts, prices can reach 150-250 lei/kg or more, depending on quality and packaging. Other factors such as the degree of roasting or processing of the hazelnuts can also influence prices.

- **Almonds:**

Almond prices may be higher compared to walnuts and hazelnuts due to the high demand in the international market for this product. In R. Moldova, almond prices can vary between 50-100 lei/kg for shelled almonds and between 150-250 lei/kg for almond kernels, depending on quality, origin and packaging. Increased demand for

almonds may result in greater price variation depending on season and market availability.

It is important to note that these prices are estimates and may vary depending on several factors specific to each product and each market. Manufacturers and retailers can set prices based on demand, product quality and their business strategies.

	Purchase price, EUR/kg	Price after processing, EUR/kg	
		MDL	EUR
hazelnuts, category I (in shell)	2	65	3,5
hazelnuts, category II (shelled)			13,0
hazelnuts, category III (shelled)			11,0
walnuts, category I (in shell)	1,8	50	2,5
walnuts, category II (in shelled)			7,5
walnuts, category III (shelled)			5
almonds (in shell)	1,8	50	2,5
almonds (shelled)			10

DEMAND FOR NUTS ON INTERNATIONAL MARKETS

The demand for nuts in international markets has seen significant growth in recent years amid increased consumer interest in healthy and natural foods. Nuts are considered foods rich in nutrients and health benefits, which has led to a growing demand for them globally.

The main international markets for nuts include the United States, the European Union, China, Japan and other Asian countries. Demand in these markets is driven by various factors such as:

- ✓ **Growing health awareness:** Consumers around the world are increasingly interested in healthy and nutritionally balanced foods, and nuts are considered an integral part of a healthy diet.
- ✓ **Growing vegetarian and vegan trend:** People adopting vegetarian or vegan diets are looking for healthy alternatives to animal protein, and nuts are a popular option due to their high plant protein content.
- ✓ **Research highlighting health benefits:** Scientific studies have highlighted the benefits of eating nuts for cardiovascular, brain and digestive health, which has increased interest in these products.
- ✓ **Diversifying the use of nuts:** Nuts are used not only as snacks, but also in the food industry to create products such as nut butter, nut milk or even ingredients for pastries and desserts.

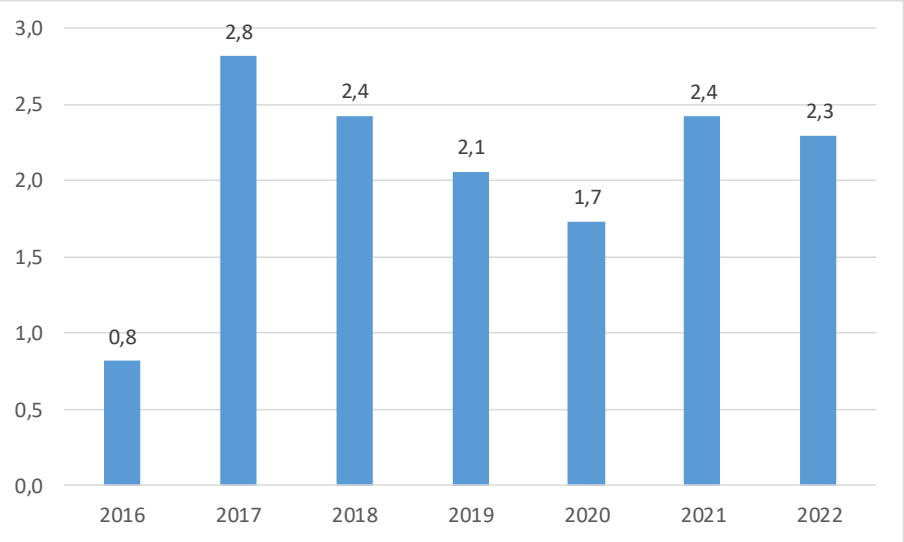
These trends show that the demand for nut trees on international markets is constantly growing, thus providing interesting opportunities for producers and exporters from Republic of Moldova and other nut producing countries.

WHERE ARE NUTS USED AND THEIR IMPORTANCE

Nuts are used in a wide variety of ways and industries. Here are some of the most common uses of nuts:

- **Direct consumption:** Nuts are eaten as a snack or as part of meals. They are valued for their delicious taste, crunchy texture and high nutritional value.
- **Food Industry:** Nuts are used in the food industry to create a variety of products. They are often used in baked goods such as cakes, tarts and biscuits. Nuts are also used in the manufacture of jams, chocolate, bakery products and pastries.
- **Alternative dairy products:** Nuts are used to create alternatives to dairy products. For example, almond milk, nut milk, and other plant milks are made from nucifera and are popular among those who adopt vegan diets or suffer from lactose intolerance.
- **Vegetable oils:** Some types of nuts, such as walnuts, are used to produce vegetable oils. These oils are used in cooking, in cosmetics, and in skin and hair care products.
- **Traditional medicine and cosmetics**: In some cultures, walnuts are used in traditional medicine for their beneficial health properties. Nut oils are also used in cosmetics for their moisturizing and nourishing properties.

Fig. 3. Nut consumption in Republic of Moldova, kg/capita, 2020-2022



These are just a few examples of the uses of nucifera, and their diversity is one of the characteristics that make them so versatile and appreciated around the world.

At the international level, the largest consumers of nut are China, the countries of the European Union, the USA and Turkey, with a consumption of about 1,990 thousand tons annually, and the demand is increasing, as the data in the table below demonstrate:

Domestic Consumption	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
China	810.800	876.200	939.400	903.700	1.172.100	1.170.000
European Union	368.169	392.425	414.700	454.400	414.000	430.000
United States	187.427	187.368	200.730	129.083	292.904	250.000
Turkey	137.900	145.400	138.900	128.000	126.300	140.000
United Arab Emirates	59.100	46.300	61.100	72.400	92.000	95.000
India	44.900	61.800	76.700	66.900	84.200	91.250
Kyrgyzstan	37.700	56.100	23.500	26.400	75.000	75.000

Japan	43.400	41.900	46.900	49.500	41.600	40.000
Korea, South	30.800	27.000	40.500	34.600	33.800	35.000
Ukraine	27.614	20.900	33.000	33.018	33.000	35.000
Other	252.200	255.200	320.800	312.900	281.900	291.200
Total	2.000.010	2.110.593	2.296.230	2.210.901	2.646.804	2.652.450

These countries represent the target market of Moldovan producers, but for which we must be prepared in terms of quality, quantities, safety requirements, packaging and others.

MAIN ISSUES AND CHALLENGES IN THE NUT SECTOR

Nut growers in Republic of Moldova face various problems and challenges in carrying out their activities. Below we address some of these issues:

- **Deficient infrastructure:** Agricultural infrastructure, including irrigation systems, roads and transport networks, may be deficient in some areas of Republic of Moldova. This can affect access to nut farms and plantations, as well as the distribution of produce to markets.
- **Lack of modern technologies:** Many nut growers may find it difficult to access modern technologies and advanced agricultural equipment to facilitate their work and optimize nut production and processing processes.
- **Water resource management:** Problems related to water resource management, especially during periods of drought or in regions with limited access to water, can affect the production and quality of the nut crop.
- **Disease and pest control:** Nut growers face challenges in controlling diseases and pests that can affect the health and yield of nut crops. This requires the use of agricultural practices and sustainable plant protection solutions.
- **Market competition:** There is strong competition in the market for nuts and products derived from nuts, both domestically and internationally. Nut growers must be competitive in terms of quality, prices and innovations to maintain and increase their market share.
- **Access to finance:** Some agricultural holdings may experience difficulties in accessing the funds and credits necessary for investments in the modernization and development of their agricultural activities, including for the expansion of nut plantations or for the purchase of modern equipment.
- **Climate change:** Climate variability and climate change can have an impact on the production and quality of the nut crop, with phenomena such as drought, floods or extreme temperature fluctuations.

These are just some of the problems faced by nut growers in Republic of Moldova, and solving these problems requires integrated efforts from the authorities, professional associations, research and development institutions and the agricultural community as a whole.

2.2.ASSOCIATIONS IN THE NUT SECTOR AND SUPPORT TO PRODUCERS

In Republic of Moldova, there are several associations and organizations that represent the interests of nut producers and are involved in various activities for the development of the nut sector. Here are some of the main associations of nut producers in Republic of Moldova and what they do:

1. **ASSOCIATION OF NUT GROWERS FROM THE REPUBLIC OF MOLDOVA -** the main professional organization of the nut branch.
2. **Union of Walnut Producers' Associations from the Republic of Moldova (UAPN):** It is one of the most important organizations representing the interests of walnut producers in the country. UAPN deals with promoting the interests of nut growers, developing the nut sector, facilitating access to modern resources and technologies, promoting products on domestic and foreign markets, as well as providing consultancy

and assistance to its members.

3. **Association of Walnut Producers of Moldova (APNM):** It is another important organization that represents walnut producers from various regions of Moldova. APNM engages in activities such as organizing events and exhibitions, promoting and marketing nuciferous products, facilitating access to finance and supporting its members in developing their businesses.
4. **Association of Quality Walnut Producers from the Republic of Moldova (APNCM):** It is an association that focuses on the promotion and development of quality walnuts from Moldova. APNCM is involved in product certification activities, setting quality standards, developing partnerships with research institutions and supporting producers in adopting sustainable practices and modern technologies.
5. **Association of Nut Growers from the North of the Republic of Moldova:** It is an organization that brings together walnut producers from the north of Moldova and that deals with promoting regional production, facilitating access to markets, developing joint projects to increase competitiveness and supporting producers in solving problems specific to the region.

These associations and organizations represent an important voice for nut producers in Republic of Moldova and are actively involved in the promotion and development of the nut sector, protecting the interests of their members and facilitating effective collaboration between producers, authorities and other stakeholders.

ASSOCIATION OF NUT GROWERS FROM MOLDOVA

Association of Nut Growers from Moldova, the main association in the nut sector that brings together more than 150 nut producers from Moldova. The basic activities of the association are:

- Consultancy, representation, lobby and advocacy,
- organization of national conferences, organization of participation in international exhibitions,
- bridge between all producers and processors,
- identifying opportunities to commercialize production and support the establishment of partnerships for the export of nut production

Table 6. Total number of members (agricultural enterprises)

Walnut	**130**
Hazelnut	20
Almond	3
TOTAL	**152**

Members of the association own about 4500 ha of nut plantations, which represents about 21% of the total plantations owned by Moldovan companies. For the year 2023, they obtained a total volume of nuts about 6500 tons, most of the production being directed to export.

Table 7. Area of plantations owned by members, ha

	Total area, ha	Productivity, tons/ha	Quantity obtained (2023)
Walnut	4000 ha	1-2	6000
Hazelnut	400 ha	0,5-1	350
Almond	100 ha	2-3	250
TOTAL	**4500 ha**		

Most of the members of the association use conventional production technologies, producers in the ecological system being members of the MOVCA association.

Table 8. Cultivation technology, ha

	Conventional	Ecological	Conversion
Walnut	3750	250	
Hazelnut	-	-	-
Almond	100 ha		
TOTAL			

For 2023, the selling prices of nuts by association members were around 2.20 eur/kg for walnuts in shell and around 2.50 eur/kg for hazelnuts in shell.

Table 9. Average realization price of nut production (2023) by association members, EUR/kg

Walnut	preț
in shell	2,20 euro/kg
wthout shell	4,50 euro/kg
Hazelnut	
in shell	2,50 euro/kg
wthout shell	
Almond	
in shell	
wthout shell	7,00 euro/kg

Most producers mention that prices could be higher by about 15-20% if the production had gone through not only post-harvest but also processing facilities.

According to the data provided by the association, about 30% of the members own post-harvest processing facilities, mostly these are only for primary post-harvest processing (shelling, drying, storage).

Regarding the sales market, over 90% of production is destined for export, mostly to EU member countries, Turkey, the Middle East.

The main problems members encounter when selling produce.

- *Inconsistent and non-homogeneous quality,*
- *Lack of association of producers and lack of coordination of their efforts during the vegetation period and during the harvest period to exchange information and experience,*
- *Too slow pace of establishing new plantations and technologicalizing existing plantations, especially those that have come into fruition*
- *Low visibility of Moldovan nut production on the main markets*

Conclusions: In the opinion of the association's executive management, the creation of a nut processing center is more than welcome. It is one of the most urgent and burning needs to continue the development of the nut sector and to further support with strong actions the process of association and collaboration between producers, processors and other actors in this field. According to the discussions held with the executive management of the association, it is obvious the positive impact that the establishment and operation of the Center will generate,

which will be one that will exceed everyone's expectations. Thus, the Association fully and unequivocally supports this idea and, if necessary, will provide all the necessary support and assistance in this process.

ASPECTS REGARDING THE PRODUCTION OF NUTS IN AN ECOLOGICAL SYSTEM

Organic agriculture in Republic of Moldova has gained more and more importance in recent years, and nucifera can play a significant role in this direction. Growing walnuts in organic farming brings several benefits, including protecting the environment through the use of sustainable practices and cultivation methods that reduce the impact on the ecosystem.

In addition, nuts can contribute to crop diversification and increase agricultural resilience, as they are perennial plants that require less intervention and inputs compared to annual crops. Nuts can also be integrated into agroforestry, where they are grown together with other agricultural plants or fruit trees, creating an ecologically and economically sustainable system.

Another advantage of growing nucifera in organic farming is related to the increased demand for organic products in local and international market. Consumers increasingly interested in organic products are willing to pay higher prices for healthy and sustainable products, which can bring economic benefits to farmers who turn to this sector.

In Moldova, organic agriculture has seen a significant development, and the promotion of crops such as nuts in this context can contribute to the consolidation of this sector and increase the competitiveness of Moldovan organic agriculture on the local and international market.

The prices of organic nuts in Moldova can vary depending on several factors, such as the type of nut (walnuts, almonds, hazelnuts.), quality, production process and market demand. In general, organic products tend to be priced higher than conventional products due to the higher costs associated with green practices and required certifications.

According to the data provided by the Ministry of Agriculture and Food Industry, in Republic of Moldova there are approximately 661 ha of nucifera plantations certified in the organic system, of which 320 ha are certified as organic production, and 341 ha are in the process of conversion.

Table 10. Area of nut plantations registered in the ecological system, ha

	2020	2021	2022
Ecological production	262	312	320
Conversion	350	377	341
TOTAL	**612**	**689**	**661**

Source: Ministry of Agriculture and Food Industry

Statistical data show us that there is an increase in ecologically certified surfaces, being the direct result of the increasing demand on the local market, but especially on the international market. Ecologically certified production implies more competitive prices, i.e. even if in organic production we have lower productivity, the prices for an ecologically certified product are 30-40% higher.

From the total number of plantations certified in the ecological system or in the process of conversion, the largest areas are those of walnuts, 458 ha, hazelnuts – 202 ha and almonds – 2 ha.

Table 11. The structure of nut plantations registered in ecological system, 2020-2022, ha

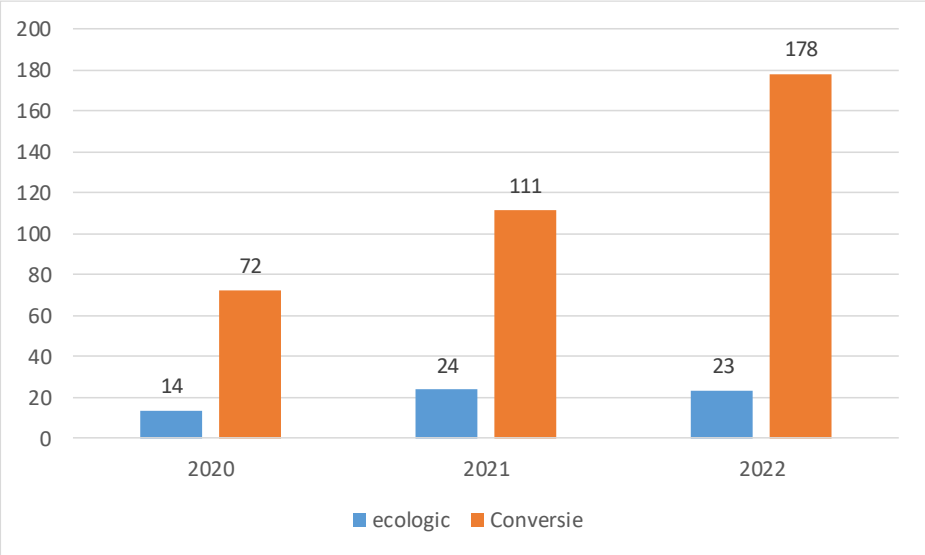
	2020	2021	2022
Walnut	445	473	458
Hazelnut	86	135	202

Almond	81	81	2
TOTAL	**612**	**689**	**661**

Source: Ministry of Agriculture and Food Industry

If in the case of nuts we have a relatively small increase, what concerns hazelnuts, there is a significant increase of about 57% in 2021 compared to 2020 and of about 49% in 2022 compared to 2021.

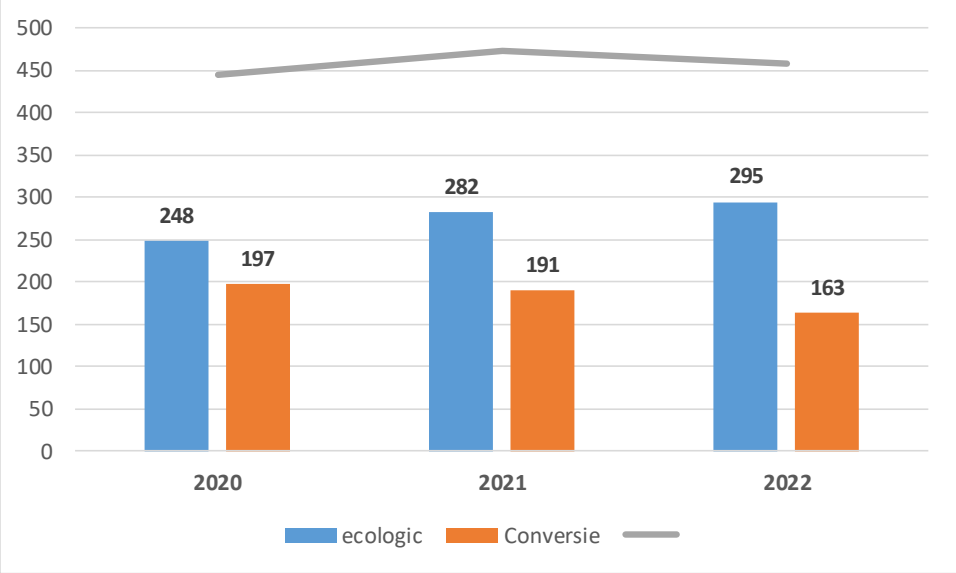
Fig. 4. Ecologically certified hazelnut surfaces and in the process of conversion, 2020-2022, ha



Source: Ministry of Agriculture and Food Industry

In the case of nuts, the organic certification process started a little earlier, and in hazelnut plantations, this process is more recent, but with a rapid growth trend, as evidenced by the data in the diagram above.

Fig. 5. Ecologically certified nut surfaces and in the process of conversion, 2020-2022, ha



Source: Ministry of Agriculture and Food Industry

Association of organically certified nut producers

The main promoter of ecological agriculture in Republic of Moldova is **MOVCA Association (Movement for Life, Commerce and Agriculture).** It is a non-governmental organization that aims to promote sustainable agriculture, fair trade and a healthy lifestyle. Here are more details about the purpose, objectives, activities and importance of the MOVCA Association for the nucifera sector:

The main goal of the MOVCA Association is to promote and support the development of ecological and sustainable agriculture in the Republic of Moldova. The association also aims to facilitate access to information and resources for local farmers and promote fair and sustainable trade.

Objectives of the association:

- Promotion of organic farming and sustainable agricultural practices.
- Supporting local agricultural producers and small-scale agriculture.
- Educating and informing consumers about the benefits of organic and local products.
- Promoting fair trade and partnership relations between producers and consumers.
- Supporting initiatives and projects aimed at protecting the environment and biodiversity.

Importance to the nut sector: MOVCA Association plays an important role in the nut sector by promoting and supporting organic farming and sustainable practices. Through its activities, the association contributes to increasing awareness and demand for ecological and local nucifera products, thus supporting the development of nucifera production and processing in a sustainable and responsible way towards the environment and the community. MOVCA Association can also provide support and advice for nut producers who want to switch to organic farming practices and engage in fair and responsible trade.

The association currently has around 80 members, of which around 23 are nut producers (hazelnuts and walnuts, almonds). The total certified area in the ecological system or in conversion of members within the association is about 563 ha, of which the largest share is hazelnuts, with 326 ha or 58%, followed by walnuts, 164 ha (29%) and almonds with 73 ha (13%).

Table 12. Area of nut plantations owned by MOVCA members in ecological system 2023, ha

Walnut	**326**	**58%**
Hazelnut	164	29%
Almond	73	13%
TOTAL	**562,49**	**100%**

The advantages offered by ecologically certified production

There are several advantages of organic nucifera over conventional ones, and these are often considered important both from an environmental perspective and from a health and food quality perspective. Here are some of those advantages:

Environmental protection: Organic farming promotes the use of sustainable practices that reduce the negative impact on the environment. Growing nucifera organically involves the use of natural fertilizers, thus avoiding the contamination of soil and water with harmful chemicals.

Product quality: Organic walnuts are grown without pesticides and synthetic chemical fertilizers, which can lead to a higher quality of the final product. They are considered healthier and safer for consumers who appreciate natural and unpolluted food products.

Biodiversity: Through ecological practices, farmers contribute to the maintenance of biodiversity and ecological balance in agricultural ecosystems. The use of agroforestry or other techniques for integrating nucifera into natural environments can support habitat for plant and animal species.

Disease and pest resistance: Organic farming encourages the development of more disease and pest resistant agricultural systems by promoting crop and ecosystem diversity. This can reduce the need to use pesticides and other chemicals for plant protection.

Benefits for farmers: Growing walnuts organically can bring economic and social benefits to farmers. For example, there are increasing demands for organic products in domestic and international markets, and higher prices can contribute to better incomes for producers.

Consumer health: Consumers who opt for organic nuts benefit from healthier products without pesticide residues or other harmful chemicals. These products are often considered tastier and more nutritious.

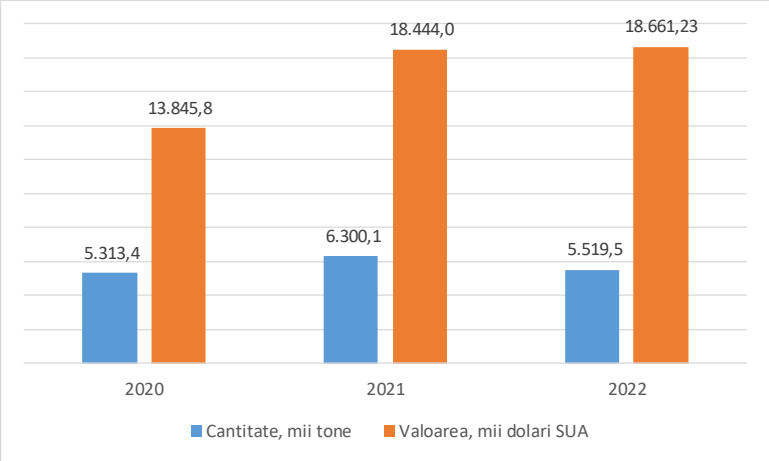
Overall, organically grown nuts are a sustainable and healthy option for consumers and the environment, helping to promote sustainable and responsible agriculture.

2.3. IMPORT OF NUTS IN R. MOLDOVA

In R. Moldova, the import of nuts can be influenced by several factors, including domestic demand, local availability of certain types of nuts and changes in the global nut market. Here are some important aspects related to the import of nucifera in the Republic of Moldova:

- **Variation in local availability:** Depending on climatic conditions and local production capacity, Republic of Moldova may import certain types of nuts that it does not produce in sufficient quantities or at all. For example, hazelnuts, macadamia nuts or Brazil nuts are often imported to meet domestic demand.
- **Diversity of demand:** Consumers in R. Moldova may have varied preferences regarding the types and origins of nuts. Imports may be influenced by demand for specific nuts or products derived from them, such as vegetable oils or nut milks.
- **International quality and prices:** Import can also be determined by the quality of nucifera available in the international market and their prices. Sometimes importation may be economically advantageous compared to domestic production or may be necessary to provide a variety of products to the local market.
- **Trade agreements:** Republic of Moldova can import nuts in accordance with trade agreements concluded with other countries or trade groups. These agreements can influence the quantities and types of nucifera imported, as well as the customs duties applied.

Fig. 6. Imports of nuts in the Republic of Moldova, 2020-2022



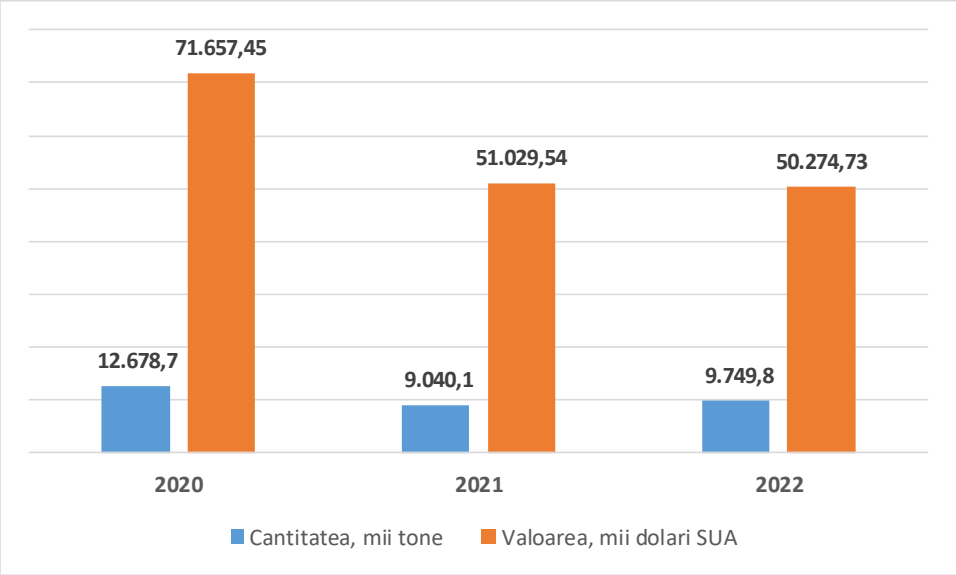
In general, the import of nuts into the R. Moldova can be an important aspect to satisfy the domestic demand and to complete the supply of products on the local market. It is possible that the import is more pronounced for certain types of nuts or for derived products that are not produced in sufficient quantities in the country.

2.4.EXPORT OF NUTS FROM REPUBLIC OF MOLDOVA

Export of nuts from R. Moldova can be influenced by several factors, and the existence of an export potential can represent an important opportunity for the country's agricultural sector. Here are some relevant aspects regarding the export of nucifera from the Republic of Moldova:

- **Diversity of production:** The Republic of Moldova produces a variety of nuts, such as walnuts, hazelnuts, almonds. This diversity can be an advantage in export, as it allows diversification of the product range and access to international markets that demand different types of nuts.
- **Quality and food safety requirements:** In order to export nuts, the Republic of Moldova must comply with international quality and food safety standards. This includes aspects such as quality control, compliance certifications and compliance with hygiene and environmental regulations.
- **Access to international markets:** The export of nuts can be facilitated by trade agreements signed by the Republic of Moldova with other countries or trade groups. These agreements can reduce trade barriers and provide competitive advantages in accessing international markets.
- **Promotion of local products:** The export of nut trees can contribute to the promotion and recognition of Moldovan agricultural products internationally. An effective marketing and promotion strategy can strengthen the positive image of local products and attract more external customers.
- **Diversification of incomes for producers:** The export of nut trees can offer producers from the Republic of Moldova opportunities to diversify incomes and increase profitability. Access to foreign markets can bring additional income and reduce dependence on the domestic market.

Fig. 7. The volume of nut exports from R. Moldova, 2020-2022



As can be seen from the data above, the export of nut trees had a negative trend in the period 2020-2022, largely due to the drought that led to a decrease in production but also in the quality of the fruits. Moldova exports mostly walnuts, the export of hazelnuts being a very small one. This is explained by the fact that we have many small producers with uneven batches of products (different varieties, uncalibrated and without packaging).

At the same time, R. Moldova is one of the main exporters of walnuts on the European Union market, being in the top 5 exporting countries on this market. Respectively, taking into account that we have a trend of increasing the areas planted with nuts, especially modern varieties with higher productivity, there is an increased potential for commercializing nuts on external markets, at a competitive price.

Table 13. Major Walnut Exporters to EU

Major Walnut Exporters to EU, (metric tonne, inshell basis)

Country of origin	2019/20	2020/21	2021/22
United States	148.898	157.326	175.999
Chile	55.032	59.530	63.266
Ukraine	36.537	38.764	41.301
China	9.841	11.835	22.312
Moldova	**23.270**	**13.992**	**9.286**
Other	13.754	11.529	12.222
TOTAL IMPORTS	**287.332**	**292.976**	**324.386**

In conclusion, the export of nuts from the Republic of Moldova can be an important aspect for the development of the agricultural sector and for the economic growth of the country. With a strategic approach, compliance with international standards and promotion of quality products, the export of nuts can be a valuable opportunity for Moldovan producers.

2.5. DEMAND FOR NUTS ON THE RETAIL MARKET OF THE REPUBLIC OF MOLDOVA (REQUIREMENTS FOR THE FINAL PRODUCT)

The demand for nuts from supermarket chains in the Republic of Moldova can be influenced by several factors, and these chains can have different strategies and preferences regarding the products they sell. Here are some relevant aspects related to the demand for nuts from supermarket chains in R. Moldova:

- **Consumer trends:** Supermarket chains are attentive to consumer trends and customer preferences. If there is an increased demand for nuts among consumers, these chains will be more willing to offer a greater variety of products in this category.
- **Quality requirements:** Supermarket chains place particular emphasis on the quality of the products they sell. Thus, nuts must meet high standards of quality, freshness and food safety to be accepted in distribution chains.
- **Product Range Diversification:** Supermarket chains are constantly diversifying their product range to meet varying customer demands and preferences. Thus, they may look to include different types of nuts such as walnuts, almonds, hazelnuts, etc. to meet demand and provide customers with a variety of options.
- **Provenance and sustainability:** Some supermarket chains may have specific criteria regarding the provenance and sustainability of the products they sell. They may prefer nuts from sources that are certified organic or that meet environmental protection standards.
- **Promotion of local products:** If the local production of nucifera is valued and appreciated by consumers, supermarket chains may be interested in promoting and marketing local products, including nuts from the Republic of Moldova.

In general, the demand for nuts from supermarket chains in the Republic of Moldova can be influenced by multiple aspects, such as consumer preferences, quality and sustainability standards, availability of local products and consumption trends.

Preferences of supermarket chains

As part of the feasibility study, interviews were conducted with representatives of the most important retail networks in the Republic of Moldova, such as: Metro, Nr. 1, Local/Bonus, Linella. The most important aspects regarding the collection of nucifera production from the local market were the following:

- openness to local production;
- most of the amount of hazelnuts and almonds present in stores comes from imports, because local production does not meet the standard requirements (stable and uniform quantities, size, packaging);
- the amount of walnuts is practically 100% provided by local production, especially due to the lower price compared to imported ones;
- large dispersion of agricultural producers, which offers non-compliant hazelnut production;
- at the moment we have only one producer of hazelnut that delivers finite products to retail networks (hazelnut in shell and shelled hazelnut, packaging of 150 gr, 200 gr, 500 gr);

3.1.THE IMPORTANCE OF THE INVESTMENT PROJECT

The nut sector is of significant importance in the Republic of Moldova from several perspectives. Here are some aspects that highlight the importance of this sector:

Economic: The production and export of nuts contributes to the economic growth of the country. This sector provides employment in agriculture, processing, distribution and other related areas, generating income for producers, workers and businesses in the nucifera value chain.

Agricultural diversification: The cultivation of nuts allows the diversification of agricultural activities in the Republic of Moldova. This reduces reliance on traditional crops and can provide opportunities for increased income for farmers and farms.

Export and international trade: Nut export is an important source of income from international trade. The Republic of Moldova can capitalize on its products on foreign markets and benefit from trade agreements and access to international markets.

Nutrition and health: Nuts are considered healthy and nutritious foods, rich in protein, healthy fats, vitamins and minerals. Their consumption contributes to a balanced diet and maintaining health, being appreciated both on the local and international markets.

Promotion of local products: The nut sector can contribute to the promotion and recognition of Moldovan agricultural products internationally. This can increase the prestige and competitiveness of local products and open new opportunities in foreign markets.

Overall, the nut sector has a significant economic, social and nutritional importance for the Republic of Moldova, offering opportunities for the development and diversification of agriculture and the country's economy.

The need to create the Multifunctional Center

The main purpose of creating the Multifunctional Nut Processing Center can be approached from several perspectives, and its benefits can be considerable for both producers and consumers. Here are some of the main objectives of such a center:

- **Production efficiency and quality:** A multifunctional center can be designed to optimize nut processing processes, leading to increased efficiency and quality of finished products. By using modern technologies and efficient processing practices, faster and more consistent production can be achieved.
- **Product diversification:** Such a center can facilitate the diversification of the range of products derived from nuts. For example, oils, butter, nut milk, pastries and other nut-based food products can be produced. This provides opportunities for increased revenue and market competitiveness.
- **Full utilization of resources:** The multifunctional center can be designed to ensure full utilization of resources from nuts. For example, shells and other components can be used to produce compost or other by-products, thus contributing to the sustainability of the production process.

- **Standardization and certification:** By concentrating processing in a single center, standardization of processes and products can be pursued. This can facilitate obtaining quality and food safety certifications, which can increase consumer confidence and access to international markets.

- **Local economic development:** A multifunctional nut processing center can contribute to local economic development by creating jobs, stimulating the agricultural sector and promoting local production in regional and international markets.

Overall, a multifunctional nut processing center has the potential to bring multiple benefits, including increased efficiency, product diversification, full utilization of resources and contribution to local economic development.

3.2. IMPACT OF THE PROJECT

A. Economic impact

The creation of a multifunctional nut processing center can have a significant economic impact in R. Moldova. Here are some aspects that highlight the economic impact of this type of center:

- **Job Generation:** A multifunctional center will require staff for processing operations, production management, quality control, logistics and administration. This can lead to the creation of a significant number of direct and indirect jobs in the agricultural sector and related industries.

- **Increase in agricultural production:** The center can stimulate the growth of agricultural production of nuts in the region, as farmers and producers can be encouraged to develop and expand nut crops to provide raw material for the processing center.

- **Value addition:** Nucifera processing in a multifunctional center adds value to agricultural products. Derived products such as oils, butters, nut milks and other processed products command higher market prices than raw raw materials, which can increase income and profitability for producers and the local economy.

- **Export and External Revenue:** The Center can facilitate the export of processed nut products to international markets. This can generate foreign income and contribute to the country's comercial balance by increasing exports and competitiveness in foreign markets.

- **Stimulation of other economic sectors:** The development of a multifunctional nut processing center can also stimulate other related economic sectors such as transport, logistics, packaging, marketing and distribution. This can have a domino effect in increasing economic activity and investment in the region.

Financial benefits of the project	EUR
Total value of raw material collected from small producers within 5 years	2.191.500
Total salaries paid to people who will be employed in the locality and region during 5 years	893.583
Total profit obtained from the activity of the center (5 years)	1.321.132
Total Taxes paid to the state budget (5 years)	271.777
Total Financial benefits	**4.677.992**
Total planned investment	**2.015.000**
Cost-benefit ratio (Total benefits/Total investment costs) (> 1)	**2,3**

B. Social impact

The launch of the Multifunctional Nut Processing Center can have a positive social impact both locally and regionally, affecting various aspects of local communities and society in general. Here are some aspects that highlight the social impact of this type of center:

- **Job creation:** A multifunctional center will generate a significant number of jobs in the region, including for workers in the agricultural sector, processing personnel, management, logistics, sales and other related fields. This can help reduce unemployment and improve the living standards of local communities. The multifunctional center will initially generate 20 direct jobs (priority for local residents) and approx. 100 indirect jobs in the supply chain and associated services.
- **Improving access to services:** The development of a nut processing center can also attract other services and facilities to the area, such as medical, transport and infrastructure services. This can improve access to essential services for the residents of the region and contribute to the development of local infrastructure.
- **Promotion of local entrepreneurship:** The Center can stimulate the development of local entrepreneurship by creating opportunities for local suppliers of raw materials, producers of agricultural products and small producers of processed products. This can increase the entrepreneurial spirit in the community and contribute to the diversification of the local economy.
- **Improving the quality of life:** Creating a multifunctional center can benefit the quality of life in communities by generating income, improving access to jobs, education and services, as well as promoting sustainable development and the general well-being of residents.
- **Increasing social cohesion:** A nut processing center can contribute to strengthening the community and increasing social cohesion by involving residents in common economic and social activities, as well as promoting collaboration between different stakeholders in the region.

3.3. ASPECTS REGARDING THE INTEGRATION OF THE ACTIVITY OF THE MULTIFUNCTIONAL CENTER IN THE GREEN AND CIRCULAR ECONOMY

The launch of the Multifunctional Nut Processing Center can help promote a green and circular economy in the region. This can be achieved by adopting sustainable practices and technologies and efficient resource management. Here are some relevant aspects in this regard:

- **Efficient use of resources:** A multifunctional center can use modern technologies and efficient processes for processing nucifera, thus contributing to the efficient use of natural resources. For example, the management of husks and other processing waste can be done in a sustainable way, through recycling or use in other processes.
- **Green energy:** The center can implement solutions to reduce energy consumption and use green energy sources such as solar or wind energy. This can help reduce your carbon footprint and promote a more energy-sustainable economy.
- **Recycling and reuse:** A multipurpose center can promote the practices of recycling and reuse of materials and waste. For example, nut shells or other components can be used in other processes or turned into by-products such as compost or environmentally friendly packaging materials.

- **Promotion of sustainable production:** The Center can collaborate with local producers to promote sustainable and ecological agricultural practices. This may include using organic farming methods, responsible management of water and soil resources and protecting biodiversity.
- **Certifications and standards:** A multifunctional center can seek to obtain certifications and accreditations attesting to compliance with environmental and sustainability standards. These certifications can increase customer confidence and open new opportunities in international markets for processed nut products.

3.4. THE ROLE AND IMPORTANCE OF THE MULTIFUNCTIONAL CENTER IN EDUCATING LOCAL PRODUCERS

The multifunctional nut processing center can play a crucial role in educating and training local producers, having a number of benefits and significant importance in this regard. Here are some aspects that highlight the role and importance of this center in educating local producers:

- **Transfer of knowledge and technologies:** The center can provide local producers with access to modern nucifera production knowledge and technologies. This can improve the quality of products and the efficiency of production processes, helping to increase the skills and abilities of local producers.
- **Hands-on Training and Demonstrations:** The Center can organize hands-on training sessions and demonstrations for local producers where they can learn first-hand about nucifera cultivation, harvesting, storage and processing techniques. This type of direct training can be very beneficial for assimilating correct practices and effective techniques.
- **Promoting sustainable agricultural practices:** The center can educate local producers about sustainable and ecological agricultural practices, such as using organic farming methods, responsible management of water and soil resources, or reducing the use of pesticides and chemical fertilizers. This can help protect the environment and promote more sustainable agriculture.
- **Certifications and standards:** The center can help local producers obtain the necessary certifications and accreditations to meet quality, food safety and sustainability standards. This can open up new opportunities in domestic and international markets and strengthen consumer confidence in local products.
- **Partnerships and collaborative networks:** The Center can facilitate collaboration and exchange of experience between local producers, research and development institutions, agricultural associations and other stakeholders. This can stimulate innovation, technology transfer and the development of the nuciferous sector as a whole.

Therefore, the multifunctional nut processing center can be an important hub for the education and training of local producers, contributing to improving the quality and efficiency of agricultural production, promoting sustainable practices and developing a more competitive and socially responsible agriculture and environmental.

3.5. COLLABORATION PROCESS OF THE NUT PROCESSING CENTER WITH AGRICULTURAL PRODUCERS

The collaboration process between the Nut Processing Center and agricultural producers can be structured in several stages and ways to ensure an efficient and beneficial collaboration for both parties. Here are some ways or processes by which they can work together:

- **Identification and selection of producers:** The center can identify and evaluate agricultural producers who grow nucifera or who are interested in starting their cultivation. This process may involve analysis of production capabilities, crop quality, compliance with quality standards and compliance with sustainable agricultural practices.
- **Consultancy and Technical Assistance:** The Center can provide consultancy and technical assistance to agricultural producers regarding selection of nut varieties, best agricultural practices, efficient use of resources, disease and pest control, etc. These services can be offered regularly or on demand, depending on the needs of the farmers.
- **Raw material quality assurance:** The Center can set quality standards for raw materials supplied by agricultural producers and provide guidance and feedback to ensure that these standards are met. This is essential for obtaining high quality final products.
- **Production planning and coordination:** Through close collaboration, the Center can plan and coordinate the production of raw material (nuts) according to the requirements and capabilities of the processing center. It can ensure an efficient and balanced flow of raw material and finished products.
- **Training and professional development:** Organizing training and professional development sessions for agricultural producers can be an effective way to improve their skills and knowledge in growing, harvesting and storing nucifera. These sessions can be interactive and practical, involving both theoretical and practical aspects.
- **Collaboration agreements:** The center and agricultural producers can conclude formal collaboration agreements, establishing clear terms and conditions regarding the supply of raw material, prices, quality standards, delivery times, etc. These agreements can ensure a stable and transparent relationship between the parties.
- **Monitoring and Evaluation:** The Center can monitor and evaluate the performance of agricultural producers in terms of crop quality, adherence to quality standards, compliance with sustainable practices and overall production efficiency. This information can be used to provide feedback and guidance to manufacturers for continuous improvement.
- **Promotion of products:** The Center and agricultural producers can collaborate in the promotion and marketing of products on domestic and foreign markets. This may include developing marketing strategies, participating in events and exhibitions, creating promotional materials, etc.

By implementing these cooperation methods and processes, the Nut Processing Center and agricultural producers can build a solid and beneficial relationship, which will bring advantages for both parties and contribute to the development of the nucifera sector in R. Moldova.

3.6. REGULATORY FRAMEWORK

The nut sector is governed by several laws and regulations that establish requirements, standards and procedures for the production, processing and selling of nuts. Here are some of the main legislative acts related to the nucifera sector in Republic of Moldova:

- **Law no. 239/2008 on the record and quality of agricultural products:** This law establishes the rules and requirements regarding the production, processing and marketing of agricultural products, including nuts. It regulates aspects such as quality and food safety standards, product labeling and packaging, recordkeeping and quality control.
- **Law no. 136/2007 on organic agriculture:** This law establishes the legal framework for the practice of organic agriculture in the Republic of Moldova. It regulates issues such as the certification of organic products, the use of pesticides and other chemicals in organic farming, as well as the promotion and support of organic farming in general, including nut crops.
- **Horticulture development program for the years 2021-2025 (Government Decision no. 840/2020).** This program has as its basic objective the orientation of investments for the strengthening of the value chain and the processing infrastructure of agricultural production and the modernization of the processing industry by creating a system of small and medium-sized enterprises for the processing, storage and packaging of agri-food products, established by the nominated Plan for the agricultural sector and the food industry.
- **Regulation on the quality and marketing of agricultural products:** This regulation details the specific standards and requirements for the quality and marketing of agricultural products, including nuts. It establishes criteria such as size, color, taste and other characteristics of nuts that can be traded and that can benefit from specific certifications.
- **Norms and technical standards:** In R. Moldova there are norms and technical standards that are applied in the process of production, processing and selling of nuts. These norms and standards may include aspects such as soil quality, cultivation technologies, harvesting and storage methods, as well as hygiene and food safety conditions.
- **International agreements and EU regulations:** Republic of Moldova has trade and cooperation relations with the European Union (EU) and other countries, and such agreements and regulations can influence and regulate aspects related to the nucifera sector, including quality standards, export procedures import and other specific requirements.

These are some examples of legislation and regulations that apply to the nut sector in the Republic of Moldova. It is important to note that these regulations can be updated and changed over time, and manufacturers and operators in this sector must be aware of the latest changes and legal requirements.

3.7. LOCATION OF THE MULTIFUNCTIONAL CENTER

For the construction of the Multifunctional Center, the use of existing facilities in Puhoi village, Ialoveni district is proposed as an option. The given location represents a complex of buildings with afferent land, located in the outside of Puhoi village. It has a very successful location, being located in the Central region of Moldova, near where we have the highest concentration of nut plantations, being at a distance of about 30 km from Chisinau. . For the creation of the Center on the basis of this location, the repair and improvement of the existing buildings are planned, in which the spaces for the installation of the primary processing, shelling and storage lines will be arranged. For the process of drying the nuts, but also for the processing activities, it will be necessary to build a special hall that meets the technical and food safety requirements.

Fig. 8. The proposed site for the location of the center

Table 14. Implementation plan (investment phase)

		Year 1												Year 2											
#	**Activity**	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	Development and approval of the feasibility study																								
2	Preparation of the funding request and its approval by the donor																								
3	Development of project documentation for the planned investment																								
4	Elaboration of tender documentation, including specifications and its approval																								
5	Identification and approval of the location for the construction of the Multifunctional Center																								
6	Initiation of the investment project																								
7	Project implementation (construction phase)																								
8	Project implementation (equipment stage)																								
9	Completion of construction																								
10	Launching the operational activity of the Multifunctional Center																								

3.8. LEGAL FORM OF ORGANIZATION OF THE MULTIFUNCTIONAL CENTER'S ACTIVITY

An economic processing activity can take several legal forms such as SRL, SA, Entrepreneur's Cooperativa. In our case, it is proposed to register an LLC, and to collaborate with agricultural producers on the basis of contract farming.

How contract farming works. A farming contract is an arrangement between a farmer (or group of farmers) and a buyer, such as a food processing company or distributor, in which certain conditions and obligations are set out for both parties. Here's how contract farming generally works:

1. Negotiation and establishment of the contract:

- The process begins with negotiations between the farmer and the buyer to establish a contract. These negotiations include product price, estimated quantities, product specifications, delivery times and other relevant terms.
- The contract will be drafted to reflect these details as well as other legal and commercial aspects such as the duration of the contract, the rights and responsibilities of both parties, termination clauses, etc.

2. Planning and production:

- After signing the contract, the farmer begins to plan and produce the crops or products specified in the contract. It can be guided by contract requirements regarding cultivation techniques, quality, use of agricultural inputs, etc.
- The buyer may provide technical assistance, seeds, agricultural inputs or other resources necessary to ensure that production conforms to the standards established in the contract.

3. Monitoring and management:

- During the contract period, the buyer and the farmer monitor and evaluate the production progress. This may involve field visits, regular reporting, quality reviews, etc.
- If there are problems or changes in the contract, they are brought to the attention and discussed between the parties to find solutions or necessary adjustments.

4. Collection and delivery:

- After production is completed, the farmer harvests the crops according to the contract specifications and delivers them to the buyer within the terms set in the contract.
- The buyer can carry out quality inspections and tests to ensure that the products conform to the required standards.

5. Payment and completion of the contract:

- After delivery, the buyer pays the farmer according to the terms of the contract, such as price per unit or quantity delivered.
- The contract is completed once all obligations have been fulfilled according to the agreement and payment has been made.

Contract farming can be mutually beneficial, providing farmers with an opportunity to secure income and access to stable markets, while buyers can obtain quality products and security of supply. However, it is important that contracts are fair and respect the rights and interests of both parties involved.

3.9. TECHNICAL SOLUTION FOR EQUIPPING THE MULTIFUNCTIONAL CENTER FOR PROCESSING

Description of the investment project and the technical solution

This document presents the preliminary design blueprint for a prospective nut processing plant intended for establishment in the Republic of Moldova. Primarily focusing on walnuts collected from numerous cultivators across different regions, the plant is also designed to manage processing tasks for hazelnuts and almonds local to the area. This plant will play a pivotal role in enhancing and standardizing the quality of the nuts, thereby boosting their commercial appeal and marketability. Furthermore, the facility's apability to handle multiple nut varieties will substantially bolster its investment returns and extend its operational period across seasons. Before finalizing the facility's construction plans, our approach involves defining the operational scope and capacity of the plant, followed by devising an initial conceptual layout and projecting the investment needed for the infrastructure. This phase will concentrate on an optimal layout design. Subsequently, upon confirmation of the specific location and building parameters, the foundational design will be tailored to fit the precise architectural requirements.

Walnut Processing:

Depending on the variety and location, walnut harvest usually begins during the second half of September and last though the end of December, Walnut kernels reach full physiological maturity, when the peak of oil content in the kernel is reached, several weeks before they naturally detach from the tree. From this time onwards, the fruit stops to grow and has the lightest color, which is commonly defined as one of the most important quality characteristics. However, at this stage, the shell is strongly attached to the green hull as well as to the tree making it not only difficult to harvest but also hull (remove the green hull). Unless induced artificially, it takes several weeks for the maturation of the green hull and for the fruits to be detached from the tree. Harvesting and processing of walnuts as close to this stage as possible will ensure them to maintain their natural light color, and increase their market value. Through the end of this period, hull separation is accelerated and nuts starts falling from trees. Remaining on wet soil will also affect their color negatively as nuts start getting darker in color on the orchard surface, especially in wet conditions. As this period of the year also coincides with the fall rains which could make deteriorate harvesting conditions, harvesting as early as possible, within the shortest time frame is a good practice to ensure nut quality. It is practical to define the Walnut processing system in three independent operations that will run in four physically separated parts of our building. These are:

Essential Components of a Walnut Processing Line
• Hulling/Washing
• Drying and
• Calibration
• Storage

Depending on the marketing strategy there may be other processes involved, that may include various packaging method. A very important part of the operation is storing and inventory management.

Let us dive into each of these processes and their sub steps:

I. HULLING (WASHING) LINE:

Commercial walnut orchards are usually harvested mechanically, by harvesting systems that collect nuts from orchard surface. In doing so, a large number of foreign materials are collected from the orchard. These may include, stones, empty walnut, soil, sticks, leaves, and other debris. The initial step of the walnut processing, usually called hulling/washing or cleaning, is the process of removing the nuts from various debris. This process involves a removal of a large volume of solid debris using a very high volume of water. Therefore, it is usually done outside of the processing plant, under a shed roof that will protect the machinery as well as its operators from rain and sun. One important characteristics of the hulling line is that they cannot be upgraded easily. Therefore, the capacity of the hulling line should be analyzed carefully so that it will be capable of handling the capacity that you may require at the highest productivity or the production that may come from additional parcels that might be planted later on. Although the line seems to be made up of independent machines and conveyors that are placed next to each other (independently positioned equipment), as the speed and capacity of the line increases, it needs to be designed and established as a continuous integrated line.

A hulling line made of independently placed machines

An integrated hulling line on a mainframe

In order for it to be effective and to protect the crop as well as the machinery, this needs to be carried out in an order:

A - Reception Pit: Walnuts harvested are placed in a depository, either located on the surface or buried underground, usually called the reception pit or drive-over depository. Here the contents are moved by an horizontally placed conveyor towards an elevator that will transfer them into the hulling line. The capacity of the depository should be determined according to the capacity of the processing line as well as the speed of incoming harvest. The faster the harvest is done, by harvesting machinery, the larger capacity should be used. Larger pit size will help free up harvester and trailers.

B - De-sticking/De-leafing: The initial stage of the hulling process is to remove sticks, pieces of wood and leaves that could negatively affect the process by jamming into machines. Considering that the walnuts coming into the processing line will be harvested in different methods, it is advisable that the hulling line has an effective de-sticking/de-leafing unit.

C - Pre-cleaning: Precleaning is a process that the nuts are subject to spray of high pressure water and or physical agitation. The purpose of this process is to remove external debris and initiate the removal of the hull. Some pre-cleaning models are based on circular rotation of the walnut in a horizontally placed cylindrical container while being sprayed with water. If such a method is being used, pre-cleaning should be placed after the de-stoning (removal of the stones) so that neither the equipment nor the nuts are damaged by the stones inside the walnuts.

D - Destoning: Destoning is the process of removing stones that have been collected from the orchard surface along with the walnut. Depending on the soil characteristics and how the harvest is done, the amount, size and

the structure of the stones may show significant changes. Assuming that at least some of the orchards will be harvested mechanically, this is a critical process that needs to be included in the hulling line. The equipment that separates stones from the walnuts is also called a floatation tank. It is usually a stainless steel tank filled with water, where floating walnuts will be removed out by an elevator while the stones that sink are removed from the bottom with a different elevator. The capacity of the system should be compatible with the general capacity of the line.

E - Hulling: Hulling is the removal of the green membrane that separates the walnut shell. It is arguably the most important step of the hulling/washing line. During the early stages of the harvest, the hull will come in a much stronger form, making it difficult to remove. It will gradually be more detached from the shell and towards the second half of the harvest, walnuts may even be mostly without the green hull. Because of this progress, an ideal hulling line should be able to operate equally well in various situations. There are a few established hulling designs that can be configured in different settings during the harvest period according to the condition of the nuts. In order for an entire processing line to work efficiently, all of its components should be configured with the capacity that complements each other. Because of the intensive nature of the hulling process, its speeds may need to be adjusted down when needed. Therefore, Hulling machine is usually considered as the bottleneck of the Hulling/Washing line.

F - Washing/Brushing: Walnuts that are hulled (the green hull removed), are exposed to the dark liquid that is created during this process. If not removed, this dark liquid will result in creating a dark stain on the walnuts, which will reduce the overall quality. A series of pressure sprayers are used to wash/drain the walnuts after the hulling operation.

Walnut hulls, when removed from walnut shells may leave some tissues around the shell. When dried, these tissues turn black and are perceived as a negative quality. A brushing conveyor is often included in the hulling line (within the washing module), that not only helps remove these membranes, but also could be very helpful in removing mud around shells especially caused by heavy soils in rainy periods. While the brushing lines could be very helpful in this regard, it will reduce the speed of the overall line.

G - Empty Separator Aspirator: There are many empty nuts that may reach until this stage that need to be removed. An aspirator generating a strong suction power will lift up the light (empty) walnut from the rest of the nuts. The flowrate and the pressure of this aspirator should be adjustable to maximize the accuracy of this process.

H - Optical Sorter: When operating in full capacity, as many as 250 nuts pass though a certain point in a 10 tons/hr hulling line every second. There could be many dark color, damaged ones as well as those that may still have some green hulls around them. While each of these exceptions can be manually removed by a series of operators, it is very labor and cost intensive to do this process based purely on manual labor. Optical sorters observe the passing walnuts with their very sensitive cameras and separate walnuts using mini mechanical fingers based on their type of defect in different directions, making sure that only the good ones pass this point. Following the hulling operation, an optical color sorter can detect the green (un-hulled) nuts back to a conveyor belt that feeds them back to the huller, while another optical sorter, can separate the rejected walnuts to trash. There could even be a third optical sorter to separate the broken ones. Each optical sorter is in essence a conveyor belt, that could also be used as a manual sorting table where operators can manually do this sorting. We believe that an optical sorter that will separate the green hulls back to the huller is an essential component while the others, with much less occurrences, are only optional, depending on the labor availability and its cost. None of the hulling line manufacturers build these optical sorters. They design and build the sorting tables where the optical sorters built by several specialized US, European and Asian manufacturers can be mounted. In US, it is also very common to rent these optical sorters on a seasonal basis as they are often updated, upgraded and their software are rewritten.

I - Sorting Table: A sorting table is essentially a wide conveyor line where operators are positioned on both sides to separate sub standard walnuts from the rest. There are usually mechanical methods to send these nuts back to a number of predetermined destinations. For example, green ones going back to the huller, black ones to the trash and damaged ones to a second quality depository.
J - Trash conveyor: Underneath the entire hulling line, there should be a long conveyor belt that usually runs in the opposite direction of the nuts that collect the soil residue (hulls, leaves, stick, stones) to a trash depository (usually a trailer).

Important :
The speed of the hulling/washing operation is generally measured by the speed of the hulling machine. It is very important to take into account that the speed mentioned here (like 10 tons/hr), is usually based on the WET weight of the walnuts. Furthermore, especially in the American lines, the value indicated here is usually in US (Short tons), which is approximately 0.907 metric tons.

II. DRYING LINE:
Harvested walnuts arrive in the processing line with high humidity, which could be as much as 35 % by wet basis (w.b.). As the harvest progresses, each new batch of walnut harvested will usually come with less moisture as the walnuts will lose moisture in time. Rain will affect affect this progress negatively. If kept in this stage, walnuts will soon start developing mold and will be unconsumable. Drying (or sometimes called dehumidifying) is the process of reducing the moisture level of walnut to a stable level that will prevent mold formation. This stable level is defined as 8 % (in-shell w.b.) which corresponds to approximately 5 % (kernel, w.b.). Let us define these concepts:

$$\text{Moisture content Wet Basis (w.b)} = \frac{Wt - Wd}{Wt}$$

where:
Wt: Weight of dry walnut
Wt: Weight of completely dried walnut

The objectives of a good walnut processing operation are:
1 - Uniform drying with the smallest deviation from target moisture:
a) The maximum moisture at the end of the drying process should be 8 % (in-shell w.b.) AND there should be a minimum difference of moisture from this level, as each percent loss is moisture below this level is 1 percent loss of product that could be sold. In addition to loss of sales due to over drying, a more intense over drying will be considered a poor product quality.
2 - Speed of drying:
Depending on the efficiency of your drying line, the drying process could take 24, 36, 48 or more hours to complete. Faster drying process means that the drying line will be less occupied with one batch and that it could be used to dry the next one, reducing the need for a higher drying capacity. Obviously the faster drying line will also prepare your nuts for sales in a shorter time.
3- Energy Efficiency:

Drying lines use electricity for fans and propane or natural gas or some other form of fuel to heat air. The energy used makes up a significant portion of the cost of the drying operation. The lower the energy use per ton of dry walnut, the more energy efficient, cost effective and nature friendly it is.

4 - Labor efficiency:

A labor efficient drying line requires less operators. Some modern lines are also capable of operating autonomously making all adjustments by themselves.

The drying line is made up of the following components.

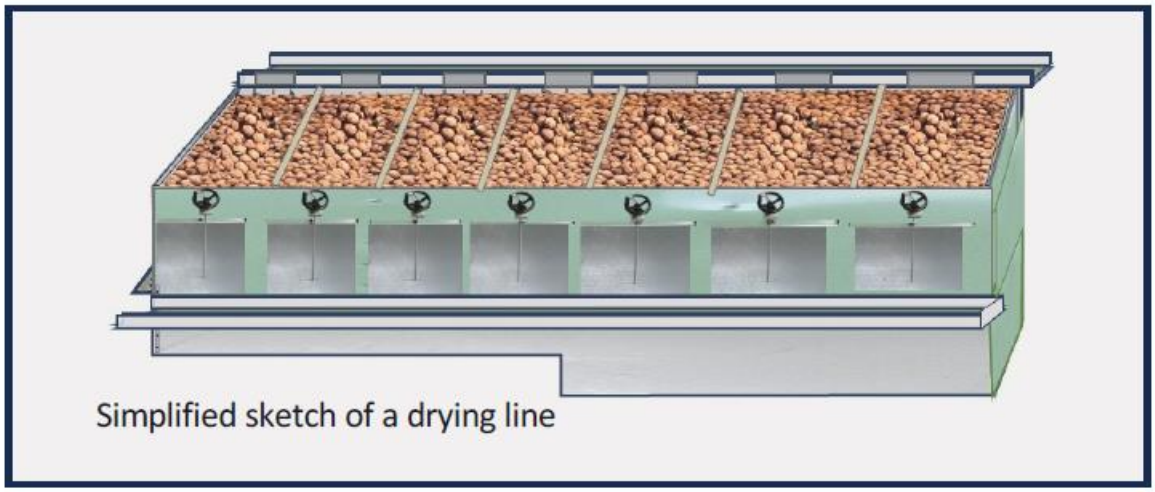
A - Conveyance system:

The walnuts are carried from the end of the hulling line to the drying room by an elevator. Then they are transferred to drying bins using a series of conveyors. Walnuts that are dried are discharged from drying bins by conveyor lines. These set of elevators and conveyors allow the flow of nuts from the hulling line to the drying line and from the drying line to the calibrator line. They can be operated manually or completely automated. An automated conveyance system is essential for a high capacity processing line. These systems often have Variable Frequency Drivers (VFDs) that allows the adjustment of their speeds.

B - Drying Bins: Almost all commercial drying lines are formed by a series of stationary drying bins (rectangular shaped metal containers) that are placed parallel to each other as series of (usually) 10 bins. This is by far the most popular drying line setup in the largest walnut production markets in the world, such as USA and Chile. The drying bins have angled floors that help the discharge of the walnuts. Inside the bins, the floors are covered with perforated metal sheets that will allow high pressure of air to rise through them.

C - Air ducts :

Under the drying bins, there is a canal where high pressure air is being pumped by the drying fans. Air that reaches the bins pass through louvers and rise though the stacks of walnut and removes the moisture from them, leaving from the top of the bins. These louvers can be adjusted to different settings depending on the stage of drying. Some drying lines have automated louvers that adjust themselves automatically.



Simplified sketch of a drying line

D - Drying Fan:

A drying line consisting of 6 or 10 bins has one or more fans that generates the air that dries walnuts. The accurate calculation, adaptation and control of the air requires a precise calculation and high engineering

which creates the efficiency of the entire line. It is vital to determine the correct flowrate (air volume) as well as the air pressure that is required for the drying operation. In doing so, the right combination of different types of fans must be used (radial fans used for the high pressure and axial fans for the high flow rate). The drying operation is the most technical part of the entire processing operation. Many drying systems fail due to improper design or calculation resulting in very inefficient drying that could take extremely long durations. A well designed drying line should provide proper drying on average of 24 hours during the harvest period.

E - Heaters:
While the air is the primary vehicle of the drying operation, the heat plays a secondary role by lowering the relative humidity of the air pumped inside the bins. As the air is heated, it expands in volume which lowers its relative humidity and therefore increases its capacity to absorb moisture from walnuts. It is important to understand that the heat is only used to increase the temperature of the air slightly but not to heat up the walnuts. Walnuts exposed to high temperatures loose their color, their taste and nutritional composition with the deterioration of the lipid acids. A good drying line should be operated with temperatures that should not exceed 34 degree celsius, and should complete a drying cycle in 24 hours on average.

F - Drying Room Exhaust System: A walnut drying line with a dry capacity of 120 tons, is usually filled with 170 tons of wet walnuts with 35 % moisture level. The drying operation effectively removes about 50 tons of water from the walnut in the form of water vapor in 24 hours, releasing on average 2 tons of water vapor into the drying room every hour. This high level of moisture must be discharged from the drying room and replaced by fresh air from outside. Air taken from outside is usually colder and requires more heating compared to the inside. Furthermore, the outside air humidity also may reach to very high levels in deifferent times of the day. Therefore the exhaust system should determine the correct source of fresh air by continuously measuring the air values from inside and outside the drying room to make sure that the most efficient source of air is used. In addition to these active exhaust systems, there are also passive exhaust components such as gates, windows that could be automatically operated.

Capacity of the drying line is measured by the mass of dry walnuts that they could hold. This is usually calculated by the internal usable volume of the bins multiplied by the density of dry walnuts, which could change according to average caliber and inshell yield. Usually measured as approximately 0.35 gr/ cm3. or 350 kg/m3.

Example:
A drying line consisting of 2 drying rows of 10 bins.
(a total of 20 bins), with dimensions of:

l: 3 meters
w: 2 meters
h: 1.6 meters

Volume of 1 bin = 3 x 2 x 1.6 =. 9.6 m3
Capacity of 1 bin = 9.6 x 350 = 3,360 kg (dry in-shell walnut)
20 bins = 67,200 kg total capacity

Important:
Assuming that the drying operation will take 24 hours to complete on average, the capacity of the drying line should be at least twice the daily capacity of the hulling/washing line. So that the hulling line will have drying bin capacity for the second day, when the first batch of walnuts are still being dried. Failure to use the correct relationship between the capacities of different steps of the drying bin will either cause over capacity or force the line to stop due to shortage of capacity.

Due to its nature and complexity, the drying line should be established indoors in a segregated room with high walls to prevent condensation. It is advisable to have a height of at least 8 meters. The high moisture level inside the drying room may affect the finished inventory negatively. So the final product storage should not be done here.

III. CALIBRATION (SIZING) OPERATION:

A high quality commercial walnut requires to be calibrated, that is separated into different sizes. There are a number of different size standards commonly used. These are USDA standards (which classifies walnuts according to their diameters in inch, as Baby, Standard, Medium, Large, Jumbo and Mammoth sizes. According to the USDA standards each of these sizes have a tolerance of up to 12 % in quantity UNECE Standards (common standard in Europe), classifying walnuts according to the diameter in mm, as – 28 mm, 28-30 mm, 30-32 mm, 32-34 mm, + 34 mm Documentation regarding these standards will be provided in the following releases of our report. Calibration of inshell walnuts are done in a number of methods. Of these the most reliable and efficient models are the flat conveyor style calibrators and the deck sizing models. The circular sizers that are based on different layers of horizontally placed cylinders with holes as well as flat sliding calibrators have neither high accuracy nor the speed required from a high capacity processing line.

Calibration operation capacity is often measured in the hourly output, like 5 tons/hr.

> Important :
> A well planned processing line should provide a continuous operation that do not require additional silos as buffer zones. If each of the components are designed and sized correctly a line can operate continuously without any of its components to wait for the others.

IV. STORAGE

The importance of storage of the finished goods in a processing line is often not understood. Inventory of the finished goods is the most important asset of a processing line. The goods must be kept in excellent condition that will preserve their quality. At the same time, this needs to be done in the most economical way both in terms of financial investment in equipment as well as use of storage space.

Storage Models:

A - Silos: Many of the processing factories in Europe are designed with large silos that were built to compensate for the misalignment of the capacity and speeds of the different systems. A well planned and established walnut processing line, do not require such structures that will not be sufficient in any way. The Density of dry walnuts is about 350 kg/m3. Therefore, even a giant metal silo of 5 meters by 5 meters (length and width) by 8 meters in height can roughly hold approximately 70 tons of walnut. Considering that the nuts will also be separated in different calibers (4 or 5 different sizes), you will need many of these silos to keep a small portion of your inventory. They will also require building of large elevators.

B - Bags: Storing walnuts in bags is also a very inefficient model. One pallet with 1.2 m2 area will hold approximately 12-14 25 kg bags (or approximately 300-350 kg). You cannot put a second ayer of pallet on top of an other.

C - Stackable Boxes: Large processing facilities in California and Chile use the stackable box system to store their products. These boxes are either made from wood or plastic. They are stackable on each other. Usual dimensions are 100 cm x 120 cm by 76 or 85 cm in height. They can contain between 215 to 250 kg of dry in-shell walnut. They can be stacked in 8 rows with a forklift easily. This way, a 1.2 m2 area in a storage area can easily hold up to 2 tons of inventory.

Stackable boxes are the most convenient and efficient way of maintaining your finished goods inventory

When determining your storage space, you must take into account the following parameters:

1. To protect your dried walnuts from the effect of moisture, your storage space must be indoors and it must be physically separated from the drying room. It can however be in the same room as the calibration operation.
2. Stackable Boxes is the most practical and economical method in maintaining your inventory.
3. Working with stackable boxes, you should consider approximately 80 m2 of storage space for every 100 tons of dry in-shell walnuts stored in stackable boxes. This are also includes the circulation of the forklift inside the storage area. A simple model will be the following example :

The batch of stackable boxes pictured here is
5 x 8 boxes in the base,
with 8 rows on top of each other,
making a total of 400 boxes,
each containing 250 kg,
holding a total inventory of 100 tons.

Its dimensions are:
6 meters (5 x 1.2) by
8 meters (8 x 1.0), or 48 m^2.
You will need approximately 35 m^2 of area around each of these batches so that you can use a forklift easily.

CAPACITY:

The proposed NUT PROCESSING FACILITY is predominantly designed for Walnut/hazelnut processing. Therefore our methodology is to initially determine the capacity of the Walnut Processing Line. Following this, we will determine what functions of the hazelnut and almond processing can be integrated in this design. There will be some modification to the Walnut Processing Lineto adapt it to the two other crops.

Walnut Plantations:

We have been instructed to design the walnut processing line capable of processing a total production of 1,500 – 2,000 tons in a harvest season.

Thera are 5 main varieties.

- Pesceanski (Moldova)
- Kostiujeni (Moldova)
- Chandler
- Franquette
- Lara

The two Moldovan varieties start harvesting in Mid September, and the three others are harvested during the first half of October. As a grower, our experience shows that the Chandler harvest should begin slightly later than these dates indicated, beginning usually around the end of the first week in October lasting until the end of the month. Based on these figures, we are assuming that the harvest operation will take about 5 weeks to complete for all 5 varieties. We are using the following assumptions in labor structure:

- Shifts per day : 1 shift
- Duration of shift : 8 hours total, 6.5 hours efficient
- Work days during harvest : 7 days a week
- Total ideal harvest days : 35 days

If any of these assumptions are incorrect, the capacity calculations should be reviewed once again.

CAPACITY:

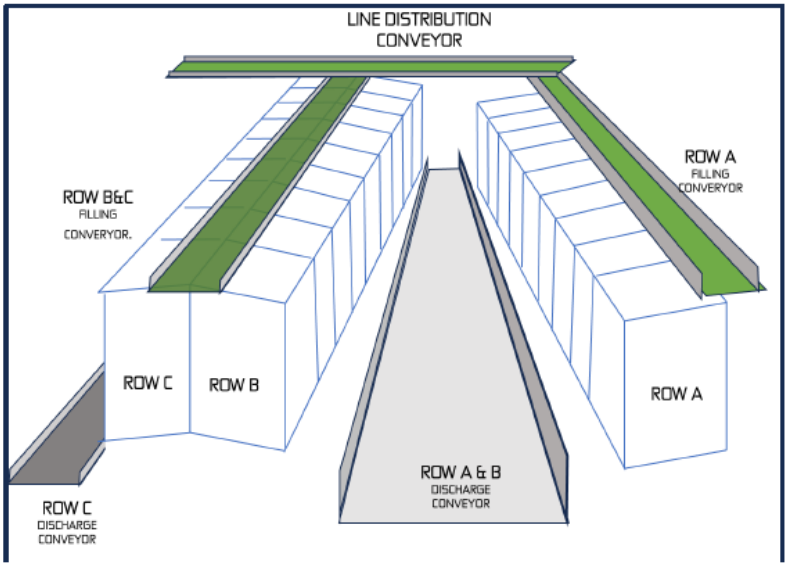
These assumptions indicate that there will be on average of 1,500 / 35 = about 45 tons of walnut (cry basis, in-shell) to be received by the hulling line every day. The goal of the drying line is to finish a drying batch in

24 hours on average. The first batches (at the beginning of the harvest will take a bit more, ap to 30-32 hours) whereas the following batches will naturally dry faster, time dropping as low as under 10 hours. These figures indicate that we should have a drying line of approximately 90 tons (dry, inshell basis). This should be configured as three rows, ROW A ,ROW B and ROW C. Each with 10 bins, (total of 30 bins). Below are the details proposed:

Drying Line:

- Total number of rows : 3 ROWS,
- Bins per row : 10 Bins
- Total number of bins : 30 Bins
- Bin dimensions : 2.0 m x 3.0 m x 1.5 m (net usable)
- Bin Volume : 9 m3,
- Bin capacity : 3.15 tons (dry, in-shell)

Important:
In order to ensure that the drying operation is completed on average in 24 hours, the drying line must be designed with precision and high efficiency taking into account the local climatic data at the time of harvesting. This can be done by a strong engineering company with extensive experience and proven track record in designing such systems. If the drying operation can not achieve this performance, additional drying capacity will be required. This situation should be avoided.



A simplified sketch of a 3 row, 30 bins, drying line with 90 tons dry walnut capacity. ROW A will have a separate filling conveyor and ROW B and C will share a common filling conveyor.

Row A&B will be sharing a common discharge conveyor and Row C will have a separate discharge conveyor. One single line distribution conveyor will service all three lines.

CAPACITY:

Calibration Line:

The calibration line should be designed to meet the discharging speed of the dryers. Our calculations indicate that a calibration line with a capacity of 5 tons per hour, separating walnuts into 4/5 calibers should be sufficient initially. As the production increase, a second calibration line will be needed, increasing the calibration speed to 10 tons per hour. The calibrator should be capable of weighing the calibrated nuts, and

placing them in boxes. Furthermore, as there will be multiple growers a comprehensive lot numbering system should be in place with the drying and calibration lines.

Calibration line of 5 tons per hour in 5 sizes

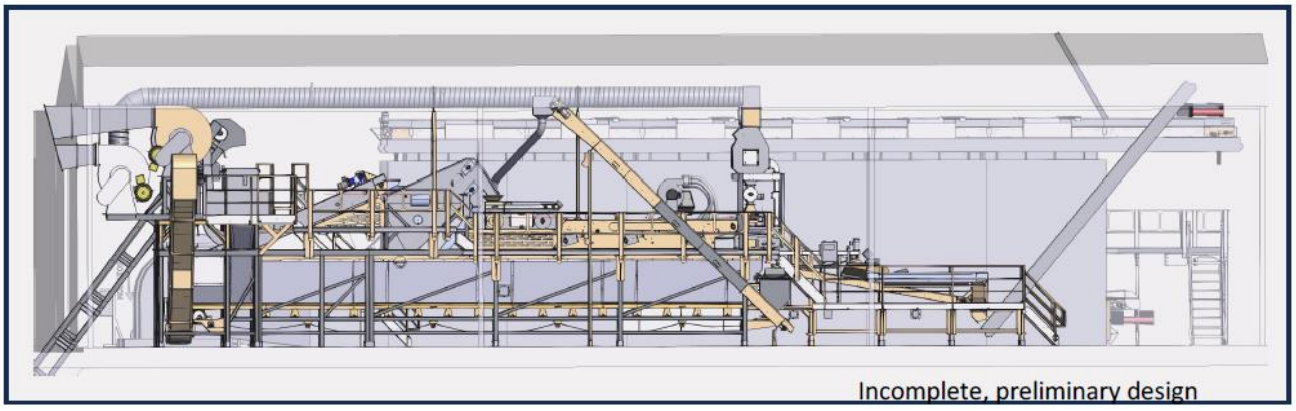
CAPACITY:

Hulling Line:

The hulling line should be designed to feed the drying bins for maximum efficiency. It should be capable of delivering the drying bins equivalent of 45 tons of dry walnut. Assuming that the incoming moisture level will be on average 30 % and the dry walnut will have 8 % moisture. This will correspond to: Approximately 60 tons of wet walnut delivered into the drying bins:

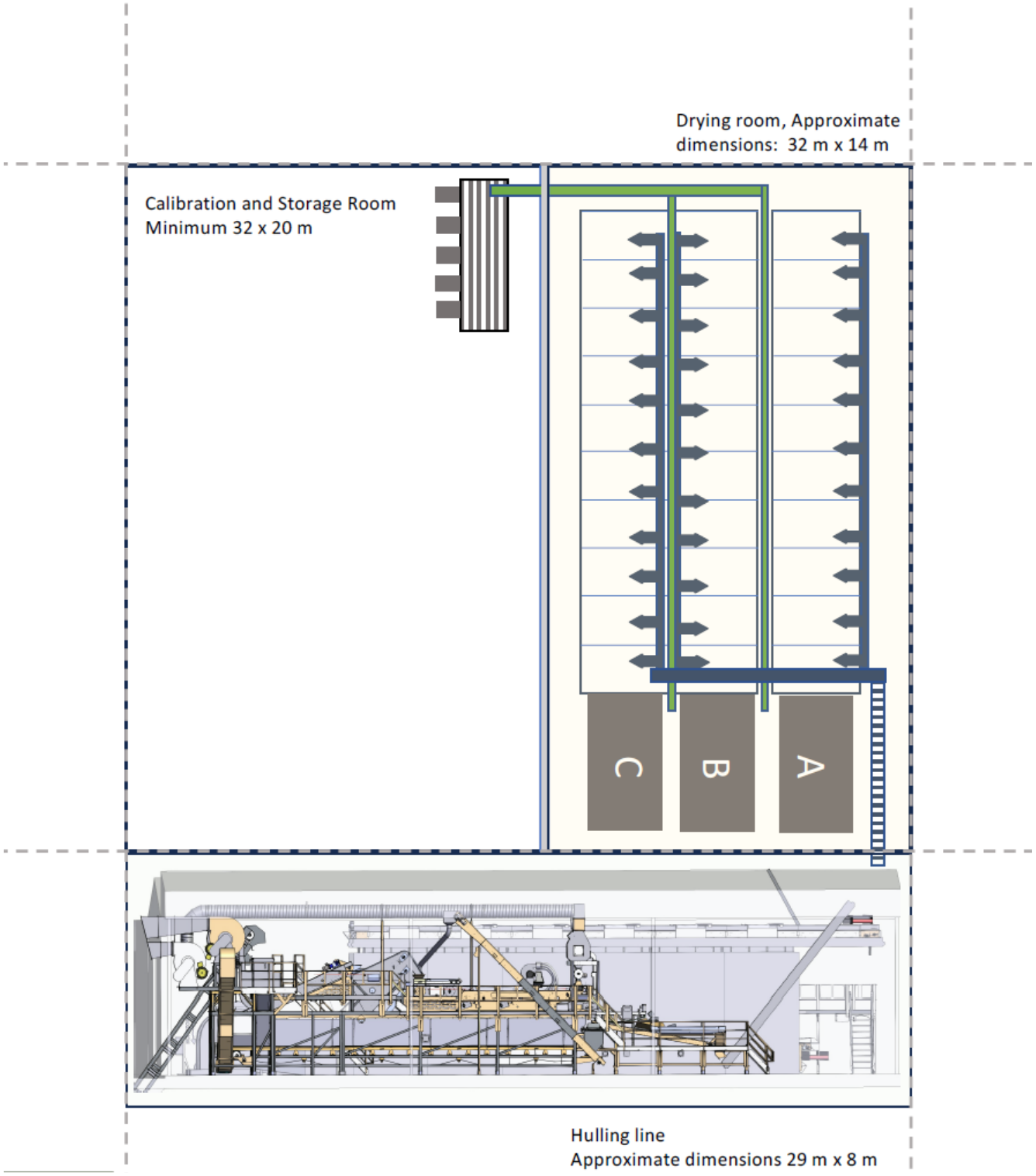
- 45 tons * (1-0.08) = 41.4 tons dry material
- 41.4 dry material at 30 % moisture equals to:
- 41.4 / (1-0.3) = 59.14 wet walnut delivered into drying bins every day.

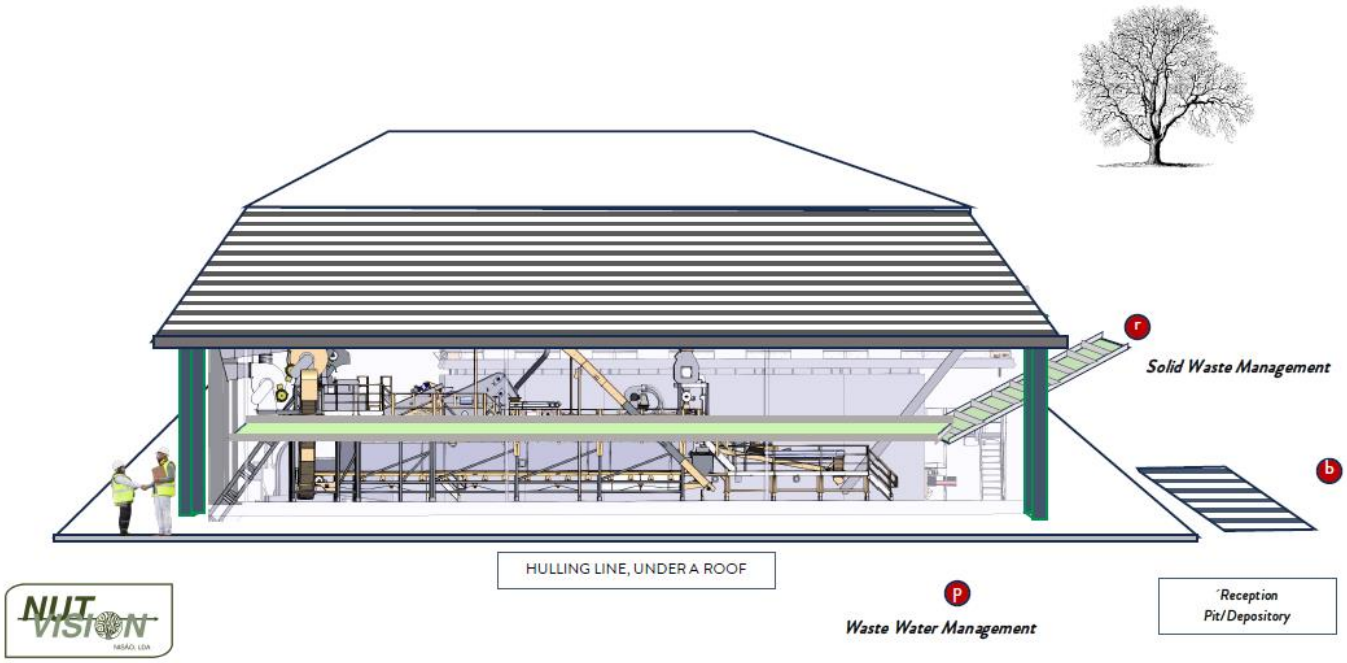
Assuming that the hulling line will be operational with 8 hours shifts, with 6.5 hours of efficient time, this will require a hulling line capacity of 10 tons per hour. Our initial design can be presented in the following sketch of a hulling line capable of processing 10 tons per hour (web basis), delivering approximately 45 tons of dry equivalent walnut into the drying bins



Incomplete, preliminary design

Layout Top View





Inclusion of the hazelnuts and almonds into the processing operation:

One of the design requirements of the processing plant is the capability of handling of the all three crops, hazelnut, walnuts and almonds. While these crops have many similar steps in their processing, there are certain differences that need to be taken into account. Therefore, the "common line" capable of achieving this goal may have certain design compromises when it is evaluated separately. Our goal in trying to comply with this design requirement is to maximize the synergies while minimizing these design compromises.

Almond Processing:

Almond processing is significantly different than the two operation required for the two other crops. Harvested almonds need to be peeled, which means that their green hulls and other debris collected with them need to be separated. In mechanical harvesting where trees are shaken and the crop is collected from the orchard surface, a very high amount of leaves are also collected. The foreign materials, leaves, stones, debris are removed from the product during this process that also removes the green hull around the nut. This is a relatively easy operation that can be done using a simple pealing machine and the existing conveyancebsystems at the factory.bDepending on the geography and the varieties produced, almond harvest usually begins asbearly as mid August when the temperature is quite high, causing the almonds to dry closebto the required end moisture levels of around 6 % in kernel. Because of this reason, the requirement for mechanical drying of almonds is usually not required. Two of the most common methods are:

i - To collect moisture readings from the crop when it is still on the tree and begin the harvest when the moisture level is reduced to the desired level. Since this is the time of the year with low chance of rain, this is a very practical method used by growers in Spain.

ii - To lay the harvested almonds on a dry surface and to wait for the reduction of themoisture level. Since the Almond production is a very small portion of the goals of the factory, we will only be focusing on the cleaning of the almonds, as well as the removal of the green hull.

This process can be completed using the existing structure of the processing plant, without the need for further machinery, with the exception of a small peeler, that is capable of peeling up to 3 tons per hour.

Hazelnut Processing:

Hazelnut processing, in terms of the steps taken, is similar to the Walnut processing with some exceptions: Depending on how the harvesting is being done, hazelnuts usually arrive in the processing line with less need for cleaning. As in Walnuts, they arrive with the green husks, similar to Walnut hulls. The Walnut shell is more resistant to abrasion. However, if the hazelnuts are intended for sale in-shell, the hulling/cleaning operation needs to be done more gently as the hazelnut shell can easily show marks of abrasion. Hazelnut usually arrive at the processing line with lower moisture levels compared to walnuts. The time, climate and the method of harvest have an important affect on this. Therefore, under normal conditions, the drying process in hazelnuts takes a shorter time and the process requires a more closer monitoring so that the product is not over-dried. Our aim is to create maximum synergies in using the hulling and the drying line both for walnuts and hazelnuts, with the minimum level of modifications to the existing line. In the next page of this report, we will be introducing a "conversion kit" that includes certain parts for the hulling line that need to be replaced before switching from hazelnut and walnut processing. These changes can be done on site by local mechanics that we can train and been completed within a few days. This way, the entire hulling line will be adaptable to Hazelnuts as well as Walnuts.

Hulling Line Conversion Kit for Walnut & Hazelnut processing

REQUIRED COMPONENTS

1. Desticker Unit - Add Hazelnut Configuration cable kit
2. Replace Standard Add - 24" Preclean 2-stage Conveyor
3. Rock Tank - Replacement 24" Twin bar rod chain
4. TRAXX Huller - Hazelnut Soft Brush kit
5. Wash Conveyor - Replacement 24" Twin bar rod chain & Sprockets
6. Control Panel - Hazelnut / Walnut Combo Adder

OPTIONAL EQUIPMENT QUOTE (NOT ESSENTIAL, BUT SHOULD BE EVALUATED BASED ON HARVESTING MODEL)

7. Add - Dual Linear Power Brush Unit DLPB-36 Model & Control /HMI Upgrade
8. Trashsperator Unit - Add 24" Twin bar rod chain
9. Precleaner Conveyor - Replacement 24" Twin bar rod chain & Sprocket

Hulling Line Conversion Kit for Walnut & Hazelnut processing

The conversion kit, combined with the original hulling line setup provided in the initial draft will be able to provide a speed of 10 tons per hour, (wet basis, in-shell), both for hazelnut as well as Walnuts.

We do not foresee any changes for the drying line already presented. The exiting drying line structure can be used for walnuts and hazelnuts without any modification.

ii. Inclusion of a Shelling (Cracking Operation) capability to the factory:

As we have stressed in more than one occasions previously, the hulling and drying operations are agricultural processes aiming to reduce defect, separate products from debris and to bring them to a sustainable moisture level. At the end of these steps, the product is still inside the protective layer of the shell. As a

contrast, the shelling (cracking) operation is the transformation of an agricultural product into a FOOD ITEM. The shelling operation requires different quality certifications, different hygiene standards and precision of product control. Consider having a small 10 cm piece of wood inside a 25 kg in-shell walnut bag. And then compare this with the possibility of having a 3 mm piece of wood inside a 200 gr bag of walnut kernel ready to be consumed by client in traffic. The consequences of having these systemic mistakes are very different. Therefore, the Processing and Shelling should be regarded as two separate operations. In order to satisfy certification standards, they must be conducted in separate dedicated locations, and should be managed separately by supervisors that focus on relevant quality standards. Having made this very important distinction, I would like to clarify a few key concepts that
Is crucial in the design of the required shelling line:

1 - Quality,

Obviously the quality of walnut kernel is related to the walnut being shelled. Atthis level, I would like to focus on the characteristics of kernel quality independently, that may be affected according to the choice of your model of shelling. There are two main characteristics that define the kernel quality (not taking into account the quality of the source walnut). Sizing Classification: Depending on how the kernel is removed from the shell, it is classified as Halves, quarters, large pieces and broken (small) pieces. Different terminologies are used according to the quality standards being used. Obviously, the higher percentage of Halves is a desired quality that will maximize the value of your product. A good walnut shelling line should be able to give a very high percentage of walnut halves, no less than 85 %.

Shelling Intensity and its effect on Seed Coat:

Walnut kernel is covered by a thin layer of membrane that is called “seed coat”. The primary purpose of this membrane is to protect the walnut’s kernel (seed), and it also contains antioxidants and other compounds beneficial to health. Another important role that the seed coat plays is protecting the kernel from oxidation. This layer is rich in phenolic compounds, which are known for their antioxidant properties. Antioxidants help in plays a significant role in protecting the kernel from oxidation. This layer is rich in phenolic compounds, which are known for their antioxidant properties. Antioxidants help in neutralizing free radicals, which are unstable molecules that can cause oxidative stress and damage to cells, including those in walnut kernels, neutralizing free radicals, which are unstable molecules that can cause oxidative stress and damage to cells,nincluding those in walnut kernels. According to the model used to shell (crack) walnut, this membrane may be preserved perfectly or can be damaged during the process. While the immediate effect will only be visual, the damage caused in the membrane will accelerate the oxidation of the product and will affect its quality negatively. On one extreme hand cracking walnuts will result in almost fully intact seed coat and very high level of halves. On the other extreme, a very fast, efficient industrial cracking line will be very harsh on the seed coat, resulting in serious damages on it. The hand crack quality is appreciated in the market, and is given a better value. However obtaining it has a very high variable (per kg) labor cost.

2 - Investment Cost,

The model of shelling you choose will have a significant effect on your initial investment cost. While putting a team of operators to shell walnuts by hand may have very little initial investments, a high speed industrial shelling line may have a very high initial budget.

3- Operating Cost,

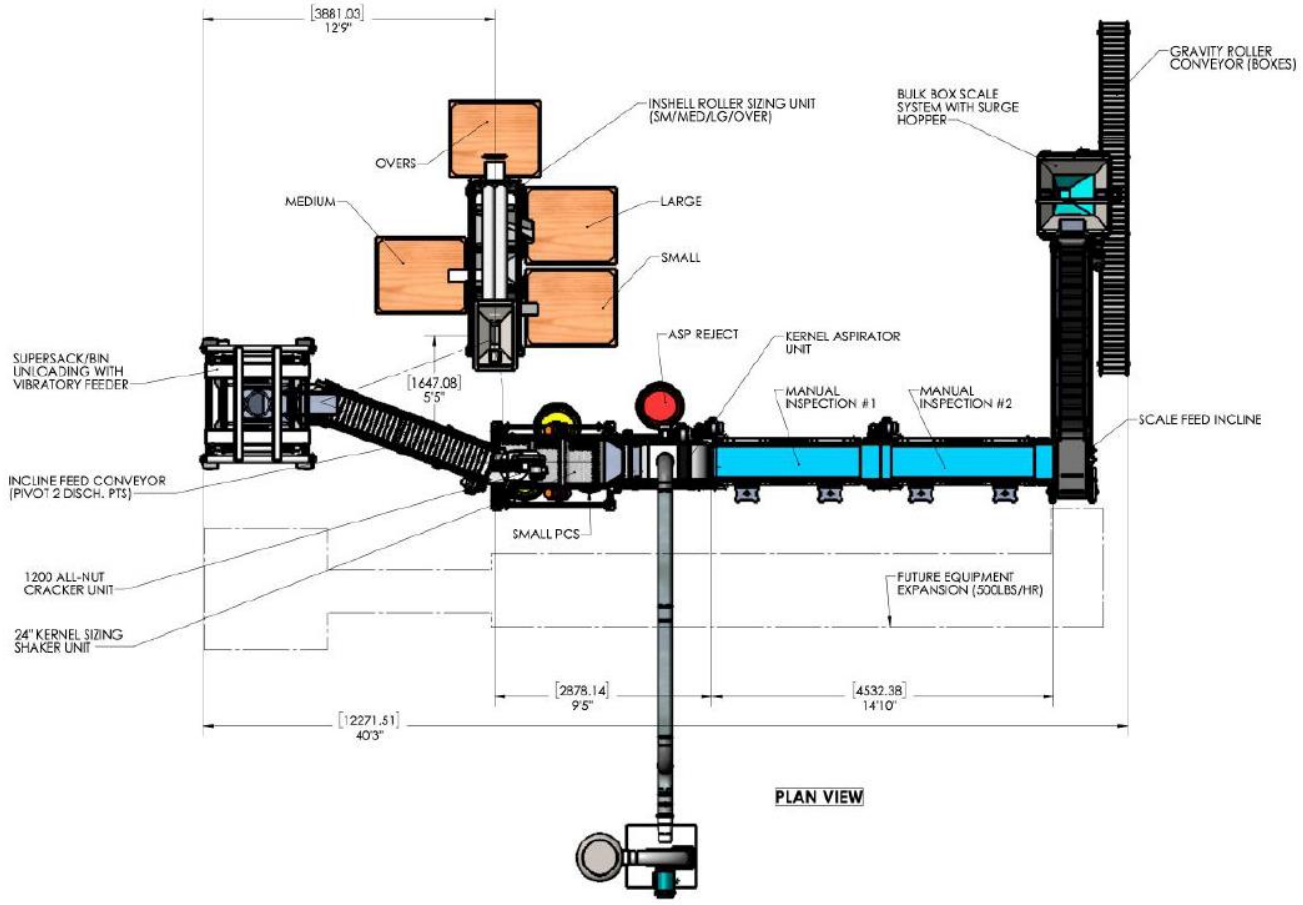
Perhaps the Operating Cost is one of the most important factor that will determine your decision. A shelling line that operates with a lot of manpower has a very high operating cost that will be reflected to the cost of per kg kernel you will produce. On the other hand a sophisticated, industrial shelling line can operate in great

speeds with just a handful of people virtually minimizing your operating cost to the level of maintenance, depreciation and energy costs. Given the very high competition in the walnut market today, it is advisable to minimize your labor cost, which will imply that at least some level of mechanization to be used.

4 - Speed:

A trained operator can shell as many as 30 kg of walnut in one shift of 8 hours. This is in-shell weight, which will usually produce around 45 % of kernel. You will need more than 30 operators to shell about 1 ton of walnut in a day. While a simple industrial line can shelling line can shell more than 2 tons per day with 1 or 2 operators a larger and more complicated shelling line can shell 20 tons per day almost with the same number of operator. As the speed of shelling increase so will its negative effect on the seed coat. Therefore our recommendation will be to focus on an industrial shelling line with an hourly capacity of 500 lbs – 1,000 lbs (approximately 230 to 460 kg/hr. These lines, operating in multiple shifts will give the highest level of productivity, speed and product quality, minimizing initial investment and operation costs.

Walnut & Hazelnut Shelling Line



5.1.ASSUMPTIONS REGARDING THE DEVELOPMENT OF THE FEASIBILITY STUDY

To perform the financial calculations, the following assumptions were taken into account:

Table 15. General assumptions for the realization of the investment project

Generale	Unit	Year 1	Year 2	Year 3	Year 4	Year 5
Average annual inflation rate (2023-2024)	%	5,0%				
Duration of operation of the infrastructure	Years	20				
Duration of exploitation of machinery/equipment	Years	10				
Annual infrastructure depreciation rate	%	6%				
The annual depreciation rate of the machinery	%	10%				
Number of farmers within the informal producer group (2-10 ha)	nr.	50	60	70	100	150
The area of walnut plantations group members	%	251	300	320	350	400
Hazelnut plantation area	ha	526	600	700	750	800
Income tax	%	12%				
Quantity of hazelnuts in shell, tons	tons	1000	1500	1500	1700	2300
Quantity of nuts in shell, tons	tons	500	1000	1000	1200	1800
Quantity of almonds in shell, tons	tons	90	150	200	300	400
Exchange rate USD/MDL MAX (2023-2024)	17,5					
Exchange rate EUR/MDL MAX (2023-2024)	19,5					

The value of the investment project

The total value of the investment project is **2,015,000 EURO,** including the repair costs of the existing rooms, the construction of two additional halls for the processing of nuts (drying and shelling), as well as the certification costs of the multifunctional center.

Table 16. *Total value of investment, EUR*

#	Investment articles	Cant.	Amount	Amount
			EUR	MDL
1	10 ton Walnut drying line	1	600.000	11.640.000
2	90 tons drying line	1	400.000	7.760.000
3	5 tons per hour Calibration line	1	125.000	2.425.000
4	Hulling Line Conversion Kit for Walnut & Hazelnut processing	1	100.000	1.940.000
5	500 lbs/hr Shelling Line for walnuts	1	180.000	3.492.000
6	1,000 lbs/hr Shelling Line for hazelnuts	1	250.000	4.850.000

7	Construction of building for drying line	1	135.000	2.619.000
8	Construction of a processing building (shelling, washing, calibration, packaging)	1	135.000	2.619.000
9	Repairs the existing building (storage spaces)	1	75.000	1.455.000
10	Costs of certification and implementation of quality and safety standards for the multifunctional Center (ISO 9001, 14000, 2200, HCCP, IFS food)	1	15.000	291.000
subtotal				
			2.015.000	**39.091.000**
Total investment (absolute value)			**2.015.000 €**	**39.091.000 MDL**
Total investment (relative value)			**100%**	**100%**

Stages of making investments

The investment project is planned to be carried out within 2 years, being divided into two distinctive stages:

- Stage 1 (Year 1) – Construction and Repair – **345,000 EUR**
- Stage 2 (year 2) – Technological equipment (installation of processing equipment) and certification of the production process – **1,670,000 EUR**

Table 17. Allocation of investment, EUR

#	Investment	Year 1	Year 2	Year 3	Total, EUR
1	10 ton Walnut drying lineYear 2		600.000		**600.000**
2	90 tons drying line		400.000		**400.000**
3	5 tons per hour Calibration line		125.000		**125.000**
4	Hulling Line Conversion Kit for Walnut & Hazelnut processing		100.000		**100.000**
5	500 lbs/hr Shelling Line for walnuts		180.000		**180.000**
6	1,000 lbs/hr Shelling Line for hazelnuts		250.000		**250.000**
7	Construction of building for drying line	135.000			**135.000**
8	Construction of a processing building (shelling, washing, calibration, packaging)	135.000			**135.000**
9	Repairs the existing building (storage spaces)	75.000			**75.000**
10	Costs of certification and implementation of quality and safety standards for the multifunctional Center (ISO 9001, 14000, 2200, HCCP, IFS food)		15.000		**15.000**
	TOTAL investment, EUR	**345.000**	**1.670.000**	**0**	**2.015.000**
	TOTAL investment, MDL	**6.727.500**	**32.565.000**	**0**	**39.292.500**
	Total %	**17%**	**83%**	**0%**	**100%**

5.2. ANALYSIS OF FINANCIAL RESULTS

In order to make a financial analysis regarding the creation of the Multifunctional Nut Processing Center, it is necessary to consider several factors and perform several calculations and evaluations. Here are the main steps and elements such an analysis should include:

1. **Initial investment costs:**
    - Costs of building and fitting out the necessary buildings and infrastructure (processing spaces, storage, offices, sanitary facilities, etc.).
    - Costs of purchasing the necessary equipment and machinery for the processing of nuts.
    - Administrative and legal costs associated with obtaining the necessary authorizations, certifications and approvals.
2. **Operational costs:**
    - Personnel costs (salaries and benefits) for production, management and administrative staff.
    - Utility costs (electricity, water, heating).
    - Maintenance and repair costs for equipment and infrastructure.
    - Costs of raw materials (nuts) for processing.
    - Marketing and promotion costs of processed products
3. **Estimated sales:**
    - Projection of revenues from the sale of processed products (dry nuts, in shell, without shell, other derived products).
    - Estimate sales prices and production volume based on market demand and processing center capacity.
    - Evaluating potential partnerships and collaborations for market expansion and distribution channels.
4. **Cost and benefit analysis:**
    - Calculation of total costs (investment costs + operational costs) over time periods (annually, per project).
    - Determining the estimated revenues and profitability of the project.
    - Sensitivity analysis to identify critical factors that can influence the profitability of the project (eg: price of raw materials, energy costs, etc.).
5. **Assessment of risks:**
    - Identification and assessment of risks associated with the project (financial, operational, market risks, etc.).
    - Identification of possible alternatives and risk mitigation strategies (eg insurance, strategic partnerships, product diversification, etc.).

These are just a few aspects that a detailed financial analysis for setting up a nucifera processing center should include. It is important to make accurate calculations, consider variable factors and evaluate both costs and benefits before making strategic decisions and investing in such a project.

This feasibility study analyzed 1 project implementation scenario, depending on the financial indicators obtained. To be considered a feasible investment project, it is necessary that the internal rate of return (IRR) of the project be greater than 12.5% and the net present value be positive.

The RIR of the project must be equal to or greater than the value of the country risk of the Republic of Moldova. According to the rating agency Moody's, the country rating is currently B3, which would correspond to the fact that the investment risk and the recovery of investments require an RIR of 12.5%.

From the scenarios analyzed, it was found that the minimum period of recovery of the private investor's investment, including the period required for construction, is at least 6 years. This term would correspond to an RIR higher than 12.5%. In the case of a term of less than 6 years, the project seems to be unfeasible.

A discount rate of 10% was used to calculate the payback period. In order to be able to calculate the present value of future costs and benefits, the discount rate is used. The level of the discount rate is established by the decision of the public authorities and can be adjusted over time, depending on the macroeconomic indicators - EU: 4%, USA: 7%, Romania: 8-10%, Moldova: 8-12. The calculation of the discount rate must take inflation into account.

Financial forecasts

Table 18. *Operational plan*

Collected quantities		**year 1**	**year 2**	**year 3**	**year 4**	**year 5**	**year 6**	**year 7**	**year 8**	**year 9**	**year 10**
hazelnuts, category I (in shell)	tons	0	320	480,0	480	736	736	736	736	736	736
hazelnuts, category II (shelled)	tons	0	350	525,0	525	805	805	805	805	805	805
hazelnuts, category III (shelled)	tons	0	330	495,0	495	759	759	759	759	759	759
hazelnuts			***1000***	***1500***	***1500***	***2300***	***2300***	***2300***	***2300***	***2300***	***2300***
walnuts, category I (in shell)	tons	0	160	*320*	*320*	576	576	576	576	576	576
walnuts, category II (in shelled)	tons	0	210	*350*	*350*	630	630	630	630	630	630
walnuts, category III (shelled)	tons	0	165	*330*	*330*	594	594	594	594	594	594
walnuts		0	***535***	***1000***	***1000***	***1800***	***1800***	***1800***	***1800***	***1800***	***1800***
almonds (in shell)	tons	0	36	60	80	160	160	160	160	160	160
almonds (shelled)	tons	0	54	90	120	240	240	240	240	240	240
almonds		0	***90***	***150***	***200***	***400***	***400***	***400***	***400***	***400***	***400***
TOTAL		**0**	**1625**	**2650**	**2700**	**4500**	**4500**	**4500**	**4500**	**4500**	**4500**

Table 19. Quantity obtained after processing (drying and shelling), tons

	percentage after processing	**year 1**	**year 2**	**year 3**	**year 4**	**year 5**	**year 6**	**year 7**	**year 8**	**year 9**	**year 10**
hazelnuts, category I (in shell)	65%	0%	256,0	312,0	312,0	478,4	478,4	478,4	478,4	478,4	478,4
hazelnuts, category II (shelled)	65%	0%	122,5	341,3	341,3	523,3	523,3	523,3	523,3	523,3	523,3
hazelnuts, category III (shelled)	65%	0%	115,5	321,8	321,8	493,4	493,4	493,4	493,4	493,4	493,4
		0%	***494,0***	***975,0***	***975,0***	***1495,0***	***1495,0***	***1495,0***	***1495,0***	***1495,0***	***1495,0***
walnuts, category I (in shell)	65%	0%	128,0	202,8	202,8	374,4	374,4	374,4	374,4	374,4	374,4
walnuts, category II (in shelled)	65%	0%	73,5	221,8	221,8	409,5	409,5	409,5	409,5	409,5	409,5
walnuts, category III (shelled)	65%	0%	57,8	209,1	209,1	386,1	386,1	386,1	386,1	386,1	386,1
		0%	***259,3***	***633,8***	***633,8***	***1170,0***	***1170,0***	***1170,0***	***1170,0***	***1170,0***	***1170,0***
almonds (in shell)	65%	0%	28,8	39,0	52,0	104,0	104,0	104,0	104,0	104,0	104,0
almonds (shelled)	65%	0%	18,9	58,5	78,0	156,0	156,0	156,0	156,0	156,0	156,0
		0%	***47,7***	***97,5***	***130,0***	***260,0***	***260,0***	***260,0***	***260,0***	***260,0***	***260,0***
		0,0	**1189,5**	**2374,6**	**2374,6**	**3773,9**	**3773,9**	**3773,9**	**3773,9**	**3773,9**	**3773,9**

Table 20. Quantity obtained after processing (drying and shelling), EUR

	price/tons, EUR	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
hazelnuts, category I (in shell)	200		64.000	96.000	96.000	147.200	147.200	147.200	147.200	147.200	147.200
hazelnuts, category II (shelled)	200		70.000	105.000	105.000	161.000	161.000	161.000	161.000	161.000	161.000
hazelnuts, category III (shelled)	200		66.000	99.000	99.000	151.800	151.800	151.800	151.800	151.800	151.800
walnuts, category I (in shell)	180		28.800	57.600	57.600	103.680	103.680	103.680	103.680	103.680	103.680
walnuts, category II (in shelled)	180		37.800	63.000	63.000	113.400	113.400	113.400	113.400	113.400	113.400
walnuts, category III (shelled)	180		29.700	59.400	59.400	106.920	106.920	106.920	106.920	106.920	106.920
almonds (in shell)	180		6.480	10.800	14.400	28.800	28.800	28.800	28.800	28.800	28.800
almonds (shelled)	180		9.720	16.200	21.600	43.200	43.200	43.200	43.200	43.200	43.200
TOTAL			**312.500**	**507.000**	**516.000**	**856.000**	**856.000**	**856.000**	**856.000**	**856.000**	**856.000**

Table 21. Production costs, EUR

Costuri de producere, euro		year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Costs of procurement of nuts in shell			312.500	507.000	516.000	856.000	856.000	856.000	856.000	856.000	856.000
Processing costs (washing, drying, peeling)	6%		30.542	76.946	78.311	128.395	128.395	128.395	128.395	128.395	128.395
Processing costs (calibration, packaging)	3%		15.271	38.473	39.155	64.198	64.198	64.198	64.198	64.198	64.198
Remuneration of work			14.319	219.816	219.816	219.816	219.816	219.816	219.816	219.816	219.816
Other expenses	1%		5.090	12.824	13.052	21.399	21.399	21.399	21.399	21.399	21.399
TOTAL			**377.723**	**855.059**	**866.334**	**1.289.808**	**1.289.808**	**1.289.808**	**1.289.808**	**1.289.808**	**1.289.808**

Table 22. Staff structure and salary expenses

	# pers.	Salary / month, EUR	# month	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10
Directe												
General manager	*1*	***1000***	***12***	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000
Production manager	*1*	***1000***	***12***	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000
Sales manager	*1*	***1000***	***12***	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000
operator	*10*	***750***	***12***	90.000	90.000	90.000	90.000	90.000	90.000	90.000	90.000	90.000
driver	*2*	***750***	***12***	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000
Technical staff (guards)	*3*	***400***	***12***	14.400	14.400	14.400	14.400	14.400	14.400	14.400	14.400	14.400
Medical and social insurance	***29,0%***			45.936	45.936	45.936	45.936	45.936	45.936	45.936	45.936	45.936
Sub-total				***204.336***	***204.336***	***204.336***	***204.336***	***204.336***	***204.336***	***204.336***	***204.336***	***204.336***
Indirecte												
Accountant	*2*	***500***	***12***	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000
Medical and social insurance	***29,0%***			3.480	3.480	3.480	3.480	3.480	3.480	3.480	3.480	3.480
Sub-total				***15.480***	***15.480***	***15.480***	***15.480***	***15.480***	***15.480***	***15.480***	***15.480***	***15.480***
TOTAL				**219.816**	**219.816**	**219.816**	**219.816**	**219.816**	**219.816**	**219.816**	**219.816**	**219.816**

Table 23. Planned sales, EUR

	Planned sales	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	*hazelnuts, category I (in shell)*	*0*	*89.600*	*109.200*	*109.200*	*167.440*	*167.440*	*167.440*	*167.440*	*167.440*	*167.440*
2	*hazelnuts, category II (shelled)*	*0*	*159.250*	*443.625*	*443.625*	*680.225*	*680.225*	*680.225*	*680.225*	*680.225*	*680.225*
3	*hazelnuts, category III (shelled)*	*0*	*127.050*	*353.925*	*353.925*	*542.685*	*542.685*	*542.685*	*542.685*	*542.685*	*542.685*
	subtotal		***375.900***	***906.750***	***906.750***	***1.390.350***	***1.390.350***	***1.390.350***	***1.390.350***	***1.390.350***	***1.390.350***
4	*walnuts, category I (in shell)*	*0*	*23.040*	*36.504*	*36.504*	*67.392*	*67.392*	*67.392*	*67.392*	*67.392*	*67.392*
5	*walnuts, category II (in shelled)*	*0*	*55.125*	*166.359*	*166.359*	*307.125*	*307.125*	*307.125*	*307.125*	*307.125*	*307.125*
6	*walnuts, category III (shelled)*	*0*	*28.875*	*104.569*	*104.569*	*193.050*	*193.050*	*193.050*	*193.050*	*193.050*	*193.050*
	Subtotal		***107.040***	***307.432***	***307.432***	***567.567***	***567.567***	***567.567***	***567.567***	***567.567***	***567.567***
7	*almonds (in shell)*	*0*	*7.200*	*9.750*	*13.000*	*26.000*	*26.000*	*26.000*	*26.000*	*26.000*	*26.000*
8	*almonds (shelled)*	*0*	*18.900*	*58.500*	*78.000*	*156.000*	*156.000*	*156.000*	*156.000*	*156.000*	*156.000*
	subtotal		***26.100***	***68.250***	***91.000***	***182.000***	***182.000***	***182.000***	***182.000***	***182.000***	***182.000***
	Subtotal	-	***509.040***	***1.282.432***	***1.305.182***	***2.139.917***	***2.139.917***	***2.139.917***	***2.139.917***	***2.139.917***	***2.139.917***
	VAT, 8%	-	*37.707*	*94.995*	*96.680*	*158.512*	*158.512*	*158.512*	*158.512*	*158.512*	*158.512*
		-	***546.747***	***1.377.427***	***1.401.862***	***2.298.429***	***2.298.429***	***2.298.429***	***2.298.429***	***2.298.429***	***2.298.429***
	TOTAL	-	**546.747**	**1.377.427**	**1.401.862**	**2.298.429**	**2.298.429**	**2.298.429**	**2.298.429**	**2.298.429**	**2.298.429**

The forecasted financial results indicate that the given project has an increased financial return. Thus, the following table shows the ratio between net sales, cost of sales and net profit that the project will generate during the 10 years analyzed.

Table 24. Financial results, EUR

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Net sales	-	**509.040**	**1.282.432**	**1.305.182**	**2.139.917**	**2.139.917**	**2.139.917**	**2.139.917**	**2.139.917**	**2.139.917**
hazelnuts, category I (in shell)	-	89.600	109.200	109.200	167.440	167.440	167.440	167.440	167.440	167.440
hazelnuts, category II (shelled)	-	159.250	443.625	443.625	680.225	680.225	680.225	680.225	680.225	680.225
hazelnuts, category III (shelled)	-	127.050	353.925	353.925	542.685	542.685	542.685	542.685	542.685	542.685
walnuts, category I (in shell)	-	23.040	36.504	36.504	67.392	67.392	67.392	67.392	67.392	67.392
walnuts, category II (in shelled)	-	55.125	166.359	166.359	307.125	307.125	307.125	307.125	307.125	307.125
walnuts, category III (shelled)	-	28.875	104.569	104.569	193.050	193.050	193.050	193.050	193.050	193.050
almonds (in shell)	-	7.200	9.750	13.000	26.000	26.000	26.000	26.000	26.000	26.000
almonds (shelled)	-	18.900	58.500	78.000	156.000	156.000	156.000	156.000	156.000	156.000
Cost of sales	-	**464.313**	**941.649**	**952.924**	**1.376.398**	**1.376.398**	**1.376.398**	**1.376.398**	**1.376.398**	**1.376.398**
Costs of procurement of nuts in shell	-	312.500	507.000	516.000	856.000	856.000	856.000	856.000	856.000	856.000
Processing costs (washing, drying, peeling)	-	30.542	76.946	78.311	128.395	128.395	128.395	128.395	128.395	128.395
Processing costs (calibration, packaging)	-	15.271	38.473	39.155	64.198	64.198	64.198	64.198	64.198	64.198
Remuneration of work	-	14.319	219.816	219.816	219.816	219.816	219.816	219.816	219.816	219.816
Other expenses	-	5.090	12.824	13.052	21.399	21.399	21.399	21.399	21.399	21.399
Depreciation	-	**86.590**	**86.590**	**86.590**	**86.590**	**86.590**	**86.590**	**86.590**	**86.590**	**86.590**
Profit before taxation	-	**44.727**	**340.783**	**352.258**	**763.519**	**763.519**	**763.519**	**763.519**	**763.519**	**763.519**
Income tax, 12%	-	5.367	40.894	42.271	91.622	91.622	91.622	91.622	91.622	91.622
Net income	-	**39.360**	**299.889**	**309.987**	**671.897**	**671.897**	**671.897**	**671.897**	**671.897**	**671.897**
EBITDA	-	**131.317**	**427.373**	**438.848**	**850.109**	**850.109**	**850.109**	**850.109**	**850.109**	**850.109**
%		25,80	33,33	33,62	39,73	39,73	39,73	39,73	39,73	39,73

Therefore, the financial results recorded by the Processing Center demonstrate its ability to meet the assumed financial obligations as well as to accumulate its own resources for their investment in the perspective of the investment development of the operational activities. As can be seen from Table 24, the net profit shows an increase of 117% in the 10th year of operation compared to the 3rd year (the first full year of operational activity).

Table 25. Analysis of the investment payback, thousands EUR

Analiza recuperabilităţii investiţiei		anul 1	anul 2	anul 3	anul 4	anul 5	anul 6	anul 7	anul 8	anul 9	anul 10
Capital investments, EURO	2.015.000	345.000	1.670.000								
Net profit		0	39.360	299.889	309.987	671.897	671.897	671.897	671.897	671.897	671.897
Discount rate	10,00%	1,10	1,21	1,33	1,46	1,61	1,77	1,95	2,14	2,36	2,59
Discounted profit	-2.015.000	0	32.529	225.311	211.725	417.195	379.268	344.789	313.445	284.950	259.045
Accumulated flow		-345.000	-1.982.471	-1.757.161	-1.545.435	-1.128.240	-748.972	-404.183	-90.738	194.212	453.257
		1	2	3	4	5	6	7	8	9	10

Payback period	**Ta**	**7,1 ani**
Net Present Value	**VNA**	**163.920 EUR**
Internal Rate of Return	**IRR**	**11,89%**
Profitability index	**PI**	**1,08**

The net present value (NPV) is a fundamental criterion for the economic and financial evaluation of investment projects. NPV represents the realized capital surplus over a certain period of life of the investment. Taking into account that the positive value of NPV is a necessary condition of investment projects, a higher value of it would determine a higher profitability of the project.

Therefore, the net discounted value in the amount of 163.920 thousands EUR was obtained, under the conditions of the discount rate of 10%, and its positive value confirms the assumptions of the feasibility of the investment project. The project having a positive NPV is already considered to be profitable, it remains only to check the size of the Internal Rate of Profitability.

The internal rate of return (IRR) expresses that level of the cost of capital that equates the discounted income with the discounted expenses and that makes the value of the discounted profit equal to zero. IRR is the minimum profitability threshold of a project, below which it is not efficient.

The estimated value calculated, depending on the criteria taken into account, for Processing Centre reflects that a high cost of capital of 10% would not be profitable for the company and, at the same time, indicates that the profitability of the household should exceed the given level so that the activity can generate profit for all interested parties - management, associates, financial institutions, partners, etc.

The investment payback period is estimated at 7.1 years and reflects, in the conditions when the discount rate would be equal to 10%, the period of time in which Processing Centre would cover all its costs with the investment made from the income obtained following the investment data.

The investment profitability index is estimated at 1.08 and shows the value of the discounted capital surplus for each EUR reinvested. The investment condition for any investment project is that this value is higher than unity. In the case of our household, the profitability index reflects that for every leu invested in the business, the enterprise will generate a profit of 0,08 EUR in updated terms.

CHAPTER IV. IDENTIFICATION AND ANALYSIS OF RISK REDUCTION OPTIONS ACCORDING TO THEIR MANAGEMENT CAPACITY

Risk is an uncertain event, but possible to appear in the process of the concrete activity, the effects of which are harmful and irreversible (additional costs, reduction of income and/or profits). Risks can have both an internal character, referring here to managerial mistakes, and an external character represented by practically any event outside the organization that can negatively affect the progress of a project.

The identification of risks and ways of managing them in order to reduce their impact is a continuous process throughout the project's implementation period and further throughout its duration.

The risk assessment process includes the following steps:

- identification of risks relevant to the project;
- determining the material consequences of the risks (if it is possible to materialize);
- establishing the method of reducing the probability of occurrence and the impact of risks;
- allocation of risk responsibility to other entities.

The implementation of the project to create the Multifunctional Nut Processing Center may be associated with some risks and challenges. Here are some of them:

1. **High initial investment:** One of the main risks is the need to make significant initial investments to acquire the land, build and equip the center, as well as to develop the infrastructure necessary to process and store the nucifera. These investments may involve financial and project budget management risks.

2. **Legal Applications and Approvals:** The process of obtaining the necessary authorizations, certifications and legal approvals for the construction and operation of the center can be complex and may involve risks related to delays or additional costs in case of legal or compliance issues.

3. **Availability of raw material:** Another risk is related to ensuring a constant and quality supply of raw material (nuts) for the processing center. Variations in production or fluctuations in the quantity and quality of the crop can affect the center's operations and lead to problems in meeting the demand for processed products.

4. **Market competition:** The nut processing sector can be competitive, and the existence of other processing centers or other players in the market can create competitive pressures and market risks, such as volatile prices or fluctuating demand for processed products.

5. **Technological and operational risks:** Implementing processing technologies and managing the daily operations of the center may involve technological and operational risks, such as equipment breakdowns, processing losses, proper waste management and compliance with food quality and safety standards.

6. **Fluctuations in product demand:** Variability in market demand can be an important risk as the facility must be able to respond to changes in demand and adjust its production and operations accordingly to avoid over- or under-production.

7. **Risks related to the labor force:** Securing a qualified labor force and stabilizing the work team can be another risk in the implementation of a multifunctional nucifera processing center, especially in the context of fluctuations in the labor market and the demand for specialized personnel.

In order to manage these risks, detailed planning and analysis is essential before project implementation, involving assessing potential risks, developing a risk management plan, engaging specialized consultants, developing strong partnerships and securing adequate funding and resources for the project. Also, constant monitoring and evaluation of the center's operations and performance is essential to identify and manage any risks that may arise along the way.

The implementation of the project to create the Multifunctional Nut Processing Center is a complex and significant initiative that can bring both opportunities and risks. Here are some important conclusions regarding the implementation of this project:

1. **Development opportunities:** The creation of a multifunctional nut processing center offers significant opportunities for the development of the agricultural sector and the local economy. This project can contribute to increasing the production and quality of nut products, creating jobs and diversifying agricultural activities in the region.

2. **Market demand:** There is an increased demand for processed nut products both in the domestic and foreign markets. A well-organized and efficient processing center can exploit this demand and access new business opportunities and partnerships.

3. **Profitability:** The financial analysis shows that the project has the potential to be profitable and profitable in the medium and long term, given the estimated revenues from the sale of processed products and the effective management of operational and investment costs.

4. **Risks and Challenges:** Project implementation comes with certain risks and challenges such as high initial costs, efficient management of resources and manpower, market fluctuations and competition. It is important to identify and manage these risks to ensure the success and sustainability of the project.

5. **Social and economic impact:** The creation of a nucifera processing center can have a positive impact on the local community, generating jobs, supporting agricultural producers and contributing to the growth of the regional economy.

In conclusion, the implementation of the project to create a Multifunctional Nut Processing Center can bring significant benefits, but requires careful planning, a detailed analysis of costs and benefits, effective risk management and the involvement of appropriate partners and resources to ensure success and long-term sustainability of the project.