

SWIM and Horizon 2020 Support Mechanism

Working for a Sustainable Mediterranean, Caring for our Future

SWIM-H2020 SM Regional Activities The international olive oil sector and its environmental impact: An overview, with cases from various countries

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•SWIM and Horizon 2020 SM Sustainable Management of Olive Oil Mills' Waste

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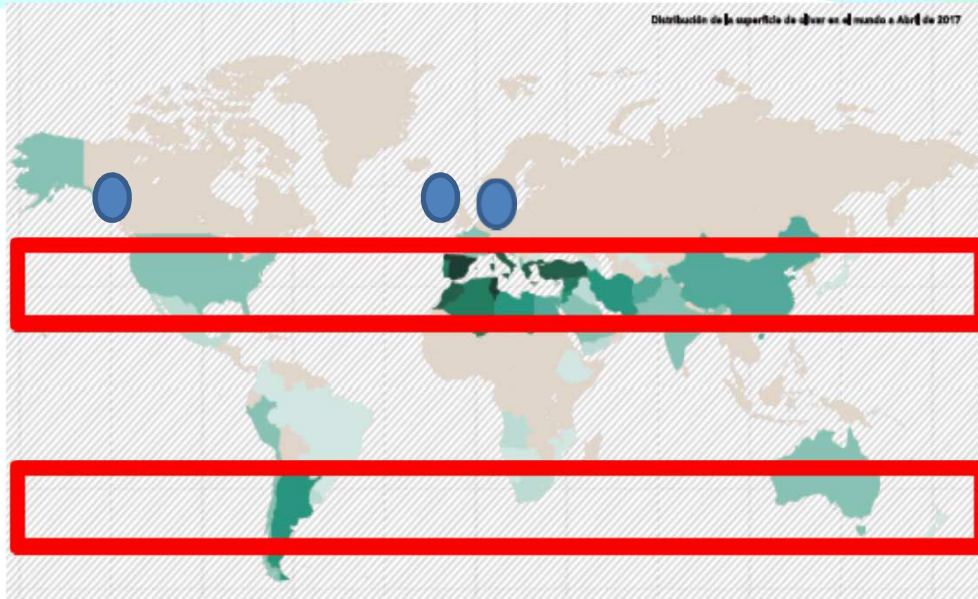




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A DESCRIPTION OF THE INTERNATIONAL OLIVE OIL SECTOR



Every day, 365 days a year, olive oil is being produced somewhere in the world

A turnover of between 9 thousand and 13 thousand million euros, employing more than 35 million people, 18% in the olive table sector

Last 10 years, the world surface of olive grove has grown 15%, 162 thousand hectares per exercise, 10 olive trees per second.

Olive oil is produced in 58 countries on 5 continents, and consumes 179.

6.3% of the world olive grove is organic, 68.43% dry land, and 74.66% sloping

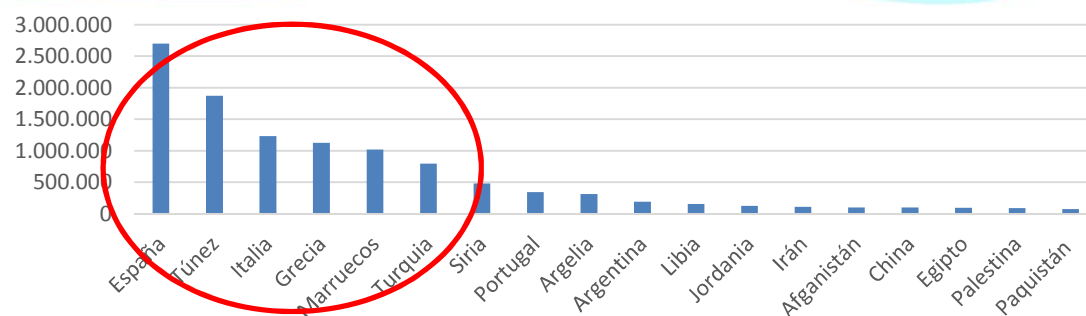
11.4 million hectares of olive groves, 11% for table olives, 89% for olive oil

Every 10 seconds 1 t of olive oil and table olive are consumed in the word

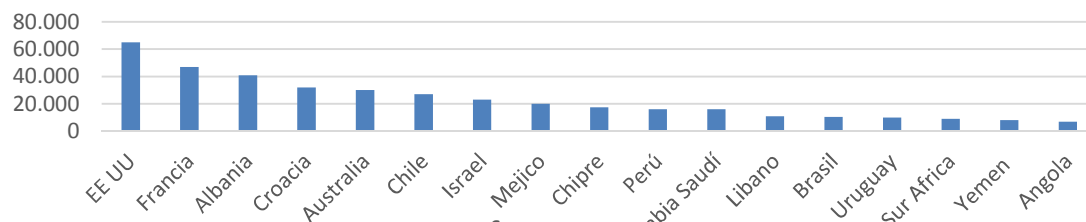
The olive is the permanent crop most present on our planet, 1% of the world agricultural surface

A DESCRIPTION OF THE INTERNATIONAL OLIVE OIL SECTOR

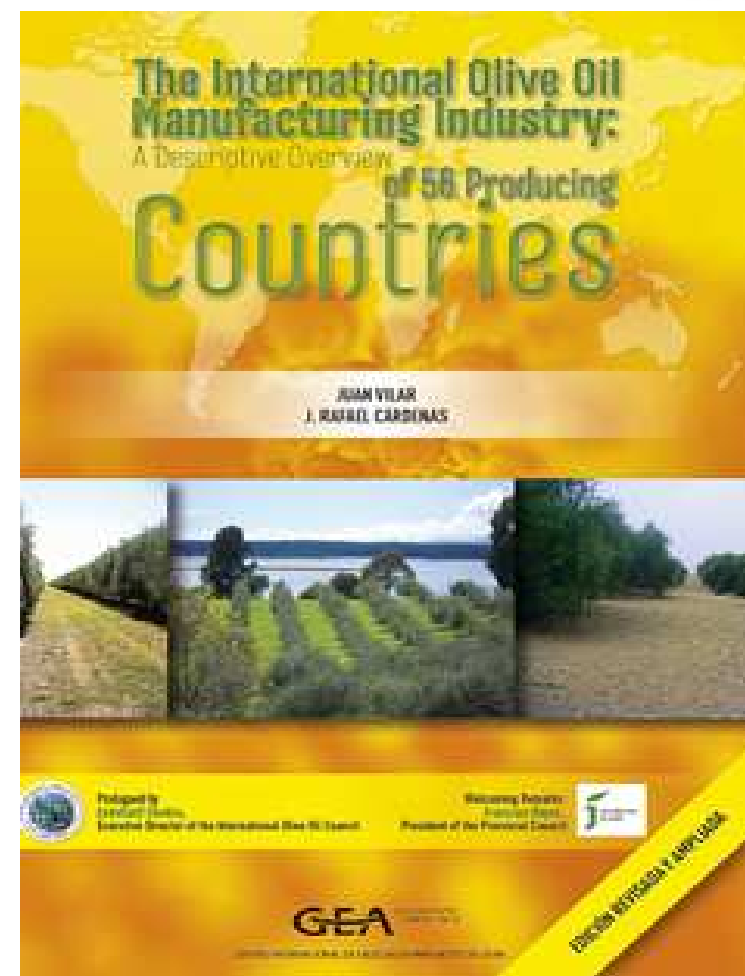
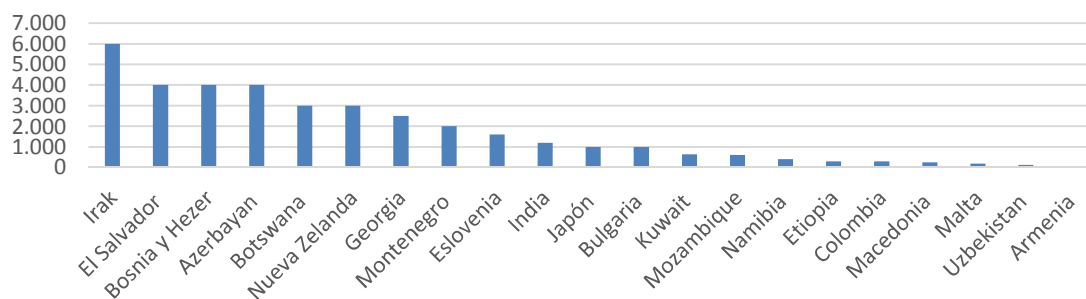
Surface top 18



Surface group II



Surface group III



Different modes of cultivation, and implications for the water consumption



- Each season between **12 and 20 million tons of olives are milled** on the planet
- **60% of this amount is water**
 - **15 – 20%** from addition
 - **40 - 45%** from the fruit
- To clean and to eliminate this water , like a water vapor we use a lot of **energy**
- But it depends of the **system of cultivation everything is different** if we are talking about waste water

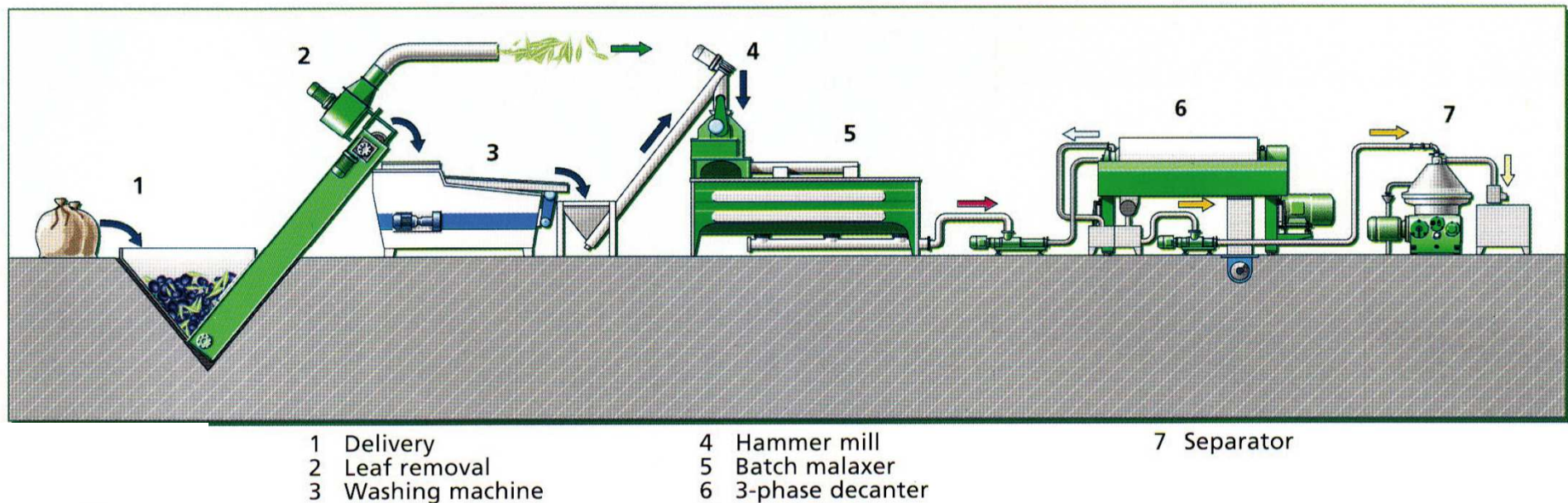
Different modes of cultivation, and implications for the water consumption

Category	Cultivation system	Porcentaje	Area	Porcentaje	Area
Traditional	Traditional olive grove in high rainfed slope.	33,90%	3.873.116,02	74,66%	8.529.995,34
	Traditional olive grove in high irrigation slope.	0,45%	51.413,04		
	Traditional olive grove in moderate rain-fed slope.	30,72%	3.509.797,17		
	Moderately traditional olive grove pending irrigation	9,59%	1.095.669,10		
Intensive	Intensive rainfed	3,81%	435.297,11	21,03%	2.402.702,95
	Intensive with irrigation system	17,22%	1.967.405,84		
Superintensive	Superintensive	4,31%	492.422,72	4,31%	492.422,72
Total		100%	11.425.121,00	100,00%	11.425.121,00



Source: own elaboration from Juan Vilar and International Olive Council's information

Different modes of cultivation, and implications for the water consumption



The **superintensive** system has to be irrigated, and the olives collect directly from the tree, these fruit are clean, and are the best for environment **it saves more water**, its consumption is between **0 – 5%** of water per ton **(2 phases)**.

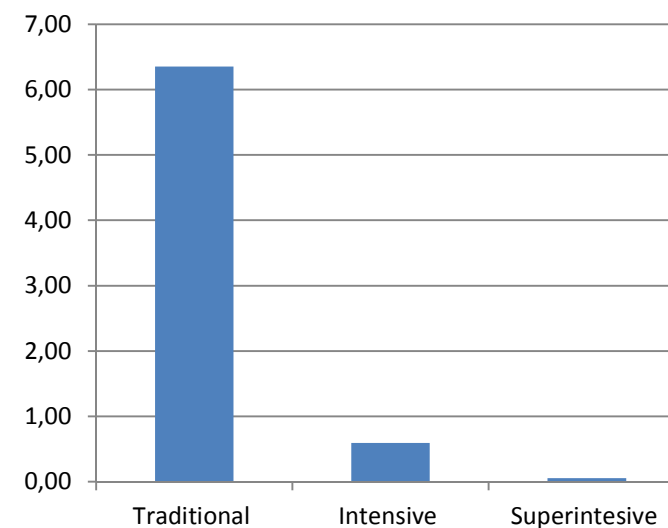
In the **intensive system** 95% of the olive fruit comes from the tree, and they are also irrigated, their water consumption ranges between **2 and 10%**. **(2 phases)**

The traditional system spent between **20 – 30% (2 phases)** of water per ton, it depends if the fruit came from the tree, if the system is irrigated, etc.

Different modes of cultivation, and implications for the water consumption



Water Consumption



	Traditional	Intensive	Superintensive	Total
M/t water	6,35	0,59	0,06	7
% consumption	91%	8%	1%	100%

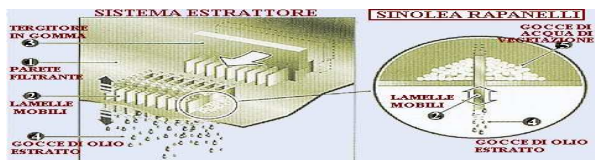
Inside the fruit there are also around 12,5 Mt, around 20 in total

Source: own elaboration from Juan Vilar and International Olive Council's information

Different olive oil processing plants. For its orientation, technology and location

Currently there are about 12,000 oil mills distributed throughout the 5 continents, 80% are production lines by centrifugation (2 and 3 phases), **95% in capacity. (10% 3 phases – 75% 2 phases)**

In this sense, the current evolution is very different: small oil mills that are not very efficient in terms of cost, and oriented to quality, and large mills huge and efficient farms, oriented towards cost leadership

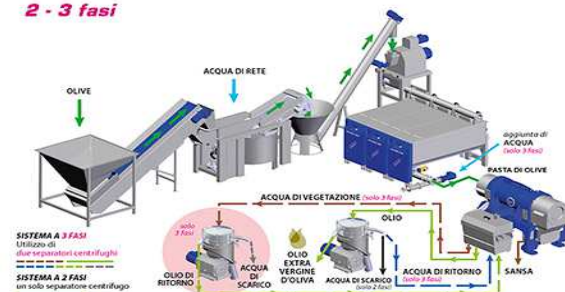


The Sinolea system does not consume water except for washing the fruit and the machinery



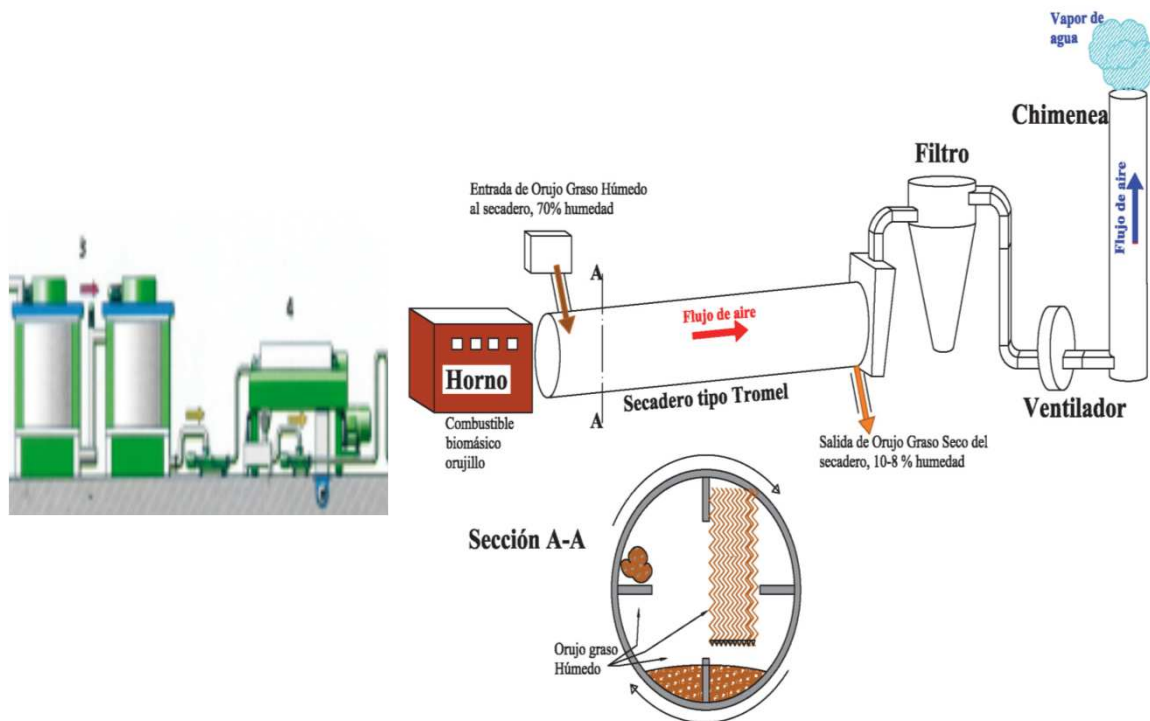
The system of elaboration by pressure consumed between **2 and 3 liters of water per kg of olive**

2 - 3 fasi



As for centrifugation, the two-phase system consumes between **20 - 30% water** per t of olive, in the case of 3 phases, **the water consumption is similar to the olive fruit feed**

Productive chain from origin to pomace oil extraction



In the pomace factories the pomace enters with approximately 70% of humidity and leaves after passing through the dryer, connected with 8 - 10% of humidity. the rest of the water is evaporated.

Per **each pomace extraction factory** there are around **30 olive oil plants**, working at the same time.

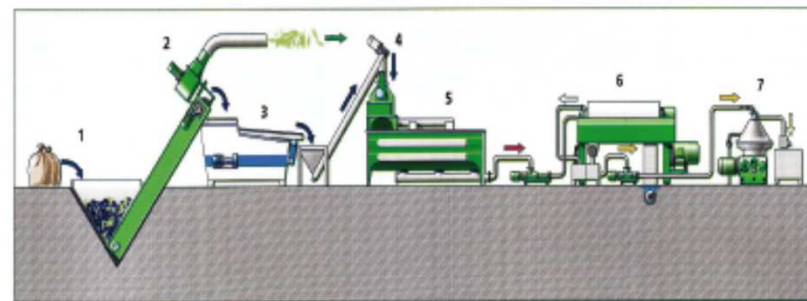
Preventive measures for saving water

The best allies with respect to saving water in oil mills are:

1. knowledge,
2. Experience
3. Technology and,
4. The combination between these 3 resources

knowledge

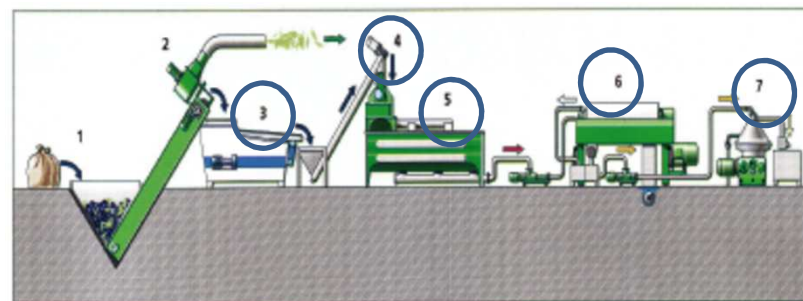
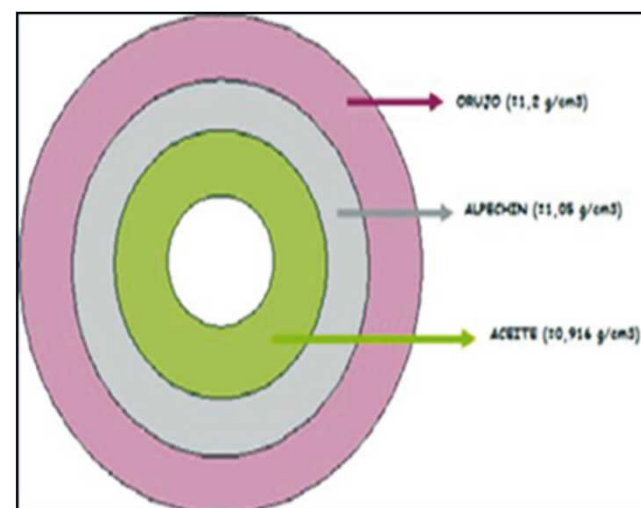
The addition of water in the process of olive oil production depends on a number of factors, such as the variety, mode of cultivation, time of collection, state of the fruit, design of the plant, period of the day, temperature, efficiency in the extraction, etc. Therefore, as more training and knowledge the process director has, the process will be better, and less the water consumption. In general terms the training of the majority of oil mill masters or process responsible should be improved



Preventive measures for saving water

Experience

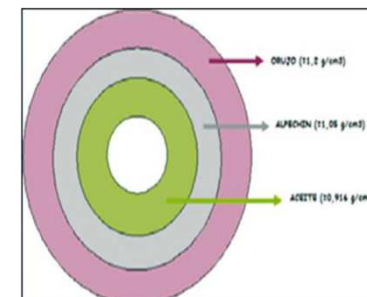
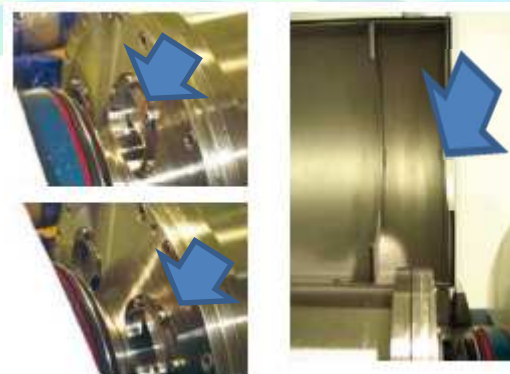
Each season it is totally different. With regard to the improvement in the process of optimizing water consumption, the experience of the master oil mill or project manager is fundamental, because as much year as he or she has worked in the process, better he or will know it and will be able to influence in it. It is fundamental to look for the homogeneity of the fruit, stabilization of the process and to make constant checks, because in the same way that the consumption of water is a capital factor, it is also the obtaining of quality oil and in the maximum quantity. In the same way, it is fundamental to know the behavior of the machine, where to add water, if it is necessary, the use of technological coadjuvants, how to use the tools, and how, when and how many etc.



Preventive measures for saving water

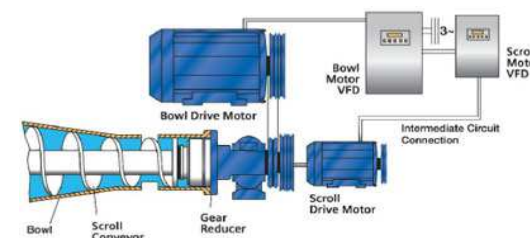
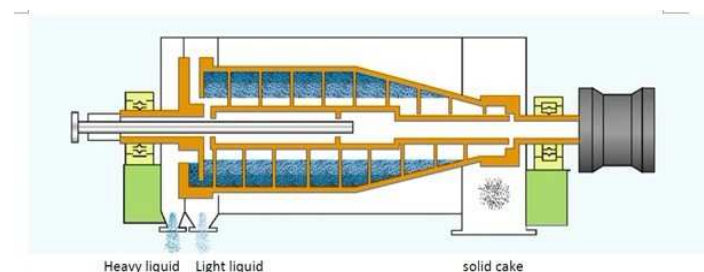
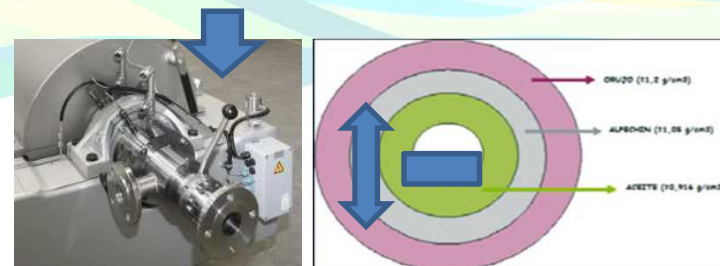
The **technology** is fundamental in order to preventively reduce and even avoid water consumption to the value 0, these are some guidelines:

1. The decanters, if they are old, they have to have an **easy access, and tools** to influence the consumption of water through the **change of diaphragms or loops**, otherwise they will not be changed easily, and we will be consuming more water, and losing oil in the pomace



Preventive measures for saving water

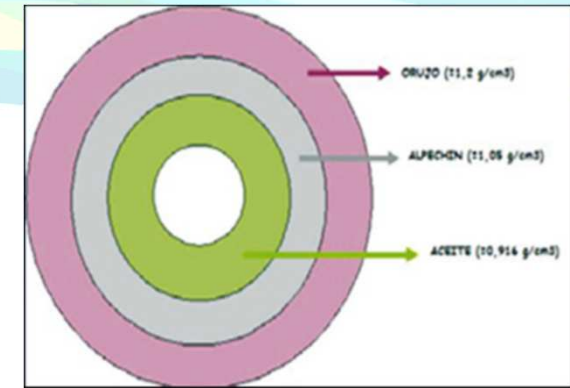
2. The **paring tube** is an automatic system that allows to reduce water consumption, without opening, or stopping the decanter, optimizing both efficiency and **water saving, it should be 100%**, among other things
3. with a single motor, the decanter goes at the same differential speed between bowl and scroll, thus, with **two motors**, everything can be altered, production, stay of the pasta in the decanter, speed of the bowl, of the scroll, etc. This makes it very versatile, **avoids water consumption**, and gives us an optimum olive oil intake



Preventive measures for saving water

4. **high-speed decanters**, with this technology the rings are tightly packed, they do not generally need water addition, because the high inertia separates the rings clearly and quickly, and the efficiency is very high. They have a wear problem superior to the rest of conventional decanters. (it needs at least 2 or 3 hours to stabilize the process) it run around 5.000 rpm while the other one work around 2.500 – 3.000 rpm

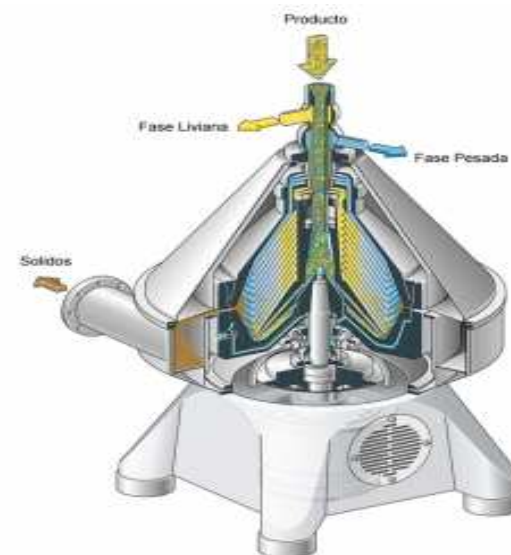
Of course it would be fantastic a decanter **with two motors, high speed, and paring tube, this would take the water consumption to 0**, and the maximum oil uptake. the difference of a conventional decanter with respect to one with all these features does not increase it in value more than 25 - 30% even some brands already elaborate them in this way



Preventive measures for saving water

5. In the **vertical separators** equipped with a system of partial discharges it is already possible to consume between 0 and 2% of water in the oil flow. in the same way it can be recirculated to the malaxer, that translates into 0 water consumption.

To conclude this section the best combination, would result from **knowledge, experience** and availability of **technology** to preventively **eliminate the water consumption**, it is materially possible



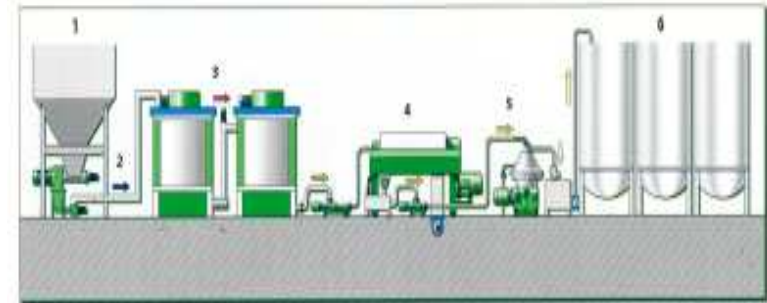
Corrective measures for saving water

The water content of an olive is around 50%, this means that even if we are careful with the process, the wastewater would be 70% of the total waste of the olive oil production process

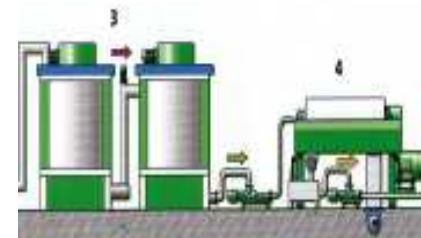
¿It is possible to eliminate this water using for example for irrigation ?

1. Is made by obtaining olive oil through a system of two stages of processing, once obtained the oil, the alpeorujo (pulp plus water) we pass it to a line of extraction of pomace oil of 3 phases, after which the resulting liquid adding electrolyte It is centrifuged by choosing water suitable to be mixed according to the proportions that the law allows and to be used in fertigation.

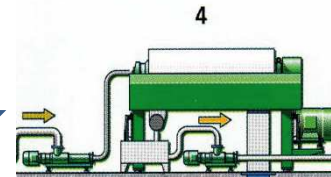
2 phases ellaboration system



Second extraction in 3 phases



3rd process wit Clarifier and
electrolite



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Corrective measures for saving water

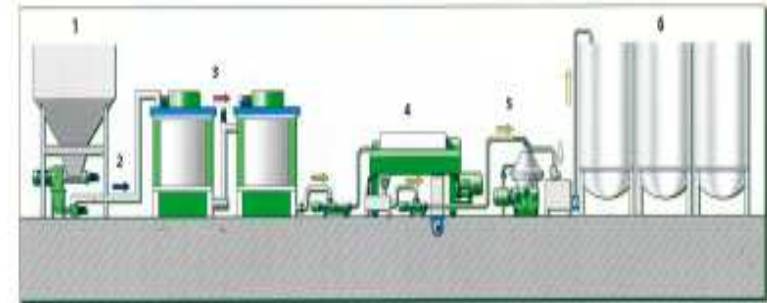
It is made by obtaining olive oil through a system of two stages of processing, once obtained the oil, the pomace (pulp plus water) we pass it to a line of extraction of pomace oil of 3 phases, after which the resulting liquid is introduced in a forced evaporator with liquid collection and up to 90% of the by-product water is used

In **conclusion**, we should point out that we have enough technology to:

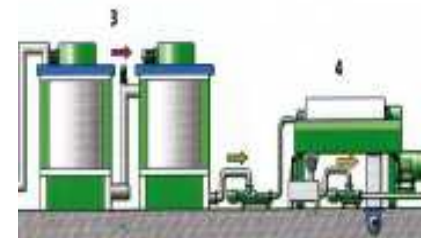
1. reduce the addition of water to 0 in the preparation process of olive oil.
2. and to optimize and reduce the wastewater from the process at 10 - 15%

we only need to carry out an application / competitiveness / efficiency analysis according to legal rules applied in each country

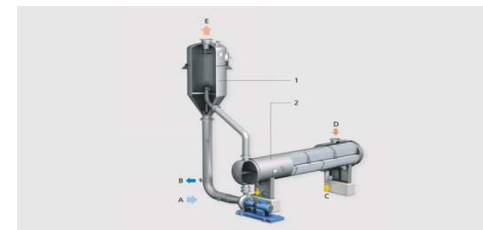
2 phases ellaboration system



Second extraction in 3 phases



Evaporator



P
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For further information

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