CAULIFLOWER PILOT CASE

Bouquet Fayiah
Bracho Miguel
Kyalo Dennis
Pacheco Juan
Veglife Seed Company

Veglife seed company
Opolske, Poland
Tel: 036878373283
www.veglife.com
veg-life60@gmail.com
Company profile

- Company name Veg-life Seed Company
- Vegetable Seed Company deals with Brassicas, Solanaceae and Fabaceae
- Founded in 2006
- A limited Liability company with four founding shareholders and open to potential investors to purchase shares
- Headquarter breeding and seed production farm location in Opolske, Poland
Mission
- To breed, produce and supply the European market with vegetable varieties tailored to all their needs

Vision
- To be a vegetable seed production leader in Europe with potential to expand to North America

Deals with:
- Vegetable breeding and Seed production
Company assets

- 5 hectares of land
- 20 permanent employees
- Casuals hired depending on work and season
- 5 greenhouses
- Priva jutri jet feeding system with drip irrigation
- Farm machinery (tractors and planters)
- Seed processing factory
- Pure breeding lines of tomatoes, chillies, watermelons and peas
Why Poland?

- EU member and main producer and exporter
- UPOV & ISTA member
- Cheap variety inspection & registration
- Fragmentation hence diversified agriculture

POLAND
Seed production in Poland

• Seed cultivation area (including plants and vegetables) has increased by 48.4% since 2005 to 2014. (PIORiN) Agriculture and Food security in Poland, 2015)
• Farmers are already used to production of seeds as a business
• Contracting growers is easier.
# Company staff

<table>
<thead>
<tr>
<th>No</th>
<th>Role/responsibility</th>
<th>Required personnel</th>
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<tbody>
<tr>
<td>1</td>
<td>Breeders</td>
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<td>Accounts and records</td>
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Organization and structure

- General manager
  - Research and Development
    - Maintain Parental line
    - Development of new varieties base on market needs
  - Production department
    - Production of certified seeds
    - Factory seed processing
    - Packaging
    - Quality & Quantity Monitoring
  - Marketing and sales
    - Product promotion
    - Advertisement
    - Product distribution
  - Finance and administration
    - Maintenance of bank account
    - Human Resource
    - Administration 
    & Support to the
Management roles

Manager-external employee

- Bouquet Fayiah .M.-Head of Production department (Masters in Mechanical engineering and Plant physiology)

- Pacheco Juan-Head of Finance and Administration (Masters in Business Administration)

- Miguel Bracho-Head of Research and Development (Masters in Plant Breeding and Masters in Molecular Biology)

- Kyalo Dennis-Head of Marketing and Sales department (Masters in Entrepreneurship, Masters in Economics)
Means of Communication

Company website: www.veg-life.com
Company email: veglife60@gmail.com
Radio and television advertisement
Farmer extension and education
Cauliflower is one of several vegetables in the species *Brassica oleracea*, in the family *Brassicaceae*.

- It is an annual plant that reproduces by seed.

- Typically, only the head of aborted floral meristems is eaten.

- *Leaves:* Surrounding the curd are ribbed, coarse green leaves that protect it from sunlight, impeding the development of chlorophyll.

- *Flowers:* The flowers are attached to a central stalk.

- *Seeds:* Seeds are head shaped also called a “curd”.
**EARLY VARIETIES:** Romansesco, Roscoff, Angers, Fremont, White Rock, Ravella and Alverda. Planted between June – July and harvested in September – October

**LATE VARIETIES:** snow crown, Snow peak, Erfurt, and Nomad. Planted in October – November and curds are available in February - March

**Life cycle for seeds:** Two growing seasons (bi-annual)

**CLASSIFICATION**

Scientific name: *Brassica oleracea* var. botrytis L.
Common names: Cauliflower
Family name: Brassicaceae (Cruciferae)

**PRODUCTION AREAS IN EUROPE**

Major cauliflower and broccoli growers are in Poland, Italy, France, and Spain

**CULTIVARS OR VARIETIES**

Major cauliflower and broccoli growers are in Poland, Italy, France, and Spain

Scientific name: *Brassica oleracea* var. botrytis L.
Common names: Cauliflower
Family name: Brassicaceae (Cruciferae)
Nutrition-wise, cauliflower is classified as a ‘superfood’, with good reasons:

- **Veritable one-day multivitamin & mineral** (Vit.-C, E, K) (Min. Fe, Ca, K, Mn,...)
- **Antioxidants** (carotenoids and Manganese), dietary fiber, protein, low calories
- **Anti-inflammatory Compounds** (vitamin K) Gluten free, low fat and
CLIMATIC REQUIREMENTS

- Growing temperatures: Minimum 0 °C and maximum 30 °C, optimum between 15 and 22 °C.
- Germination temperatures: minimum 7 °C, maximum 27 °C and Optimum 29 °C

SOIL REQUIREMENTS

- Neutral or slightly acid soil (pH 6,0 to 6,5), Normal soil pH in the range of 6,5 to 7,0.
- Well-drained, sandy loam soils - early varieties, loamy and clay loam soils for late ones.

CULTIVATION PRACTICES

Suitable soils: All types of soils  
Land preparation: Deep ploughing followed by planting  
Planting time: May-June in nursery, June-July in field

Method of planting: Flat beds, Spacing: Early variety – Plant-Plant 60cm x 45cm
Late variety – Plant-Plant 45x45cm  
Seed rate for early crop is 600 to 750 gm and for late crop 400 to 500 gm /Ha
CAULIFLOWER PESTS AND DISEASES

Verticillium Wilt
- Extensive leaf yellowing and senescing
- Typical vascular discoloration

Staphylinid Beetle
- The beetles feed on cauliflower curds, making them brown and unmarketable
- Adults fly into crops, resulting in rapid and difficult to detect infestation
Infection occurs through injuries, with fungal growth further encouraged by warm, wet weather. Symptoms may be observed in the field, they are commonly expressed after harvest.

Found in decaying tissue in lower leaves, the fungus develops into a soft, wet rot covered with white, cottony fungal growth. All parts of the plant may be affected.
Curds are small and uneven. Individual parts of the florets elongate and separate, making them appear somewhat like grains of rice.

Riciness is associated with high temperatures.

OTHER PESTS AND DISEASES OF CAULIFLOWER:

The pests such as Diamond Back Moth (DBM), Plutella xylostella, Tobacco caterpillar -Spodoptera litura, Leaf webber -Crocidolomia binotalis, stem borer Hellula undalis, Aphid, Brevicornea brassicae, Mustard aphid, Lipaphis erisimi and Painted bugs, Bagrada cruciferarum are the important pests of cauliflower in other parts of EUROPE.
Project Timeline

1. Market study
2. Germplasm recollection
3. Breeding program
4. Seed production
5. Commercialization
Market study

- Cauliflower is a traditional European crop present in Europe and also widespread in Asia.
- Cauliflower data can be found but is sometimes merged with brocolli data hence difficult to estimate the market accurately
Seed Market Focus

- Target seed markets are Italy, Spain, France and Poland (both for local consumption and export to EU).
- Spain, mostly Cauliflower grown is for export.
Italy

- Largest producer in Europe
- Accounts for 26% of total European production
- 5th largest Cauliflower producer worldwide
- Annual production of 405,053 tonnes per year
- Major producing regions: Sicily, Campania, Lazio, Apulia, Veneto and Marche.
- Mainly for domestic consumption.
Spain

• 2nd largest producer in Europe
• Accounts for 17% European production
• Production area has increased in Spain from 31,204 hectares in 2011 to 33,198 hectares in 2014 (FAOSTATS 2011 & 2014)
• Most of the Cauliflower grown in Spain is for export into the European Union. (they prefer to eat broccoli!) 😞
• Mainly grown in Andalusia, Murcia, La Rioja and the Valencian community.
France

France produces 326,355 tonnes grown in an area of 20,010 hectares. Production in Brittany (80% of production)

- Production mainly for the domestic market. Half of production is for export mainly in Europe.

<table>
<thead>
<tr>
<th>country</th>
<th>Amount in tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>57000</td>
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<tr>
<td>Netherlands</td>
<td>26000</td>
</tr>
<tr>
<td>UK</td>
<td>21000</td>
</tr>
<tr>
<td>Italy</td>
<td>8000</td>
</tr>
</tbody>
</table>
Poland

- 4th largest cauliflower producer in Europe
- 8th in production worldwide
- Accounts for 12% of total European production
- Cultivation on between 9-12 thousand hectares
- Cultivation regions (Lesser Poland, Mazovian, Lublin and Vovoideships)
- Production for both local market and export
European cauliflower production

Area cultivated in hectares

- Italy
- Spain
- France
- Poland

Year:
- 2011
- 2012
- 2013
- 2014
Produce Market focus

- Top cauliflower importers in Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity (tonnes)</th>
<th>Value (millions)</th>
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<tbody>
<tr>
<td>United Kingdom</td>
<td>183.47</td>
<td>217.2M</td>
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<td>Germany</td>
<td>66.621</td>
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<td>France</td>
<td>45.578</td>
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<tr>
<td>Netherlands</td>
<td>40.104</td>
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<tr>
<td>Russia</td>
<td>29.855</td>
<td>38.4M</td>
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<tr>
<td>Belgium</td>
<td>28.626</td>
<td>33M</td>
</tr>
</tbody>
</table>

- FAOstats data
European Feeding habits

High income earning

Small nuclear family

Quality

Quantity

Western Europe (Italy, Germany, Belgium, UK)

Vegetable / fruits consumption

Functional foods (healthy)

Carbohydrates

Proteins

Belgium
10 kg/person/yr

France
3 kg/person/yr
Demographics of the market

<table>
<thead>
<tr>
<th>Country</th>
<th>% annual growth</th>
<th>2010</th>
<th>2013 population</th>
<th>2014 population</th>
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<tbody>
<tr>
<td>Belgium</td>
<td>0.38</td>
<td>9.6 million</td>
<td>11.1 million</td>
<td>11.2 million</td>
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<tr>
<td>France</td>
<td>0.42</td>
<td>64.6 million</td>
<td>65.5 million</td>
<td>65.8 million</td>
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<tr>
<td>UK</td>
<td>0.70</td>
<td>62.9 million</td>
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<td>Italy</td>
<td>1.84</td>
<td>59.0 million</td>
<td>59.6 million</td>
<td>60.7 million</td>
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<td>Germany</td>
<td>0.30</td>
<td>80.2 million</td>
<td>80.5 million</td>
<td>80.7 million</td>
</tr>
</tbody>
</table>

Eurostats

- High living standards
- High life expectancy (F = 84, M = 79)
- Family segregation (smaller units)
- Smaller cauliflower (in many units)

High income
FAMILY SIZE CAULIFLOWER TAILOR-MADE FOR EUROPE?

Current varieties in the market

▪ Excess for the family (left overs)?
▪ Filling the trash bag?
▪ Tasteless!

Farmer??

Family size

✓ Just enough for each meal
✓ Better taste/aroma
✓ Always fresh from grocery!

Closer spacing/high density = high yield
## Competitor analysis

<table>
<thead>
<tr>
<th>Variety</th>
<th>Units of seed sales</th>
<th>Price (euros)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snow hybrid</td>
<td>1 gram/seeds (250)</td>
<td>1.82 euros</td>
</tr>
<tr>
<td>Romanesco</td>
<td>1 gram/seeds (200)</td>
<td>1.77 euros</td>
</tr>
<tr>
<td>Silicia viollette</td>
<td>1 Gram/seeds (200)</td>
<td>1.36 euros</td>
</tr>
</tbody>
</table>

Price range of curds: 1.4-2.6 Euros/kg
Competition strategy

- Product differentiation (specific target market)
- Outsourcing of expensive technology (low capital)
- Staff Motivation and efficiency
- Farmer extension and education
Goal and Objectives

• Goal
  ➢ Breed a cauliflower variety with smaller curds that have improved taste.

• Objectives
  ➢ To breed a cauliflower plant that produces a curd of a size between 12 to 17 cm in diameter.
  ➢ To breed a cauliflower plant that produces a curd which tastes is better than the average cauliflower curd currently in the market.
  ➢ To obtain the definite variety within the next 6 to 8 years.
  ➢ Commercialize the product in the European market
## Germplasm collection

<table>
<thead>
<tr>
<th>Plant identification</th>
<th>Variety name</th>
<th>Country of origin</th>
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<tbody>
<tr>
<td>PI 284594</td>
<td>Stor Dansk</td>
<td>Sweden</td>
</tr>
<tr>
<td>PI 208474</td>
<td>Ve de Slez</td>
<td>Netherlands</td>
</tr>
<tr>
<td>PI 662517</td>
<td>Dominant</td>
<td>Denmark</td>
</tr>
<tr>
<td>PI 385953</td>
<td>Patna Early</td>
<td>Kenya</td>
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<tr>
<td>PI 204764</td>
<td>D’alger</td>
<td>France</td>
</tr>
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<td>PI 462221</td>
<td>Romanesco</td>
<td>Italy</td>
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<tr>
<td>PI 343479</td>
<td>Cambridge dwarf</td>
<td>Russia</td>
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<tr>
<td>PI 209757</td>
<td>Dry weather</td>
<td>Netherlands</td>
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<tr>
<td>PI 244833</td>
<td>Orion</td>
<td>District of columbia</td>
</tr>
<tr>
<td>PI 204780</td>
<td>Merveille de toutes saison</td>
<td>France</td>
</tr>
</tbody>
</table>

Possible sources are:
- USDA Germplasm banks
- COMAV Valencia
- Growers landraces
Breeding methodology
Cauliflower Breeding

Considerations

Cross-pollination

Non-heterotic trait

Risk/reward

Biennial plant

Work simplification

Eventual hybrids: GCA testing
Cauliflower Breeding

Solution

Population breeding method

Synthetic Varieties
Years 1-3: 2017-2019

Polycross Field

Replication Field

R = N/3 or 4
**Years 1-3: 2017-2019**

- **Independent sowing:** one variety per row [Summer 2017]
- **Variety position within repetition must be randomized**
- **Repetition equal to N** (number of varieties at the beginning of the Project) divided by 3 or 4
- **Introduce pollinating insects**
- **Allow to cross-pollinate**
- **Reap seeds from each variety and from each repetition and mix equitatively. [2019]**
Years 1-3: 2017-2019

- Field at least 1.5 Km away from the polycross field
- Seed production to continue developing the project.
- Every variety must be replicated in isolation: net cabin
Various Locations Essay
Progeny of each Genotype crossed by the rest

1 32 N

- Evaluation
  - Curd size
  - Taste
- GCA testing
- Selection of highest GCA scoring varieties

- Equititative mix of every selected line’s seeds
- Seeds to be mixed come from the **REPLICATION FIELD**.
- Syn-0 population
Years 4-6: 2020-2022

Sow syn-0 \rightarrow \text{Reap Syn-1}

Years 6-8: 2022-2024

Sow syn-1 \rightarrow \text{Reap Syn-2}

Syn-2 seeds can be commercialized
<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
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</tbody>
</table>
Return on Investment

- Spacing new variety 30cm by 45cm
- Cultivation area of 10 hectares
- Plant population 7,407,405 plants
- Seed yield per plant = 30 seeds
- Total expected seed yield 222,222,220 seeds (622,222 grams = 622.2 kg) production 2024 & 2026
- 1000 seeds weigh 2.8 grammes
- Total packets processed = 6,536 packets containing 34000 seeds
- Price per packet = 450 euros
2017
Market study

2017
Collection of Germplasm; USDA & COMAV

2017
Screening of Germplasm

2017
Evaluation of Germplasm

2018
Independent sowing-polycross field

2018
Replication of selected genotypes

2019
Crossing of selected genotype for Syn 0

2019
Sowing 0 to get Syn 1

2020
Sowing of Synth 1 to get Syn 2

2020
Seed testing & Certification

2021
Marketing

2022
Seed treatment & Packaging

2023
Storage & Delivery
**SWOT ANALYSIS**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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</thead>
<tbody>
<tr>
<td>• Big room for improvement on taste</td>
<td>• Lack of sufficient funds</td>
</tr>
<tr>
<td>• Motivated, Innovative and skilled breeding</td>
<td>• Long lead time and payback</td>
</tr>
<tr>
<td>team</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Creation of a new market sector for the</td>
<td>• Weather uncertainty with regards to crop</td>
</tr>
<tr>
<td>small but high income earning family sector</td>
<td>requirements</td>
</tr>
<tr>
<td>• Possibility of future collaborations with</td>
<td>• Competitors—may launch similar or substitute</td>
</tr>
<tr>
<td>other institutions</td>
<td>varieties</td>
</tr>
<tr>
<td>• Room for further study on effect of curd</td>
<td>• Evolution of future eating habits and hence</td>
</tr>
<tr>
<td>size on post harvest browning of cauliflower</td>
<td>changes in the future market</td>
</tr>
<tr>
<td>curds</td>
<td></td>
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</tbody>
</table>
References


- http://www.cauliflowerrecipes.co.uk 2017
- **Ontario Ministry of Agriculture, Food and Rural Affairs, 2016**
- Eurostats database
- FAostats database
- Germplasm databases:
  - https://npgsweb.ars-grin.gov/gringlobal/search.aspx?
THANK YOU!