



Kingdom of the Netherlands



# EXPORT POTENTIAL OF PROCESSED POTATO PRODUCTS FOR UKRAINE

Karst Weening, NAO  
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# **1 BACKGROUND**

## **1.1 Introduction**

According to statistics the UA is among the major “potato countries” in the World. With a cultivated acreage of 1,2 million hectares it ranks as No.4 in the World, only preceded by China, India and Russia. With average yields between 16 – 19 tons per hectare this results in a staggering total production of 21 million tons. This is equivalent to 400 kgs per capita, a quantity that is clearly impossible to be consumed by households. Obviously, many potatoes find an alternative destination, and end up either as cattle feed or get transformed for other use.

Despite the enormous production volume, very few Ukrainian potatoes or potato products can be found in the World Market. Main reason for this absence is the limited access for Ukrainian ware potatoes to neighboring markets:

- Towards the West, the EU - member countries do not allow UA fresh potatoes to enter, due to very strict phyto-sanitary requirements.
- Towards the East, the present political situation, has caused the export towards Russia to stop. The remaining export towards the East varies between 15 – 20.000 tons. Main destinations are Georgia, Belarus and Azerbeidsjan (source UN COMtrade).

The potato processing sector in UA is hardly developed and therefore export of processed potato products is negligible.

As potato production depends on nature, the year to year yields and market prices will fluctuate. All major potato production countries have created outlets for “over production”. As in UA the connection with other markets is minimal, year to year price fluctuations can be extreme. Another remarkable characteristic of Ukrainian potato sector is that the vast majority ( > 90%) of potato production is still in the hands of small non-professional growers.

## **1.2 Objective of study**

The report provides information on the various types of potato processing, the major players in the World and export options. Special attention is given to describing the path of development in other processing countries. Based on an analysis of the current situation in the Ukraine, its comparative (dis)advantage for processing is assessed. Finally some recommendations are given on how to establish a potato processing sector.

## 2 PROBLEM ANALYSIS AND POSSIBLE SOLUTIONS

The scope of this report is to explore the export possibilities for processed potato products.

### *Existing processing activities*

At this point in time the processing industry in UA has been very little developed.

The major activity consists of the following activities:

#### Crisps

- *Mondelez potato crisp factory “Chips Lux” (Kyiv region)* - Capacity near 100,000 tons potato processing/Year. Actually processed 50 000 tons of potato.  
Sales: domestic market, export to Russia (mainly), Byelorussia, Moldova, Kazakhstan, Georgia, Armenia, Azerbaijan. From 2000 potato raw material supply system was set up, now including around 30 farmers.
- *Chips factory “Chips Club” ( Dnepro reg.)* - Capacity 25,000 tons potato processing/Year. Plan to increase capacity. Sales: domestic market.

#### French Fries.

- *“Inter agrosystem” (Chernigiv reg.)* - Capacity 20,000 tons potato processing/Year.  
Sales: Investigating local market and export (Azerbaijan).

#### Starch.

- *5 main starch factories in UA (Chernigiv, Ternopol, Zhytomyr reg.)*. –
- *“Vimal”* will launch new production facility in 2018. Potential capacity 1 400 tons potato/day x 4 month = 168 000 tons/Year  
“Vimal’s” Capacity new factory (tons/day):
  - Potato processed - 1 400;
  - Starch production – 230;
  - Protein production – 14,5;
  - Potato fertilizing production – 81;
  - Food fibres production – 22.

#### Flakes.

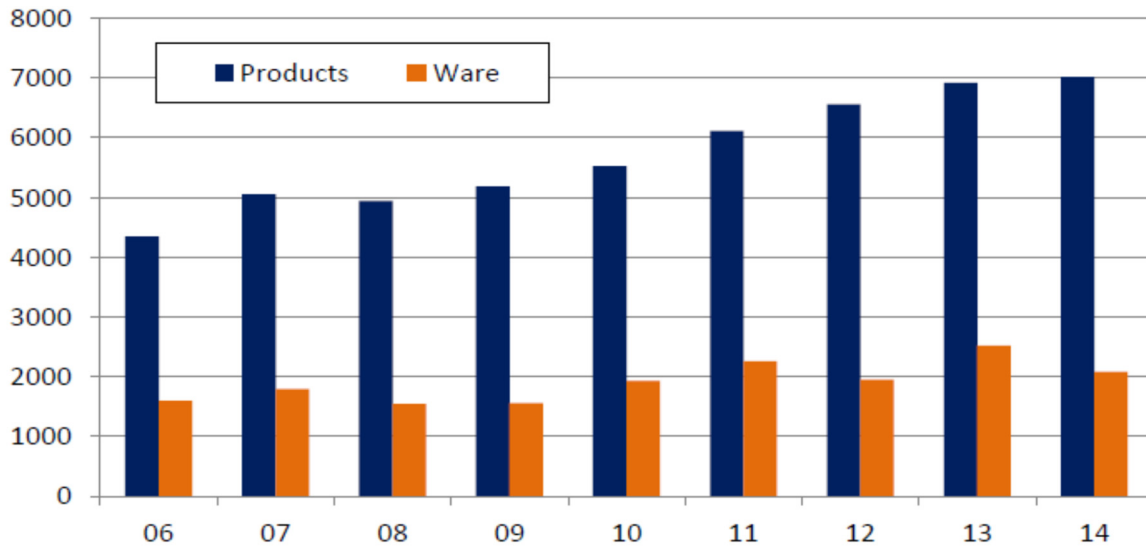
- *“Levona”* - Small production line 3 000 tons potato processing/Year.

Some 15 years ago, McCain had serious plans to establish a French Fries facility in Ukraine. Main driver behind this initiative was the idea to supply the Russian market from Ukraine. Unfortunately the realization of the plan was halted. According to internal sources of McCain the major causes were related to lack of cooperation and corruption.

### *World markets*

Over the past decade the World Market of processed potato products is going through a long period of sustained expansion.

## World potato exports (€ million)



Graph 1 shows the impressive and continuous growth of the international trade in potato products (blue) over the last 10 years. This international trade consists mainly of frozen fries (> 4,5 billion €). The remainder, at a value of around 2 billion € is made up of various categories, such as crisps, flakes, flour/granules and starch.

The trade in fresh potatoes (orange) also increased slightly, yet it fluctuates considerably from year to year.

### *Prospects for Ukraine*

Though the international demand is high and increasing, price levels are competitive. If Ukraine wants to export, its potato sector needs to be able to produce quality products against competitive prices. Currently the Ukrainian potato sector is improving, but has not yet reached the level to fully compete in all aspects with the top players in the World Market. Cost price of potatoes is relatively high due to a low production per hectare. For instance irrigation and balanced fertilization and adequate pest management are not standard practice.

Some of the following factors may explain why the sector did not make full efforts to professionalize:

- a) Strong fluctuations in market prices has made it difficult for UA growers to make large structural investments in potato growing and storage.
- b) Direct land ownership or long term lease contracts are not the common standard. Therefore the system of land tenure is not encouraging long term investments in irrigation and soil quality.
- c) The current state of the domestic market, which is not demanding potatoes of high quality.

Even before making a thorough analysis, the current situation has much similarities to the Classical *Chicken and Egg* case:

Investment by an international processor would give a boost to the modernization of the Ukrainian potato sector. However, if Ukraine wants to be attractive for such an international player, it first needs to make further steps to upgrade its potato sector.

The next chapter will look at the relevant aspects of the various processed potato categories, such as market development, factors determining competitiveness and an overview of the existing industries. Focus lies on French Fries and to a lesser extent on Flakes and Starch. Crisps will be left out as international trade is limited to neighboring countries. Chapter 4 describes the development in other important potato producing countries.

### 3 PROCESSING: DESCRIPTION OF WORLD MARKETS AND INDUSTRY

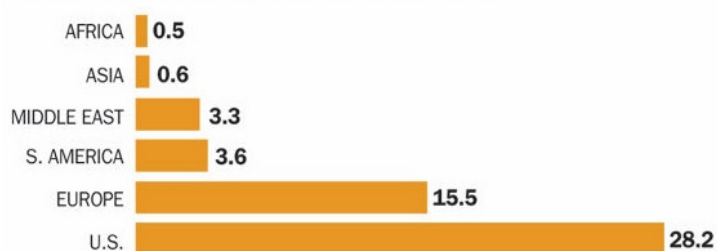
#### 3.1 French Fries

##### *Consumption*

Worldwide consumption of French Fries started to develop some 60 years ago and has been increasing ever since. It is expected to grow further in coming years. In the developed markets, Western Europe and North America the consumption is stabilizing at current levels, which vary from around 14 kg of fries per capita in the USA to 5-10 kg. in Western European markets. Currently (2016) the total market is estimated at a value of \$13 billion (€11 billion), of which North America has a share of \$ 6 billion.

In almost all other regions in the World French Fries is gaining popularity. As many countries, especially those with warm climates, are not suitable for large scale potato production, they largely depend on import. This demand creates a great boost to the international trade in frozen fries. Major importing regions are Middle East, South America and South East Asia.

Per capita french fry consumption (pounds per person, 2015)



A common pattern is that fries are introduced by the Quick Service Restaurants (QSR), like McDonalds. As North America and McDonald are using white colored fries, this is often determines the preference in the new markets. European markets are more in favor of yellow colored fries. Many countries in Europe as well as in North, East and West Africa have developed a “home fry” culture. However, in Ukraine and most of Eastern Europe home frying is not (yet) very common.

Though Frozen French are chiefly a cost price driven commodity, some higher segments have developed. Fries for the *Quick Service Restaurants (QSR)* have to meet very strict specifications for length, color and defects (discoloration) and fetch a higher price. QSR fries sometimes receive special treatments to enhance the “shelf life” in the restaurant.

Apart from common frozen fries, there is a growing demand for frozen potato *specialties* (see some examples in the pictures below), that also fetch higher prices. These specialties also

include healthier alternatives that can be baked in the oven or fried in an air fryer. The QSR and specialties are generally the domain of the large international companies.

Specifications for “*Standard*” fries are less strict and allow for more variation in length and have a higher tolerance for defects and discoloration.



### *Segmentation and transport*

French Fries is a world-wide traded commodity. As frozen fries are dense, the cost of transport by refrigerated sea container is relatively cheap. At a commodity price of around US\$ 800 per ton, and a load of 25 tons per container, the goods value is approximately US\$ 20,000. Shipping fares ranging from US\$ 500 to US\$ 3.000 per container, therefore make up only 5-15 % of total cost.

The shipping rates vary according to port of shipment and destination and also fluctuate according to supply and demand in the freight market. Reefers from Western Europe to South America are usually cheap, as they serve as “return load” for the huge import flow from South America. Cost of shipping from Ukraine needs to be investigated locally with shipping lines or cargo movers.

### **Overview of Industry**

Economies of scale are important in the processing industry. As a consequence factories are usually big, with capacities starting at 75,000 tons end product per year. Over the past decades the large companies expanded both by autonomous growth, and by taking over smaller processors. Take overs in other countries are mainly driven by the ambition to enter new markets. The potato processing industry has gone through a strong consolidation process and at present the sector is dominated by just five worldwide operating companies:

*McCain* - Privately owned, Canadian company, founded in 1957.

World’s largest processor, turning 6,5 million tons of potatoes into frozen fries and other products, in their 47 production facilities spread over all 6 continents. McCain has factories in Canada, USA, Netherlands, Belgium, France, **Poland**, India, Korea, China, Australia, New Zealand, Argentina, Colombia, South Africa (and others).

*Lamb Weston* – Farmer Lamb, from Weston, started French fry production in 1950.

Currently at Stock exchange, Lamb Weston is world wide number two processing around 5 million tons of potatoes at value of US\$ 2,5-3,0 billion. Factories are located in North America, Chile and China. Activities in Europe started in 1994 through the joint venture Lamb Weston Meijer (LWM). LWM processes 1,2 million tons of potatoes in plants in NL, UK and Austria.

*Simplot* - Large privately owned, US based (Idaho), started with fries in 1955

Agricultural company, including potatoes, fertilizer, seeds etc. Breeder of the GMO potato variety Innate. Processing around 3,0 million tons of potatoes with plants located in North and South America, Asia and Oceania. No production facilities in Europe and Africa.

*AVIKO* – Founded as a cooperative by 30 Dutch growers in 1962. Currently owned by COSUN, a large agricultural cooperative rooted in sugar. Processing around 1,8 million tons, with a turnover of approximately € 800 million, AVIKO is the largest European processor. North West European activities (12 plants) are located in Netherlands, Belgium and Germany. Outside North West Europe AVIKO has 2 joint ventures in China and **Poland**

*Farm Frites (FF)* – Founded in 1971 by a potato grower in The Netherlands. FF processes around 900.00 tons of potatoes at a value of € 400,000. Plants are located in Netherlands, Belgium, China, Argentina, Egypt and **Poland**. FF is recently investigating the construction of a new 140.000 tons facility in Kazakhstan and plans further investment in Argentina.

### *Belgium*

In addition to the five large and internationally operating companies, Belgium hosts a category of mid-sized (100- 500 employees) processing companies. They started operations during the eighties and nineties and plants are mainly located in their home country. Belgium has had a well-developed frozen vegetable industry for several decades. Supported by a strong local tradition in French fries consumption, this has facilitated the emergence of the new industry. Some Belgium companies are:

*Clarebout* – Established in 1988 having two factories in Belgium.

*Agristo* – Founded in 1986, with an initial production of 20,000 tons. Now processing 600,000 tons per year of which 98% is exported.

*Mydibel* – Family owned, founded in 1988 with turnover around € 75 million.

Other companies are *Ecofrost, Pomuni, Eurofreez and Remo frit*.

### **Production regions**

French fries production was usually started to cater the local demand. Over time the international trade did develop. As production of one kilogram of fries requires almost two kilograms of potatoes, the cost price of processing potatoes is the most important factor in choosing the location. The potatoes should also meet strict specifications and be available during almost 12 months per year.

Only two regions are able to produce large volumes of the right quality at the required low cost price for the World Market: North West Europe and North (West) America. International trade is dominated by these regions.

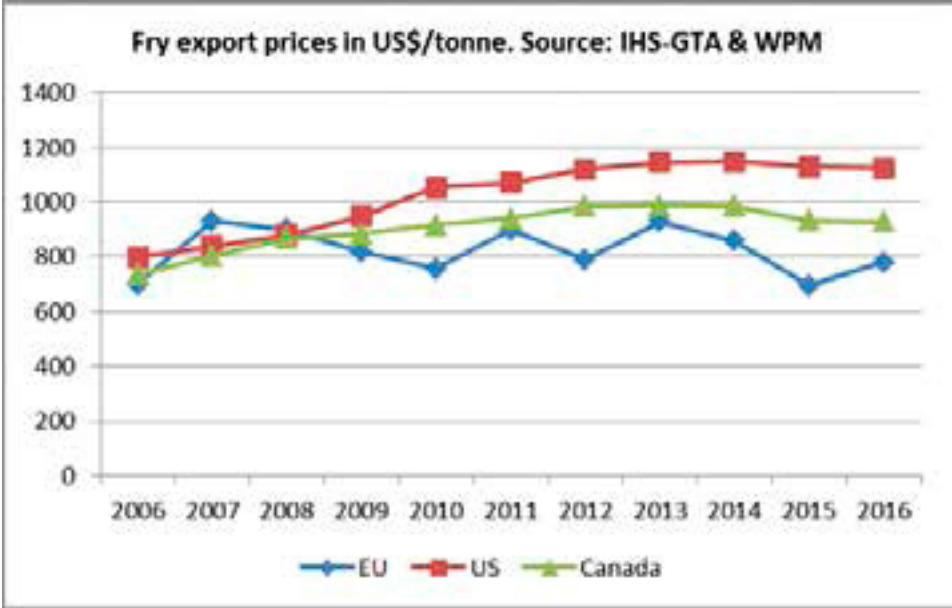
Processing locations in other countries mainly serve to supply the domestic market. This is clearly the case for South Africa (McCain), India (McCain) and China (Farm Frites, Aviko). In several cases countries impose duties on import in order to protect their own processing sector. However, such protection makes the domestic industry “lazy” and it becomes less competitive in the World Market.

Some factories are set up to supply both to domestic as well as neighboring markets. Examples are: Poland (Aviko/Farm Frites) with Russia, Argentina (McCain and Farm Frites) to Brazil and Egypt exporting to Middle East countries.

New production facilities at “new” locations are often set up as joint ventures with local partners. Currently Lamb Weston Meijer and Russia-based Belaya Dacha are establishing a



new processing plant just south of Moscow to serve its fast food service industry. Several years ago, Farm Frites and Aviko teamed up with local players in China for the same reason.

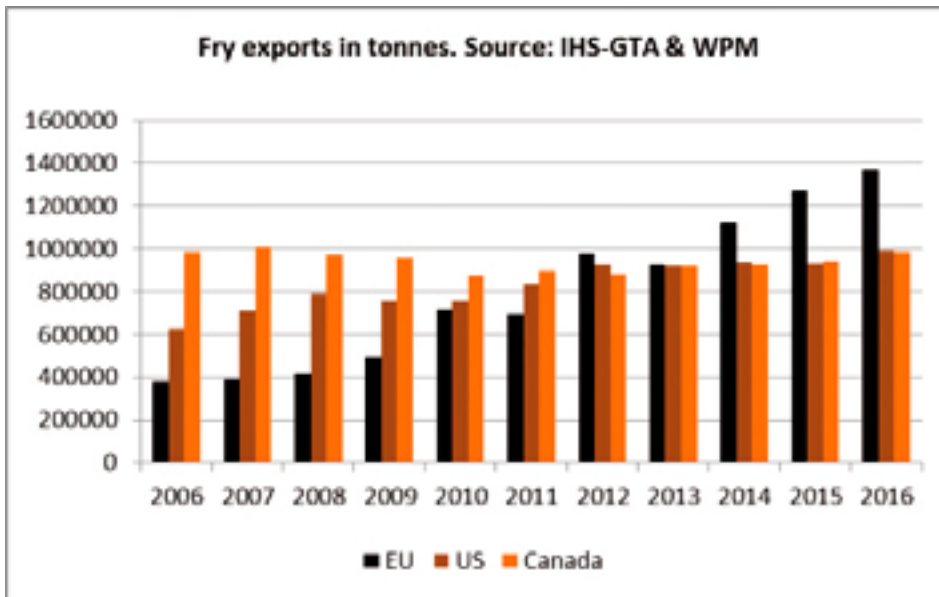


**Graph 2 :** Export prices French Fries of major exporting countries (USD per mton)

**EU – 5 (Netherlands, Germany, Belgium, UK, France)**

European French fry processing is concentrated in 5 countries in North West Europe: Netherlands, Germany, UK, Belgium and France. Two countries, The Netherlands and Belgium, are responsible for the bulk of export. The other three have large home markets.

Compared to North America, the industry in the EU developed later and in the beginning most production was for own use. During the last decade the export growth of the EU has been spectacular. Producers in the EU have proven to be very competitive, which was supported by the €/US\$ exchange rate, being in favor of the Euro countries. The result has been an enormous expansion of production capacity. As the Euro has regained strength during 2017 and farmer contract prices do increase, Europe is recently losing some of its competitive advantage against the USA and Canada.

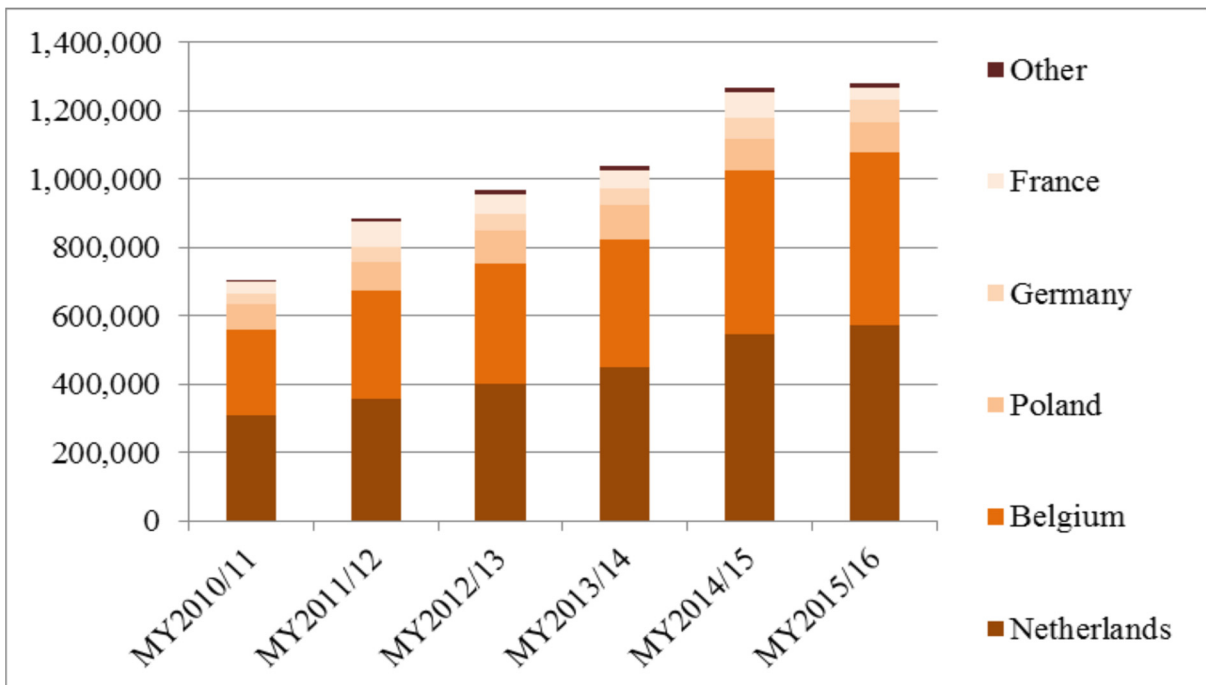


**Graph 3:** Development of export of French Fries by EU and North America.

Graph 3 shows the strong growth of export by The Netherlands and Belgium. Germany is relatively strong in export of flakes and starch.

*International markets*

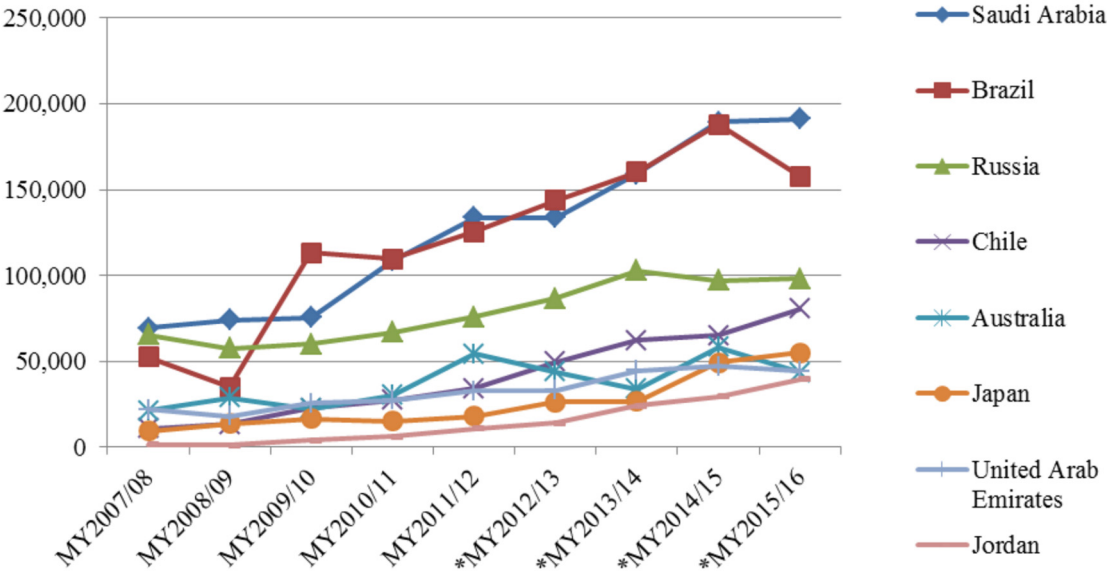
Europe and North America compete, but each dominate in different markets. North America is leading on the Asian and Central American markets while the EU countries dominate in Russia/Europe, the Middle East, South America, the Caribbean and Africa.



**Graph 4:** Export volume of French Fries by EU countries (mtons)

Over a quarter of all EU exports are shipped to Saudi Arabia and Brazil. In season 2015/16 frozen potato products export to Brazil dropped by roughly 30 thousand MT, or 16 percent due to competition from Argentina. Important export markets for EU frozen potato products include Russia, Chile, Japan, UAE and even Australia.

The United States and the EU directly compete in markets like Japan, the Philippines, Malaysia, Australia and China.

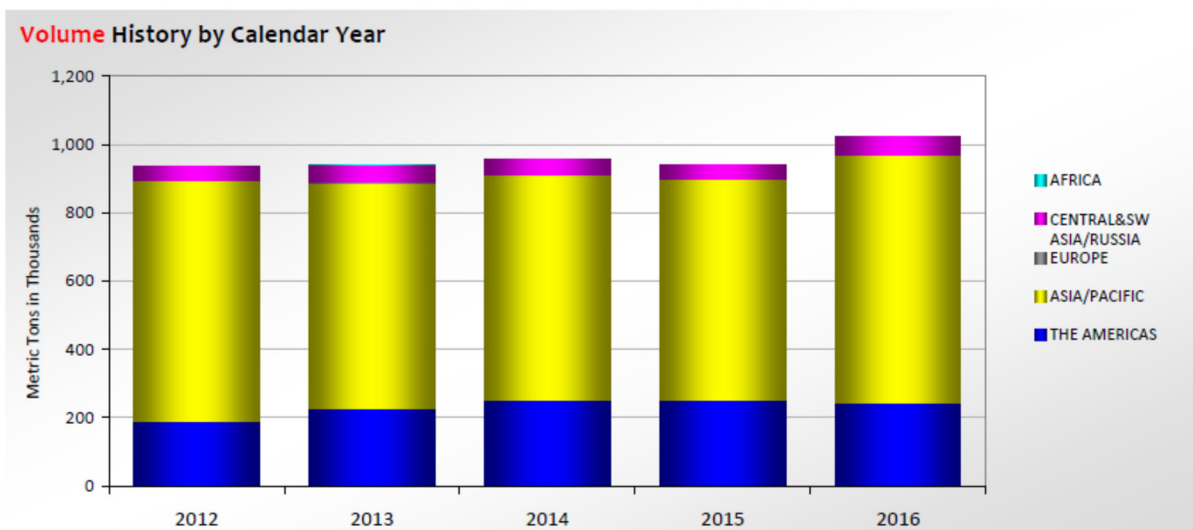


Graph 5: EU exports of French Fries to selected markets (mton).

**North America**

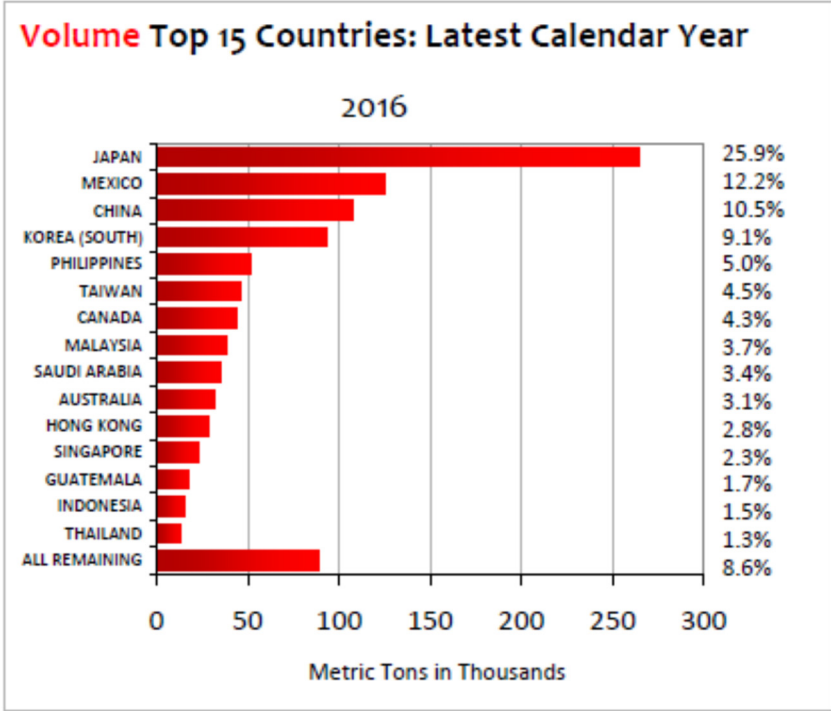
Graph 3 showed a stagnating export from Canada and a growth by United States. In fact a large share of the export by Canada is imported by the USA and most of it is re-exported.

**United States Potato Exports**  
Regional Distribution for Frozen French Fries/Potatoes  
*Metric Tons*



Total value of export of USA exceeds 1 million tons, with a value of more than 1,1 billion US\$. The unit value of the USA exports is relatively high. It includes many high end products for the QSR market. Major customer Japan is also demanding “high end” products.

The export from United States is strongly oriented towards the Asia Pacific region and the Americas. Japan, Mexico, China and Korea are the most important destinations.



*Characteristics of processing potatoes*

In the EU the traditional multi-purpose variety Bintje is rapidly being replaced by new, specific French fries processing varieties like Fontane, Innovator, Agria and Challenger. These varieties also have better resistance against diseases.

Apart from yield in the production field, also the optimal output during the processing counts. The processing output is determined by various factors, such as the size and shape of the tubers, sufficient underwater weight and texture as well as a low sugar content. Also a good storability and resistance against bruising is important.

The processors needs to operate the factory as many weeks as possible. In practice the factories operate 12 months per year, with a 1 or 2 week break for maintenance. This requires a mix of varieties: early, main season and long storage.

In order to ensure supply of the right quality during the entire season, processors organize the supply through contracts with farmers. The contract specifies variety, the delivery period and the minimum quantity. This could be around 40 tons per hectare, including the right to supply the extra production to the processor. Seed potatoes are usually arranged for by processor and cost is distracted at final payment

Basic price varies between € 0,11 (for off field delivery) and € 0,13 per kg for delivery end of season). The quality of the potatoes determines the final price paid. For calculation of the final price a detailed calculation system is agreed between processor and grower. Annex 1 shows an example of contract (in Dutch language).

Major factors determining the price are:

- Dry matter percentage, measured with the Under Water Weight (UWW) method. Minimum UWW is 360 grams. A premium is paid when above 390 grams.
- Minimum size and length of the tubers,
- Percentage of external and internal defects (rot, damage, bruises, germination, green coloration etc.
- Firmness
- Temperature at delivery
- Adhering soil and stones

### **3.2 Flakes and Granules**

#### *General information*

Flakes and granules are in fact dried potatoes. Producing Flakes is a relatively simple process: Potatoes are washed, peeled, cooked and mashed and finally dried in a “drum drier”.

The process for Granules is somewhat more complex and requires more steps (“add back”). The drying process requires a lot of energy and therefore energy is a major cost factor in flakes processing.

Flakes can be used for many purposes: Apart from instant mashed potatoes, it has many applications as ingredient for the food industry. It can also be reconstituted into fries (RAS), potato crisp (for example Pringles) or potato snacks.

Other uses are:

- Ingredient for bread and bakery products
- Fish and meat coating
- Ingredient in snack and pellet manufacture

#### *World Market*

World trade in flakes and meal (HS 110520) has shown a rapid growth from a level of € 280 million in 2011 till € 420 million, where it stabilized in 2016. Traded volume is around 400.000 tons. Trade is dominated by the EU and North America, with Germany being the largest player, exporting 135,000 tons at a value of € 142 million. Major net importers are Malaysia (€ 38 million) and Mexico (€ 25 million).

During past decade China has increased its capacity of flake production. However, it is difficult to find reliable statistics.

#### *Varieties for Flakes and Granules:*

No specific varieties are being developed for flake production. As varieties need to have a high dry matter content, mostly “starch”, “fries” and “crisps” varieties are used for flakes processing. It is estimated that in The Netherlands more than 50 different varieties are used for flakes.

When compared to French Fries, the quality requirement of potatoes for Flake production is less strict. For instance the shape of tubers is not important and defects can be tolerated to a certain degree.

In Comparison with starch production, flake requires higher standards. Green and black-bruised tubers should be avoided. Potatoes need to be low in reducing sugar, also after long time storage.

Some potatoes are grown specifically for flakes. Other flakes are produced from “French fries” potatoes, that are rejected because of size, shape or minor defects. Provided dry matter is sufficient, they are suitable for flakes. Another source of raw material are “slivers”, a by-product from the production of French fries and potato crisps.

There are various types of “flakes” and depending on the flake type, certain varieties do give the best results. Flake processors often select their varieties based on experience. The table below shows the preferred varieties by the German flakes producer Emsland. The bonus percentage offered per variety is indicated. Saturna (Danespo) is a crisp variety which produces a relatively low yield, but is very much appreciated by Emsland for its flakes quality.

Aktuelle Sortenzuschläge der Vertragssorten:

Preistabelle + 45 %	Preistabelle + 40 %	Preistabelle + 35 %	Preistabelle + 30 %	Preistabelle + 25 %	Preistabelle + 20 %	Preistabelle + 15 %
Saturna	Amanda Donald Karlena	Eldena	Allure Aurora Nomade Lady Ros.	Verdi	Aveka Tomensa Novano Saprodi SL 03-12 Supporter	Festien

The Dutch flake producer AVIKO – RIXONA uses the following standard varieties: Allure, Hansa, Donald, Saturna, Sassy and Verdi.

Starch varieties can be used for flakes, provided the TGA (Glycoalkaloid) content is below 10. Popular dual purpose starch varieties in The Netherlands are Novano (Niehof, Germany), Axion (AVEBE), Aveka (AVEBE) and Donald (STET Holland). As flake production continues year round, for late delivery well storeable varieties are required, such as are Novano (Niehof, Germany), Festien (AVEBE) and Aveka (AVEBE). Unfortunately, the AVEBE varieties are only available for AVEBE growers..

Potatoes supplied very early as well as later in the season obtain a premium price. The procurement price is strongly correlated with the dry matter content, measured by Under Water Weight method (UWW). Annex 2 shows an example of a payment schedule.

*Investment and operation cost:*

The major part of the investment consists of the drier (drum). A new “state of the art” flake production line with a capacity of 400 kgs output per hour would require an estimated

investment of € 1,5 – 1,7 million. Cost of second hand or lower quality could be significantly lower and might be explored.

*Operation* - Energy, required for the dehydration process, is an important part of the operational cost. Use of specific varieties, with high dry matter, will increase the efficiency of the process.

An informative introduction in the world of potato flakes and starch can be found through a video (webinar) made by Emsland, Germany, one of the Worlds largest producers (<http://www.foodingredientsfirst.com/webinars/enter-the-potato-snack-world.html>)

### 3.3 Potato Starch

World wide production volume of potato starch is estimated at 3,5 million tons. The EU countries produce around 1,4 million tons of Potato Starch, while China is another important producer with 0,55 million tons. Total traded volume fluctuates between 800 – 900 thousand tons of starch, having a value of around € 550 million. World trade is dominated by Germany, The Netherlands and Poland.

Potato starch is partly competing with other starch sources, of which corn starch is the most important. Potato starch does have some specific characteristics that gives it a certain uniqueness. Starch has many uses, both for food and industrial purposes. In view of the different uses, over time many types of starch and derivates have been developed.

#### *Development of industry*

In Europe the potato starch industry started some 100 years ago, with growers creating cooperatives to extract starch from potatoes. Till thirty years ago the starch extraction was a relatively primitive and simple process. Only the starch was used and all non-starch components were disposed of as waste. In those days the enormous volumes of waste, especially the protein, caused a severe pollution problem.



Till 15 years ago the potato starch sector in the EU was supported by government subsidies. After the abolition of this support, the starch sector was expected to reduce in size. However, this reduction did not happen. To the contrary, the EU starch sector developed into a large scale, highly innovative and technological industry. To date all components of a potato can be transformed into value added products. The protein now finds a good market as it fits well in the Western trend to replace animal protein by a vegetable source.

**Picture 1:** An aerial view of the AVEBE starch factory in Gasselternijveen (NL).



Part of the starch is further refined into derivatives, that are used for all kinds of specialized applications (industrial, food industry, etc). The Research & Development is often organized jointly with the customers in order to create very specific products and solutions.

### *Production*

Cultivation of potatoes for starch mainly takes place in Germany (1,8 million tons), the Netherlands (1,7 mtons), [https://en.wikipedia.org/wiki/Potato\\_starch](https://en.wikipedia.org/wiki/Potato_starch) - cite note-6 France (0,9 mtons), Denmark (0,8 mtons) and Poland (0,6 mtons). China is also an important producer.

In The Netherlands starch potatoes are produced only in the North East region, near the AVEBE factories. AVEBE still is a cooperative, owned by the grower members, and is currently the largest producer in the world with 550.000 tons of starch, part of it in Germany.

### *Cultivation and varieties*

Production of one kilogram of starch requires some 4 - 5 kgs. of potatoes, depending on the starch content. Modern starch factories only process specific starch varieties.

Where normal varieties have a starch content around 11 - 12%, starch varieties reach a level of 18 - 20%. New varieties, such as *Supporter* (Semagri) can even exceed 25% starch content, which corresponds with a dry matter of 30 – 32%.

Compared to the table potato market, the starch sector uses more modern and recently developed varieties. Apart from high dry matter and starch content the starch varieties have very high levels of disease resistance, in particular for potato cyst nematodes (*Globodera ssp*) and wart disease (*Synchytrium*). These resistances allow to grow potato more frequently in the rotation scheme. Recently also varieties with improved storability become available, which makes it possible for factories to operate for a longer period. Obviously shape and appearance of starch varieties are not important.

In The Netherlands use of certified seed and payment of royalties is well regulated. Even when growers use farm saved seed, the quality is monitored and the grower pays a license fee of € 20 per hectare to the breeder.

Most popular varieties in The Netherlands are *Seresta* and *Festien*. Both have been developed by Averis, the breeding company of AVEBE. As their policy is not to supply to competitors, these varieties are not available elsewhere. Other recommended starch varieties are: Saturna, Amanda, Eldena, Aurora, Verdi, Donald, Karlena, Allure, Lady Ros en Tomensa.

Breeders of starch varieties in The Netherlands are Semagri, Agrico and Mencke. The Semagri varieties *Sapodri* and *Stratos* are gaining popularity in several countries, such as Denmark, Sweden and Austria. German breeders like Europlant also have starch varieties. The most popular starch variety in Poland is not known.

Dual purpose varieties are suitable for both starch and flakes. Examples of such varieties are *Novano*, *Sapodi*, *Axion*, *Aveka*, *Donald*, *Nomade* and *Supporter*. These varieties allow growers to switch between two buyers depending on market situation and the quality of the potatoes.

Recommended varieties for storage are Festien, Novano and Aveka.



Selecting the most suitable starch variety based on performance in other countries has proved to be unpredictable. Therefore it is necessary to test many varieties.

The grower price for starch potatoes is relatively low. In The Netherlands farmers receive a basic price of € 6,50 per 100 kgs (Netherlands). Thanks to a successful value addition by their modern factory, and depending on starch content, the final price paid by the cooperative usually raises to around € 7,2 - 8,5 per 100 kgs. Top growers reach a production of 15 tons of starch per hectare, which results in a yield of € 5,500 - 6,000 per hectare.

### 3.4 Valorization of by-products

Approximately 1,8 - 1,9 kg of potatoes are required to produce 1 kg of French fries. The rest is by-product and/or waste. Companies are working hard to increase the usage percentage of the potatoes, as it has a strong impact on the profitability. Moreover, the “waste” can be a source of pollution. Fortunately the possibilities to put it to value are increasing.

Processors are working in two directions:

- a) Increase the “Potato utilization”
- b) Valorization of By-products.

Ad a) *Increase the utilization rate* – The key lies in using the best suited potato lot for the particular purpose. As an example, the Quick Service Restaurant (QSR) have strict specifications, requiring longer fries. The process starts by selecting the potato lot that best fits the desired end product. This means the right variety, size and shape of tubers and other aspects such as sugar content and absence of bruising and other defects. Optical sorting, which is becoming mainstream in Europe, is a powerful tool to improve the quality of the potatoes that enter the processing line.

Also during the processing itself, use of new techniques can improve the utilization rate. For instance, modern equipment is able to de-peel more efficiently, thus reducing waste.

Ad b) *Valorization of by-products* - By-products, such as peel and sliver (pieces of potatoes) are inevitable. Also the washing water from the cutting/slicing of potatoes does contain starch. The aim should be to put maximum value to these “waste” products.

The traditional destination of peel and sliver is cattle feed. However, it can also be upgraded to more valuable products, for instance flakes.

Similarly, the waste water used to be disposed of causing pollution. Nowadays, technologies have been developed that enable almost all ingredients to be recovered.

Using a centrifuge is one of the available techniques to recover starch from washing water. It should be possible to retrieve 2 kilograms of starch per 100 kgs. of processed potatoes. Minerals, such as phosphate and nitrogen can also be extracted and turned into fertilizer (struvite).

All these technologies have a cost and it is not easy to say which one is the best for Ukraine. It is not possible to indicate a break-even point, as this depends on various factors, such as the price of the recovered product and the local cost of waste disposal.

However, a general rule can be given: The larger the scale of operation, the more possibilities exist for waste recovery. It would be interesting to investigate to what extent these techniques are being used by the Kraft factory

## 4 DEVELOPMENT IN COMPARABLE COUNTRIES

### 4.1 Poland

#### *General development*

Where 25 years ago the potato sector in Poland and Ukraine had many similarities, they since have followed a very different path of development. In Poland the potato sector went through a serious transformation. The more professional and specialized growers have taken over. Quality and yield increased and as a consequence market prices went down. Due to these lower prices the small scale and less competitive farmers have left the business.

Apart from their membership to the EU (since 2004), also the nature of their Farmers population could be an explaining factor. In contrary to Ukraine, the Polish traditional farmer population stayed intact during the communist era.

#### *Acreage, production and*

In spite of a spectacular reduction in potato acreage, Poland remains a leading potato country in East and Central Europe. Since 1990 the acreage came down from 1,8 million to around 300,000 hectares, where it now stabilizes.

**Table 1:** Area, yield and potato production in Poland over the period 2009 till present.

<b>Poland</b>	<b>Area (Thousand HA)</b>	<b>Yield (MT/HA)</b>	<b>Total Production (Thousand MT)</b>
2009/10	508	19.1	9,703
2010/11	401	21.1	8,448
2011/12	406	23.0	9,362
2012/13	373	24.2	9,040
2013/14	346	21.4	7,290
2014/15	277	27.8	7,690
2015/16*	308	21.7	6,680
2016/17*	310	27.0	8,370

#### *Processing: Frozen and chips*

Processing is well developed with large factories operated by international processing companies (AVIKO/Farm Frites, McCain, FritoLay)

Farm Frites and Aviko have a joint factory in Leborg, near Gdansk in the North. The McCain facility is located in Strezlin in the South. In addition some small local companies process potatoes.

The major varieties used for standard quality are Fontane and Markies (Agrico) and Challenger (HZPC). The QSR segment mainly uses the Innovator variety (HZPC).

Frito-Lay has a large facility for production of potato crisps.



**Picture 2:** The Farm Frites/ AVIKO potato processing factory in Lebork (Poland).

*Starch and Flakes*

Apart from frozen products and crisps, Poland also produces more than 100,000 tons of starch and some flakes. These activities date back a long time and some started over hundred years ago. Due to stopping of government support, starch production went down but is picking up again and is expected to increase further in coming years, thanks to increasing market demand. Some major producers are Pepees, PPZ, Zetpezet and Nowamyl. Solan, and Stolon are producers of flakes and granules.

**Table 2:** Output volumes of various processed potato categories (“000 mtons)

	<b>CY 2011</b>	<b>CY 2012</b>	<b>CY 2013</b>	<b>CY 2014</b>	<b>CY 2015*</b>
Frozen potato products (fries)	173.5	209.0	204.5	220.5	225.0
Chips	66.5	77.5	77.3	86.2	88.0
Dry potato	14.6	23.7	24.1	25.2	25.0
Potato starch	110.5	127.8	112.3	140.6	125.0

Table 3 presents the flows and various destinations of potatoes. All the processing categories together increased from 1,5 million tons in season 2009/10 to a level of 2 million tons in 2015/16. Currently Poland is processing more potatoes than it consumes in the table market (1,9 million tons).

## POTATO SECTOR IN POLAND

Table 1. Potato balance sheet (000 tonnes).

Specification	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16 forecast
Crops	9703	8449	9362	9041	7290	7689	6684
Imports	238	258	138	94	206	132	280
Total supplies	9941	8707	9500	9135	7496	7821	6964
On-farm use	5024	4162	4699	4101	2921	3088	2499
-seeds	1002	1016	933	875	695	770	750
-feed	2632	1816	2436	1896	1026	1138	629
-self-provision	1390	1330	1330	1330	1200	1180	1120
Market sales	4017	3836	3981	4284	3975	4133	3925
- ware potatoes	2410	2306	2345	2280	2100	2050	1900
- processing potatoes*	1576	1438	1611	1935	1834	2061	2000
- exports	31	92	25	69	41	22	25
Wastes and losses	900	709	820	750	600	600	540

\*potatoes processed in the industry irrespectively of the purpose.

SOURCE: Central Statistical Office, forecast of Institute of Agricultural and Food Economics and Institute of Plant Breeding and Acclimatization. Table is given in the magazine 'Potato market — present state and perspectives (In Polish: Rynek ziemniaka — stan i perspektywy)' nr 42 (November 2015) published by Institute of Agricultural and Food Economics.

**Table 3:** Production and destination of the Polish potato production.

Table 4 shows that the major share of processed production is exported. Most of the Polish production is exported to neighboring countries. Processed potato products are not touched by the Russian import ban and export continues at a similar level. At around 11.000 mtons Ukraine is one of the major importers.

**Table 4:** Export of destinations of frozen potato products from Poland (mtons).

	2011/12	2012/13	2013/14	2014/15
<b>Total Exports</b>	<b>140,652</b>	<b>163,482</b>	<b>179,157</b>	<b>159,653</b>
Russia	52,777	58,577	72,190	63,980
Czech Republic	9,446	11,433	14,516	12,701
<b>Ukraine</b>	<b>11,576</b>	<b>11,330</b>	<b>11,920</b>	<b>9,875</b>
Hungary	7,794	10,675	10,680	9,491
Slovakia	5,651	6,329	7,907	7,816
Romania	5,793	6,320	6,060	7,368
Bulgaria	4,233	4,439	5,532	5,097
Latvia	3,749	4,319	4,421	4,347
Kazakhstan	1,997	2,528	3,654	4,182
Belgium	1,056	1,775	1,285	3,939
Others	36,580	45,757	40,992	30,857

### Ware export

As EU member Poland can export ware potatoes to all EU countries. However, as a consequence of serious problems with Ring rot and Brown Rot in Poland, the export to EU-countries is subject to special phytosanitary control measures. During season 16/17 Western Europe had a low production, while harvest in Poland was good. Several West European

processors imported Polish processing potatoes to fill the gap. This import was strictly monitored by phytosanitary authorities, resulting in an interception by UK.

#### *Government Policy*

The government is subsidizing the use of certified seed potatoes with the purpose to motivate farmers to improve product quality. For the year 2015 the payment amount was PLN 400.0 per Ha (U.S. \$100).

Similar to other EU countries, Poland is no longer subsidizing the Starch Potato growers.

## **4.2 Other countries in Central en Eastern Europe, including Turkey**

Apart from Poland, there are not many large scale processing facilities in Central and Eastern Europe.

### **Austria**

Austria is the most important, having two factories:

*Frisch & frost* - Owned by LWM, producing around 100.000 tons, of which a quarter is exported to neighboring countries.

*11er* - Family owned, with smaller turnover.

### **Turkey**

Quite recently Turkey has become a significant exporter of French fries with 32,000 tons. Half of the export goes to Brazil and Iraq. Some of the companies are:

*Doga Seed* – A company active in various sectors of the potato industry, including seed potatoes and equipment. Processing capacity is around 22,000 tons finished product annually.

Konya Seker – Turkey's largest sugar manufacturer, that started potato processing in the late 2000's. They can process 5 tons per hour.

## **4.3 North West Europe**

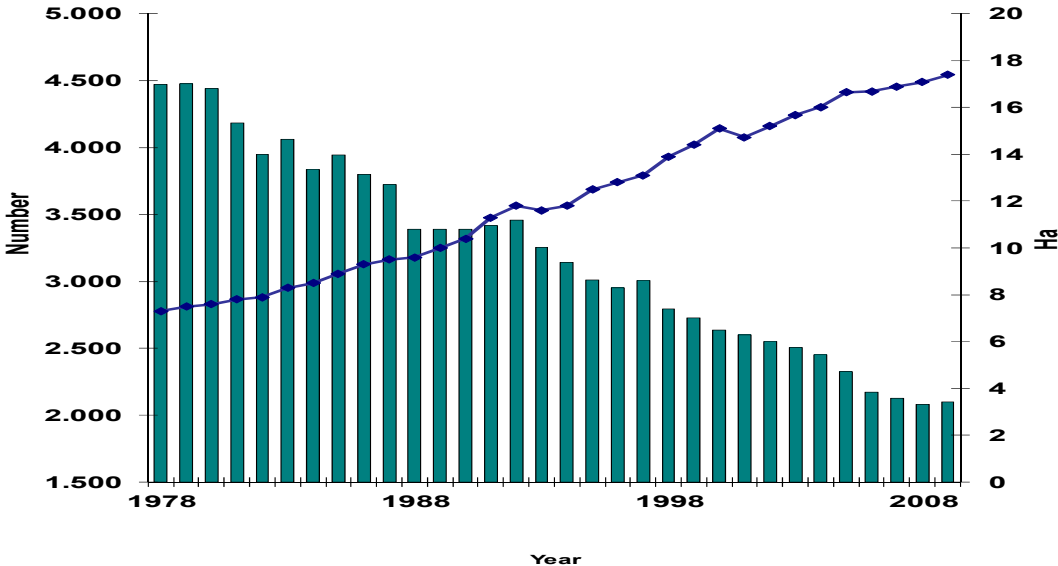
As seen in chapter 3, the international trade is dominated by Belgium and The Netherlands. Why are these two countries standing out in export of processed potatoes? The answer is simple: They have the lowest cost of production, combined with excellent logistics. Cost price is strongly determined by yield. Both countries consistently achieve yields of net marketable product at around 50 – 60 tons per hectare. In spite of the extremely high cost of land, such yield levels allow for contract prices between € 12– 13 cents

### **The Netherlands**

Dutch arable farms are relatively small, typically around 100 hectare. Potato is considered as the main crop and is grown as frequently as possible. However, rotation is strictly regulated by the government and generally allows to grow potatoes each 3 or 4 years, depending on resistance level against nematodes. Use of certified seed is mandatory by government regulation.

Dutch growers are usually the third or fourth generation of professional potato growers and therefore can build on several decades of experience. As farms are managed by one family, the grower performs all tasks himself. He is entrepreneur, tractor driver, manager, crop specialist and hand labor in one. Therefore, no detail escapes from his attention and all aspects are well taken care of. The education level of growers is increasing and many growers have a Bachelor degree. In addition most growers get support from specialists of the processor or from independent, private advisors.

Despite the good soils and the generally high level of expertise, there is still a considerable variation in yield and production cost between farmers. Main determinant for production cost per hectare is the amount of crop protection chemicals used. Because of the relatively low (contract) prices, the less competent growers will not manage to make a profit and will discontinue their activities. Cultivation of processing potatoes is a challenging business, where the better growers can show their skills and make a reasonable profit. They gradually expand their acreage. Graph 6 shows this development over the period 1976 – 2008. The trend of a declining number of growers and gradually increase in acreage still continues.



**Graph 6:** Development of number of Dutch potato growers and their acreage (hectares)

Knowledge about crop protection and monitoring of pests and diseases plays a crucial role in obtaining high yields and at the same time reducing cost per hectare. In the past pests used to be controlled by spraying according to a fixed schedule. Nowadays farmers monitor diseases in the field regularly. In combination with a nationwide monitoring and warning system against late blight growers can make a well informed decision on what and when to spray. This results in an effective disease control, while saving money for unnecessary treatments.

Soil analysis is standard practice. It saves fertilizer cost and a well fertilized crop produces a higher yield of better quality.

Over the past decades a major improvement took place in the storage practices. A combination of better equipment and increased knowledge of growers have reduced storage losses dramatically and led to improvement of processing quality.

Around 75 – 85 % of all production is organized through direct contracts between processor and grower. This system ensures that the required varieties are grown and made available at the right time.

All together this leads to excellent net marketable yields, and year-round availability at a very competitive cost price.

The important seed potato sector covers 40.000 ha of the best areas. Starch potatoes are grown on 45.000 hectares of sandy soils that are less suitable for high quality processing potatoes. Currently 85% of the 70.000 hectares of ware potatoes are used for processing. The Netherlands has no available land to grow more potatoes.

### **Belgium and France**

Most of the aspects mentioned about potato growing in The Netherlands are also valid for Belgium and France. Major difference is that to the contrary of The Netherlands, both countries can expand growing of processing potatoes further as sufficient land is still available.

The processing industry in *Belgium* is of recent date. It developed during the last twenty years, building on its already existing industry of frozen vegetables. The Belgium processing sector has its own characteristics and differs clearly from The Netherlands and North America. The five large international processors do not have the same dominant position as elsewhere. The sector consists of medium sized, local processors. They mainly focus on the traditional, standard segment of the international frozen fries trade. Looking at their spectacular growth in export volume, they are doing so in a very successful way.

*Northern France*, with its larger arable crop farms, is a suitable place to produce processing potatoes. Large volumes of potatoes are exported to Belgium factories. McCain has 3 factories in France, to serve the local QSR market (McDonalds).

Despite efforts from the French government, other international processors are reluctant to establish processing plants in France. Main reason for their hesitation are the very strict labor laws in France. This shows the importance of a good government policy for attracting international processors. As a consequence, France is currently a net importer of frozen fries.

### **4.3 North America**

The processing sector is dominated by large growers, with acreages of 400 hectares (1000 acres) and more. In Washington State, yields are very high, thanks to a long growing season (Early March till September) combined with irrigation. The largest potato acreage is in Idaho, where the growing season is slightly shorter. All processing potatoes are grown on a contract basis.

Distance to the seaport (Seattle) is around 1000 kilometers. This road transport leads to a higher logistical cost price, compared to NL and Belgium. As the main growing area is in the North West, the USA is strong in markets around Pacific. Information on the markets of North American frozen fries have been presented earlier in chapter 2.1.



## 5. ANALYSIS OF COMPARATIVE POSITION UKRAINE

Based on all information in previous chapters, the question is how Ukraine is placed compared to other players and how it can develop a potato processing sector.

### 5.1 French Fries

#### *International Investors*

The quickest path of development would be to find an international processor willing to start up production in Ukraine. This would bring in investments, expertise and export opportunities, even in the highest QSR segment.

The World Market for processed potatoes will grow further and new processing plants are going to be built in coming years. What are the deciding factors when a large international processor selects a new location/country? Basically there are two major considerations:

- A. Supply the domestic (and the neighboring) Market, or
  - B. Lowest Cost of production
- A) The *Market focus*, has resulted in new factories in China, India, South Africa and Poland. Because of imposed import duties, in several countries, the price of the end product (fries) can be higher than in the world market. In absence of local expertise, the international company is often obliged to invest, both with money and technical knowhow, in the local potato production. They are only willing to make such investments, if the market volume and price levels are attractive. This is the case in for instance China.
- B) The *Cost of production* focus, leads to new production plants in North West Europe and North America. Currently the newly built production capacity in the USA, Netherlands and Belgium is mainly targeting the overseas World Market.

#### *Comparative Position Ukraine*

The two factories in Poland fit in category A, as they were set up to supply Russia, Poland and surrounding countries. However, Poland is member of the EU and competes in open market. Polish growers compete at price levels similar to NW Europe. As Ukraine does not have a sizeable domestic market, and cannot access the Russian market, it does not qualify for this category.

For category B, producing for the overseas World Market, low cost of production is required. In fact Ukraine needs to compete with locations in NW Europe and North America, where growers are capable of achieving high and reliable yields with relatively little guidance from the processors. In addition the location is near to their existing network, and the environment is politically stable. Processors would only be interested to come to Ukraine if they are convinced that the conditions are competitive. At present this is not the case. Therefore, an international processor investing in Ukraine is not a likely scenario in the short term.

However, it is interesting to see that the International processing companies achieve a part of their growth by taking over smaller local processors. For midterm future, say 10 years, such a takeover by an international processor could be a possible scenario for Ukraine.



### *Domestic French fries processing*

As (long as) an international processor will not invest in Ukraine, the remaining strategy is to develop “homegrown” processing. A recent and not too distant example of a country setting up domestic potato processing is Turkey. In a further past Belgium developed processing on its own. In those cases the lead was taken by companies already active in processing of agricultural products.

### *Choice of location: A long term decision*

When international Processors choose the location of a new factory within a country they perform a thorough study before short listing potential sites. The suitable locations should meet at least the following criteria:

- Adequate expertise level of growers
- Possibility to irrigation with replenishable water
- Agricultural infrastructure: Size of farms and plots, availability of inputs.
- Logistics: Distance and quality of connection to markets / ports

When setting up domestic processing, obviously the geographic basis of potential investors plays a role. However, this should not become the only deciding factor. The above mentioned, objective criteria also deserve attention.

### *Scale of operation*

When starting a processing plant, the scale of operation is a crucial point of attention.

On the one side, “*the learning curve*” demands to start with a modest capacity and increase gradually, based on lessons learned and improvements made. Also the available funds for investment are often limiting the size.

On the other side, “*economies of scale*” are important in potato processing. Sufficient scale of operation is required to achieve a competitive cost price.

SMALL = EXPENSIVE!

### *Comparative cost price*

Compared to North West Europe, Ukraine has lower cost for land lease (€100 versus €800 per hectare) and labor. Potato cultivation is an expensive crop, with an average direct cost at around € 4,000 per hectare in Ukraine. This includes cost for seed potatoes, fertilizer, crop protection, equipment and storage facilities. Irrigation cost is not included.

In The Netherlands (and Belgium and Northern France) direct cost per hectare is around €4,500. At stable yields of (over) 55 tons per hectare, this results in a direct cost price of around € 0,09 per kg (excluding land lease and farmer profit). Processors typically offer contract prices between 11 and 13 cents per kg, depending on quality and delivery period (storage time).

Ukraine will have to compete with such cost price levels. As yield is the determining factor for the ultimate cost per kg., achieving higher and stable marketable yields is the top challenge for Ukrainian growers.

## **5.2 Flakes and granules**

Flakes and granules have a growing market, both world wide and domestic.

Production of flakes is not a complicated process and investment cost is mainly determined by the drum dryer. In the operation, energy cost is important. Unfortunately Ukraine does not have the advantage of cheap energy.

Potatoes with high dry matter of specific varieties (starch, crisp) are beneficial and produce higher quality flakes. Other potatoes, including rejected lots can be used to a certain degree.

## **5.3 Starch**

The world market for starch and other components, such as protein, is growing. The Ukrainian company Vimal is planning to expand and modernize its existing starch production. It will be challenge to compete with the large scale and highly technological starch industry of the major potato starch producing countries.

Many suitable varieties for starch have been developed and need to become available in Ukraine. Opportunities to use potatoes of dual purpose varieties (starch/ flakes/crisps) should be investigated.

## **5.4 Government policy**

### *General business environment*

As processing requires a long term investment, investors demand a stable, transparent and corruption free business environment. The abortion of the earlier investment plans by McCain, some 15 years ago, had much to do with the lack of such conditions. This proves the importance of a conducive business policy.

### *Avoid import duties for fry import*

For emerging industries it is tempting to ask for protection against foreign competition, by imposing duties on imported product. In the short term, this has a positive impact on profitability. Unfortunately, it makes the industry “lazy” and less competitive on the longer term. If Ukraine has the objective to develop an export oriented industry, there is no place for import duties.

### *Investment support*

Potato processing can contribute to a better balance of payments by earnings of foreign exchange. At first existing imports of fries and flakes can be substituted. In a later stage export can develop. Therefore the development of processing should deserve support from government. Many countries provide incentives to companies, by subsidizing (foreign) investment in the emerging processing industry.

### *Variety registration*

Processing requires varieties different from the usual table market. Unfortunately Ukraine has a very lengthy registration process, which makes it cumbersome and costly to obtain admission for new varieties. EU countries allow all the more than three hundred varieties that are registered on the EU variety list, to be grown in each country. This gives European farmers an important advantage compared to growers in Ukraine.

## 6 CONCLUSIONS AND RECOMMENDATIONS

### ***Future Scenario French Fries***

The ultimate goal for Ukraine is to obtain a share of the international market of frozen french fries. This market is large and expected to grow further. Prerequisite is that Ukraine can establish a competitive industry of sufficient scale. This has a chance of succeeding, but requires several conditions to be fulfilled. For this a time frame of 10 years and possibly more seems to be realistic. The best way to achieve this goal, is to follow a step wise approach.

#### ***Phase ONE – Focus on the domestic market.***

In the domestic market, transport offers a comparative advantage to foreign suppliers. The domestic market is not very large (30 - 50,000 tons) with a limited growth rate. Phase one is the learning period, in which the sector can develop in terms of improving quality, reducing cost price and expanding production volume.

Apart from establishing and fine tuning the processing capacity, it is crucial to ensure the supply of quality potatoes.

A much larger number of suitable varieties must become available and a system of contract growers needs to be organized. Growers not only need to make investments in equipment for irrigation and storage, but also in knowledge to increase yield and quality.

After the industry gradually increases its competitiveness, other markets come within reach.

#### ***Phase TWO - Expansion to surrounding countries in Eastern Europe.***

These markets are mainly supplied by smaller local producers and import from Poland.

Transport requires only trucking cost, which will be similar to the Polish competition. During this phase the industry will further increase in volume and can reduce its cost price.

#### ***Phase THREE – Explore World Market***

When the industry has developed much further it reaches a level to compete with suppliers from North West Europe. The large export markets in The Middle East and further destinations come within sight. Though large in size, these markets have competitive price levels. The shipping cost and exchange rates are important factors deciding which supplier wins the market.

The above depicted scenario has similarities with the development path followed by Belgium and Turkey. Those countries used their existing industry of frozen vegetables and sugar refining as a stepping stone to build up their French fry processing. It may be wise for Ukraine to investigate possible linkages with existing food processing activities.

#### ***Some specific conclusions and points of attention are:***

- *No international investors* - A quick path to develop French Fries processing through investment by an international processor is not realistic for the short term (5 years). Therefore the processing is to be started by domestic investors.
- *Scale of investment* – The scale of investment poses a dilemma. As economies of scale are important in potato processing, it is necessary to start with a sufficient volume. On the other hand, the new processor has to go through a learning curve. Based on experience

in other countries, a processing line with an output of 2,000 kgs fries per hour or less is not able to operate at a competitive cost price. In order to start with sufficient capacity it might, therefore, be considered to start with a second hand processing equipment.

- *Location* - Potato processing involves long term investments, both by the processor and the supplying growers. Starting at the right location is crucial for a successful operation, both on short and long term. Operating in relative proximity to other related potato processing activities can be beneficial. It enables exchange of potatoes, especially when dual purpose varieties are used. Selection of the location should be made very carefully and must be based on objective facts.
- *Location* - On the mid/long term a well performing processing facility in a properly chosen area, may attract the interest of an international company for cooperation or a takeover. This could bring in the desired influx of investment capital and expertise.
- *Location* - It is advised to perform a study to determine suitable locations that will best qualify for development of French fries processing in Ukraine.
- *Logistics* – For the longer term road transport and shipping costs to various destinations need to be studied.

### ***Flakes and granules***

The prospects for processing of flakes have many similarities to those of French fry. Though it is advised to grow varieties with high dry matter and specific properties for production of quality flakes at reasonable processing (energy) cost. Flakes production also offers the option to give value to lower quality potatoes, preferably with high dry matter.

Energy cost is a serious point of attention, as Ukraine does not seem to have an advantage

More information on specific investment and operation cost is required, before a concrete advice can be formulated.

### ***Starch***

The planned expansion in production capacity (VIMAL) is an encouraging initiative. This deserves to be supported by modernizing the cultivation practice, in particular the use of specific starch varieties.

Introduction of specific starch varieties should be started and facilitated in order to make the starch manufacturing more competitive and efficient!

Collaboration with other processing activities is also beneficial, as potato lots not suitable for fries or flakes, but with high dry matter, can be put to value in starch processing.

### ***By products and waste recovery***

Technologies to recover ingredients from waste water are available on the market. However, it does require a specialized and independent expert to advise which technology is most suitable given the specific conditions and scale of operation in Ukraine.

### ***Government policy***

Chapter 5 indicates several issues where government policy does have an impact on the development of the sector.

In order to increase productivity and competitiveness of potato growing, long term investments in land and farms, such as long term fertility and irrigation equipment are absolutely essential. The current land tenure policy, with its scattered land ownership, poses a serious handicap for the entire Ukrainian agriculture, including potato growing. Review of this policy should be priority.

For potato processing the slow procedure for variety registration creates a major disadvantage for Ukrainian growers, when compared to their European colleagues. Changing policies in the right direction usually takes time. It is important to take up the discussion with authorities as soon as possible.

## **Attachment 1: TOR MAT17UA01, Support of the Ukrainian potato sector with the implementation of European Food Safety and Phytosanitary requirements**

### **Project description**

The general purpose of this project is to develop a roadmap on export strategy in processed potato products for the potato sector, including policy recommendations for the ministry of agriculture.

#### **Problem analysis**

Ukraine is one of the leading potato producing countries in the world (estimated: 21,7 mln tones in 2016) and very suitable for potato production. However the majority of potato is still produced by the non-professional growers. In order to change this situation the sector organization together with government and international institutions focus on the support of the professional growers in order to increase the quality and safety of potato and also in order to improve the general phytosanitary and quarantine situation of the sector which can help to meet the EU standards and open other markets as an export destination for Ukrainian potato.

The professional potato market in Ukraine works closely with the Dutch suppliers. About half of all imported seed potato to Ukraine is of the Dutch origin, the Dutch also supply post-harvesting, storing and processing equipment to Ukraine which is used for added value production of potato products.

The current PSD project on potatoes, which will end this spring, will result in:

- Potato signal book to identify diseases in order to increase the quality and quantity of potatoes by recognizing diseases and pest.
- Strengthening of cooperation in the potato sector through the potato association.
- Members will have been trained in crop protection and use of fertilizers in order to be prepared for requirements related to DCFTA.

With the outcomes of the current PSD project the sector will be able to reach the demands that are necessary to start exporting. The next step is to develop a roadmap for the export of (processed) potato products.

The export of Ukrainian ware potato is limited but can be improved with the better quality and safety of the ware potato produced in Ukraine. The local consumption of potato is represented mainly with ware potato. The export of deeply processed potato products can become a good alternative in the current market situation. Also, for example, Ukraine is still a net importer of starch, although the market demand is rising. It can ensure the hard-currency profit, facilitate the logistics and limit the influence of fluctuations of the domestic market. The openness of the new markets for the Ukrainian growers will result in the increase of the demand for the Dutch materials and potato processing equipment in Ukraine.

In order to develop the Ukrainian potato sector there should be an incentive for producers to invest in seeds and technology, leading to high quality, higher yields and lower production cost. The processing industry can be a key factor in the process of getting to a stable market to supply to for professional potato growers. The Dutch suppliers of potato varieties and potato processing equipment can offer a wide range of equipment for the processing and deep processing (for example starch, flakes) of potato.

In view of the absence or low capacity of trade / export promotion organization in Ukraine the marketing of the products is responsibility of the growers / producers and unfortunately not all of them can explore export opportunities and develop the export strategy for their products on their own. With the roadmap the incentive for further cooperation will be given.

**Result**

The result will be that there is a roadmap for the sector and policy recommendations for the government with which the potato sector in Ukraine has a long term development strategy in order to develop the processed potato sector and increase export. The roadmap should at least include:

- Analysis of the Ukraine's competitive position in comparison with surrounding countries on potato production/sourcing, including the aspect of transport/ logistics in regard to export markets;
- Outline of both domestic and export opportunities existing in potato processing products (starch, flakes, etc.) and describe the needs of raw materials per processed product.
- Advice on the most promising products based on the production capacity of Ukraine and the existing market demand.
- Estimate the competitive position of the neighboring countries like Moldova, Russia, Poland etc. including their production, processing cost and yield.
- Describe potential markets for Ukrainian processed potato products into surrounding countries in section products, including the size of those markets.
- Requirements that Ukrainian producers need to meet in order to be competitive (yields, storage capacity, cost etc).
- Experience of developing potato business (including processing for chips, french fries and potato flakes) in neighboring countries: Poland, Hungary, Slovakia, Czech Republic etc
- Selection of opportunities and proposed strategy for the sector and policy recommendations for the government;
- Translation into Ukrainian.

The roadmap will be presented by the contractor during a seminar with participation of the Dutch suppliers (potential beneficiaries), representative of the potato producers of Ukraine and the ministry of agriculture. The Dutch embassy will be responsible for the logistics. The contractor will give the presentation.

**Conditions**

The project should be executed in close cooperation with the Ukrainian Association of Potato Producers and the office of the Agricultural Counsellor at the Embassy of the Kingdom of the Netherlands in Ukraine.