



LESSONS LEARNT ON CITRUS OILS

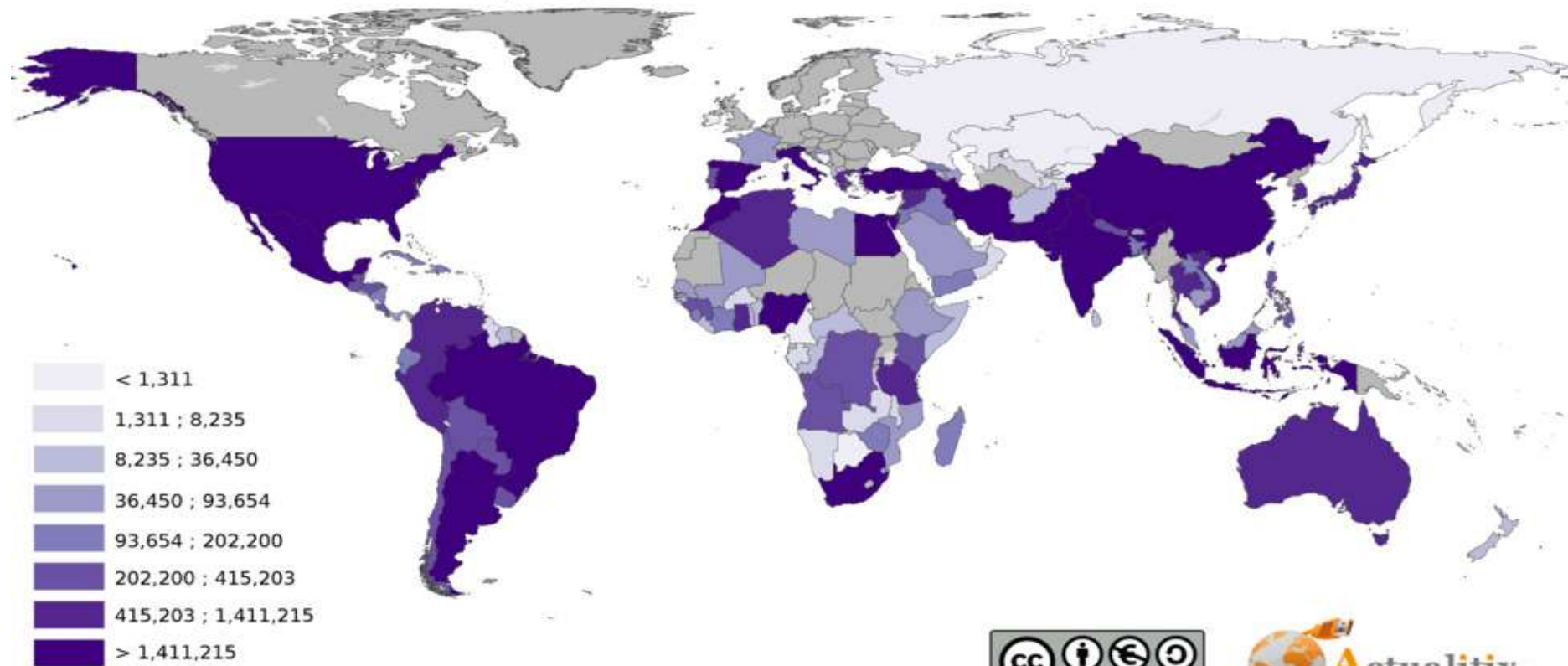
CLIVE TEUBES GROUP
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WORLD CITRUS PRODUCTION

Production of citrus fruits (tons)



Source : FAO - 2013
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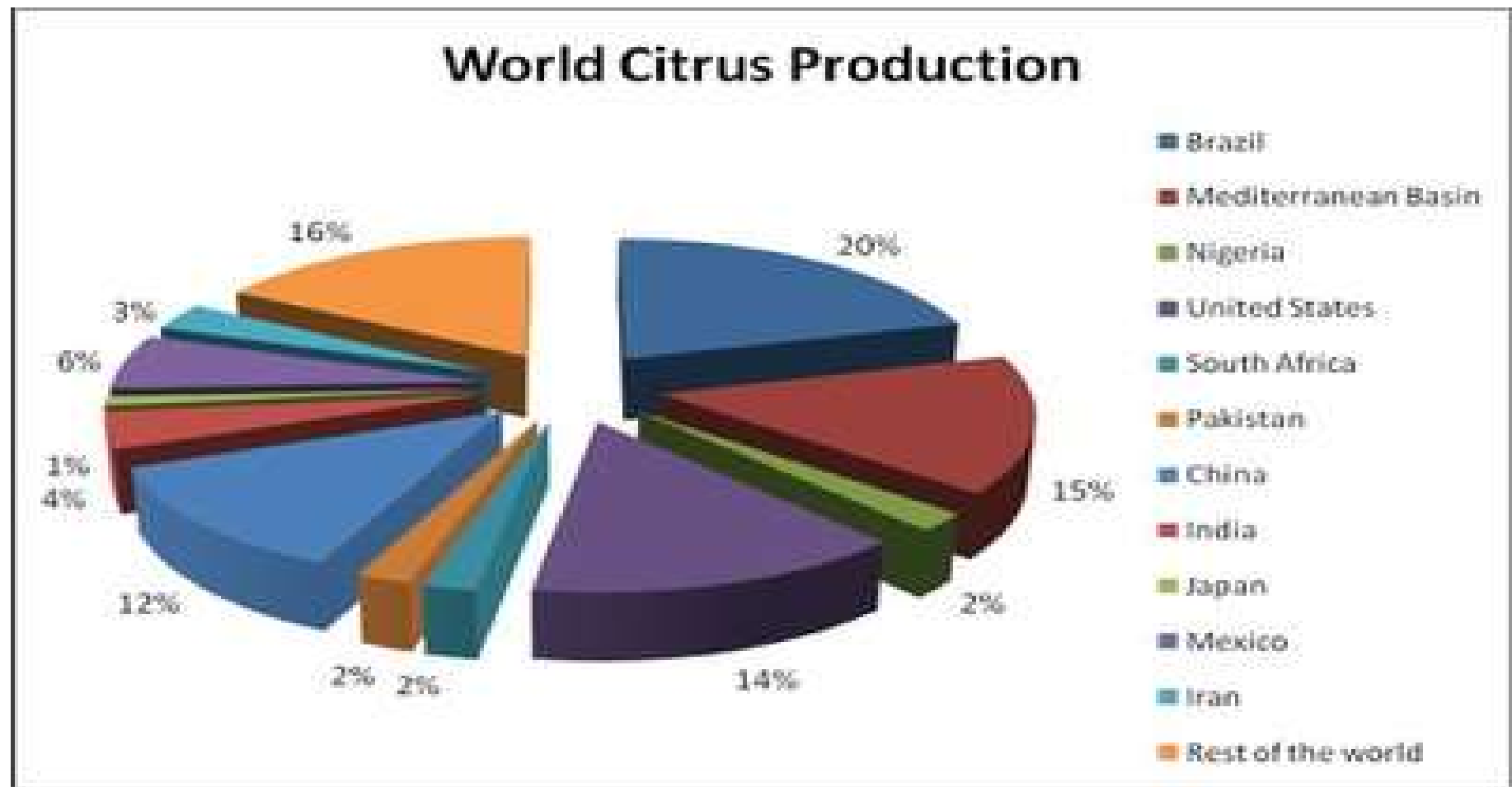
WORLD CITRUS PRODUCTION

- Citrus is the most important tree fruit crop in the world, and citrus fruits are regarded as major household items in more than 100 countries around the world as well as the world juice industry which is also led by citrus juices. Citrus industry is regarded as a leading industry in some regions.
- *Citrus* species are the most produced fruit crops and one of the most imported fruit groups subjected in both domestic and export markets. Citrus fruits can be produced in the tropical, semi-tropical, and subtropical climates with a good market value.

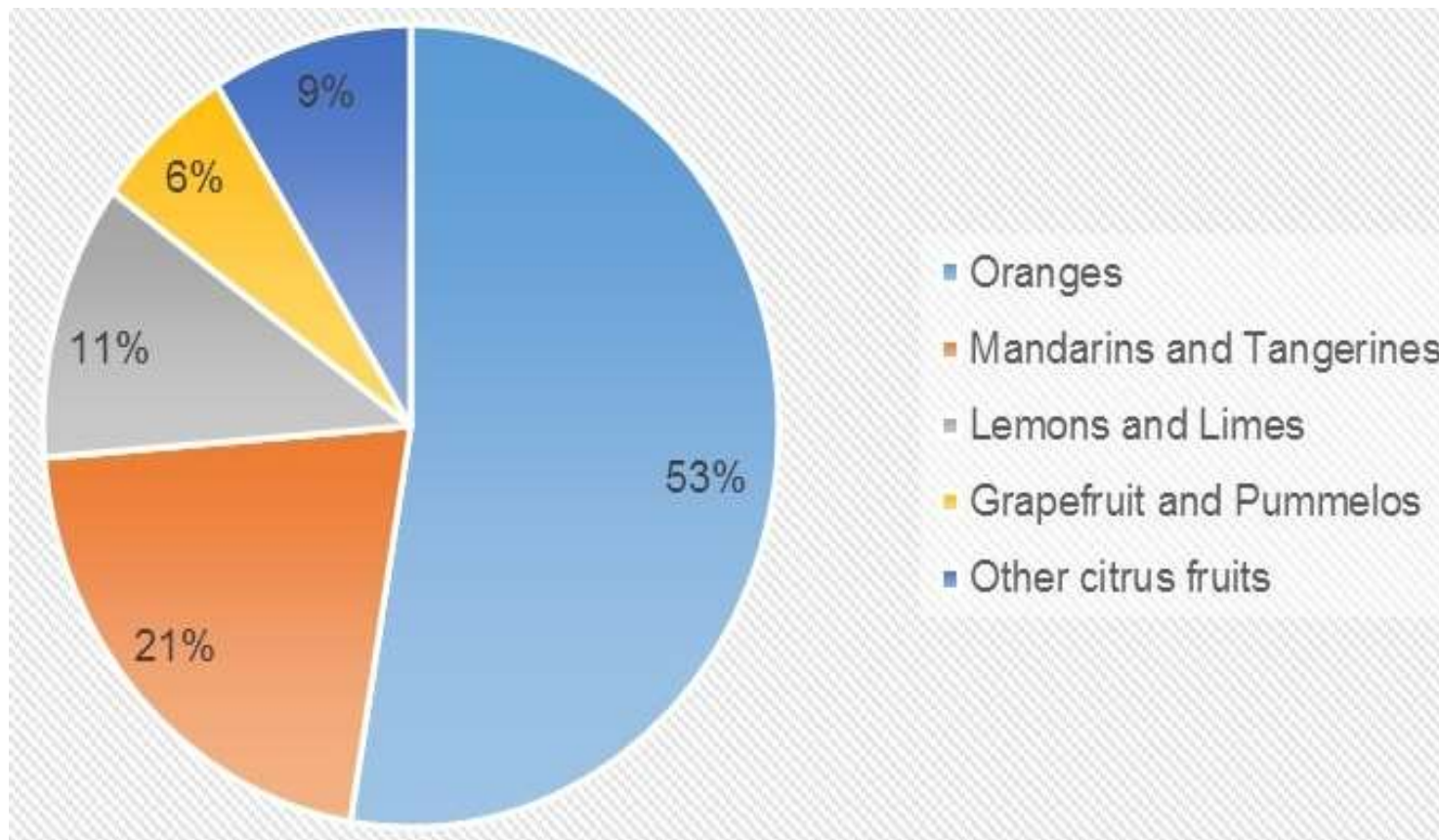
WORLD CITRUS PRODUCTION

- The largest growing areas are located in the northern hemisphere, where 68% of world production occurs, and include the important Mediterranean region with 20%, e.g., Spain, Egypt, Italy and the USA, China, and Mexico, whereas the southern hemisphere (32%) includes the largest producer in the world – Brazil, together with Argentina and South Africa.

WORLD CITRUS PRODUCTION



WORLD CITRUS PRODUCTION

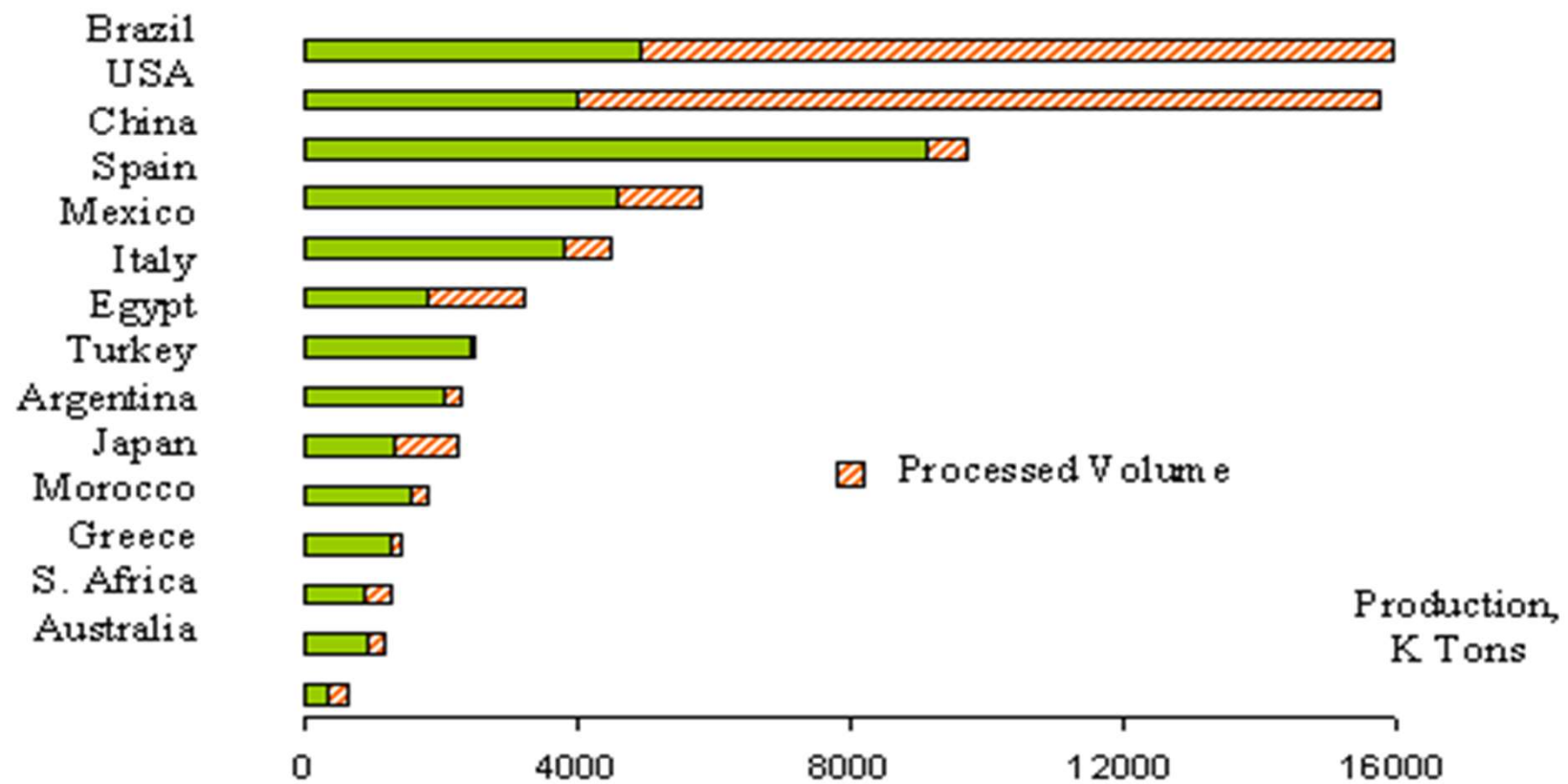


WORLD CITRUS PRODUCTION

- Citrus fruit is broken into three aspects, sold as fresh fruit; processed for concentrated juice and oil.
- The main target for citrus farmers is to sell the fruit into the fresh fruit market, any fruit that does not meet specification are sent for juice processing, the oil is a by product of the process for concentrated juice.
- The recovery of citrus by-products is an important economical aspect in citrus processing operations and it is particularly appropriate when a large volume of fruit is processed. The most common by-products derived from citrus are peel oil, aroma and essence oil, frozen pulp cells and cattle feed pellets.

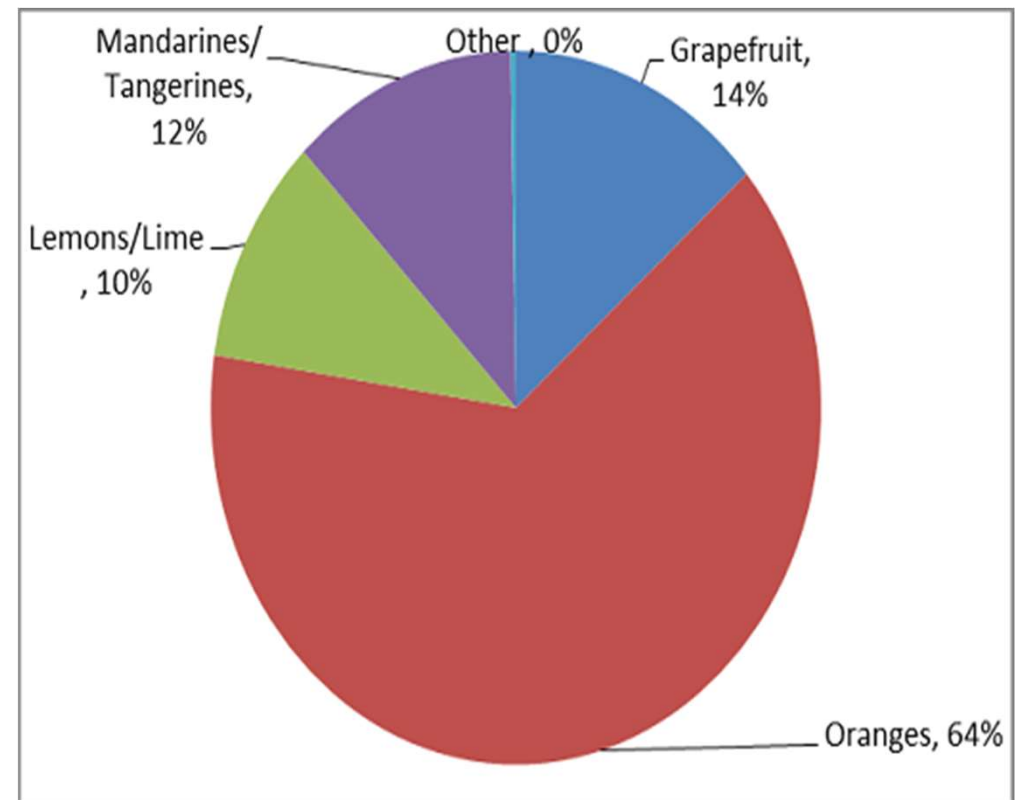


WORLD CITRUS PRODUCTION

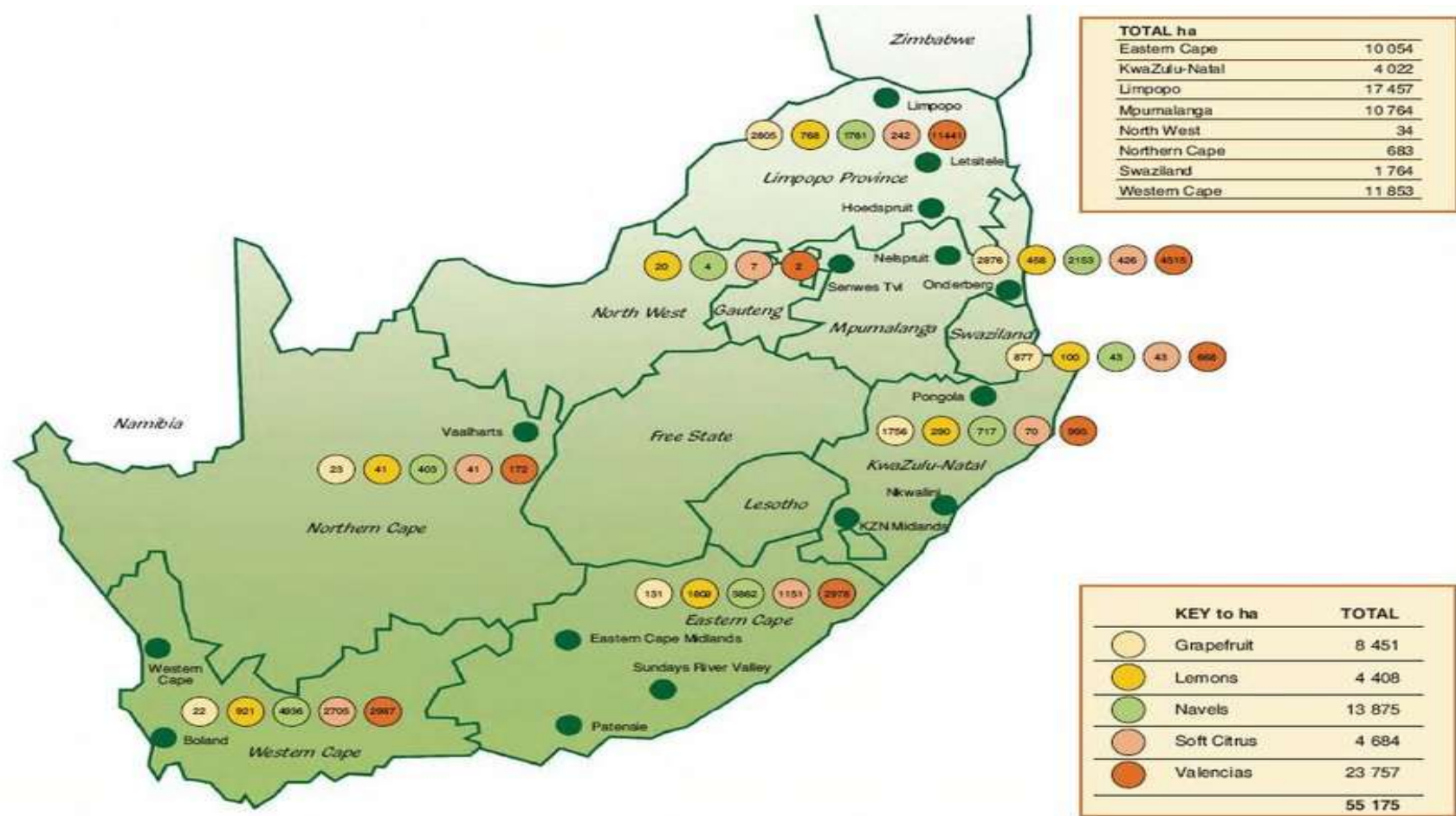


SOUTH AFRICAN CITRUS PRODUCTION

- South Africa is one of the largest citrus producing countries in the world and majority of the fruit is Orange, followed by Grapefruits and Lemons and then Tangerines.



SOUTH AFRICAN CITRUS PRODUCTION



SOUTH AFRICAN CITRUS PRODUCTION

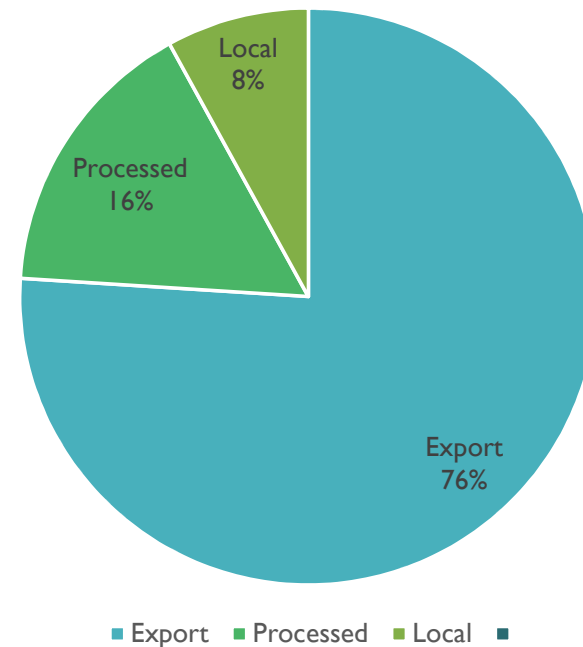
- Citrus in South Africa is grown across the country mainly in the Limpopo, Eastern Cape, Western Cape, Mpumalanga, Kwa Zulu Natal, Northern Cape and North West provinces.
- The Limpopo province is the largest citrus production area accounting for 43 percent of the total area planted, followed by the Eastern Cape (27 percent), Western Cape (17 percent), Mpumalanga (8 percent), Kwa Zulu Natal (2 percent), Northern Cape (2 percent), and North West (less than 1 percent). The Western Cape and Eastern Cape have a cooler climate, which is suited for the production of the navel oranges, lemons, limes, and mandarins/tangerines (soft citrus). The Mpumalanga, Limpopo and KwaZulu-Natal provinces have a warmer climate which is better suited to the production of grapefruit and Valencia oranges.



SOUTH AFRICAN CITRUS PRODUCTION

- The South African citrus industry is heavily favoured towards the fresh fruit market and a lot of the fruit processed in South Africa is exported.
- About 76% of all citrus is exported, 16% is processed and 8% is sold into the local market.

Breakdown of fresh and processed



SOUTH AFRICAN CITRUS PRODUCTION

- In contrast to most essential oils that are extracted by steam distillation, Citrus oils are extracted as a by product of juice extraction by centrifugation, producing cold pressed oil.
- This oil is extracted, without heat, from citrus peel. Oil is expressed from the peel and captured in water. Usually either Brown or JBT (FMC) extractors are used to express the oil from the fruit, although other types of extractors can be used. The resulting oil and water emulsion is sent to a series of centrifuges to separate the oil and water.



SOUTH AFRICAN CITRUS PRODUCTION

- The yields of citrus fruit vary from fruit type:
- 1. Orange: 3 kg of oil per ton of fruit;
- 2. Lemon: 4 kg of oil per ton of fruit;
- 3. Grapefruit: 2 kg of oil per ton of fruit;
- 4. Soft Citrus: 1.4 kg of oil per ton of fruit.



CLIVE TEUBES AND CITRUS

- The Clive Teubes Group then purchases this crude oil and processes it into various aspects for the flavour and fragrance industry, both domestically and internationally.
- The value added by Clive teubes on the citrus oil is as follows:
- Fractionation into flavour components and d-limonene, using a complex distillation column. The phase separation process is described as folding oils.
- The Folded oil which is concentrated is used in the beverage and confectionary industries.
- The d limonene / Orange Terpenes is used as a natural cleaning agent or degreaser and can be used in emulsions.
- Natural isolates are also fractionated from the oil, these will be used in by Flavour houses to enhance flavour profiles



CLIVE TEUBES AND CITRUS

- Citrus oils are also made into various forms of flavours and fragrances depending on the application, these could be water soluble flavours for the soft drink industry or a lemon fragrance for the dishwashing industry.



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CLIVE TEUBES AND CITRUS

- Quality is key for both the flavour and fragrance industry, the Clive Teubes group currently run 4 Gas Chromatographs and one GCMS. These instruments are crucial for maintaining that quality standards needed for the industry.



CLIVE TEUBES AND CITRUS

- One of the challenges that we encounter is the fact that there could be cross contamination at the processing plants because they could be processing various fruits at the same time and there could be a small possibility of fruit being mixed. The GC will be able to pick this up because each citrus oil has a unique differential chemical component set up.
- The other challenge we face are pesticide residue in the citrus oil, due to the fact that the citrus industry in South Africa is driven by the fresh fruit market, most of the oil is treated with pesticides pre-harvest and then also post harvest at the pack houses once the fruit is sorted. This leads to a problem in the oil because the pesticides remain on and in the oil pores on the skin of the fruit.
- We have to out source this analysis but we have to test each batch in order to know the pesticide levels and what application we can place the oil, if the oil has low levels of pesticides this can be sold or processed for consumption or flavours but if it is too high then it will have to go for a fragrance application.
- There are also physical tests that are done to determine the quality, these will be Density; Refractive Index; Optical Rotation; smell and colour.
- All tests are done on each batch in order to be able to compete with the international market.

CLIVE TEUBES AND CITRUS

- Main Avenues that we move Citrus oils:
- Beverage Flavour applications – Wide range of beverages ranging from soft drinks to concentrated fruit juices to flavoured waters
- Confectionary Flavours – From hard boiled candies to chewable sweets and gums
- Medicinal – As a flavour in cough syrups and throat lozenges as well as in some anti oxidant recipes
- Cleaning and detergent Fragrances – From Dishwashing liquids to washing powder and floor cleaners
- Air Fresheners
- Natural Degreasers
- Cloudifier for emulsions



Beverage



Confectionary



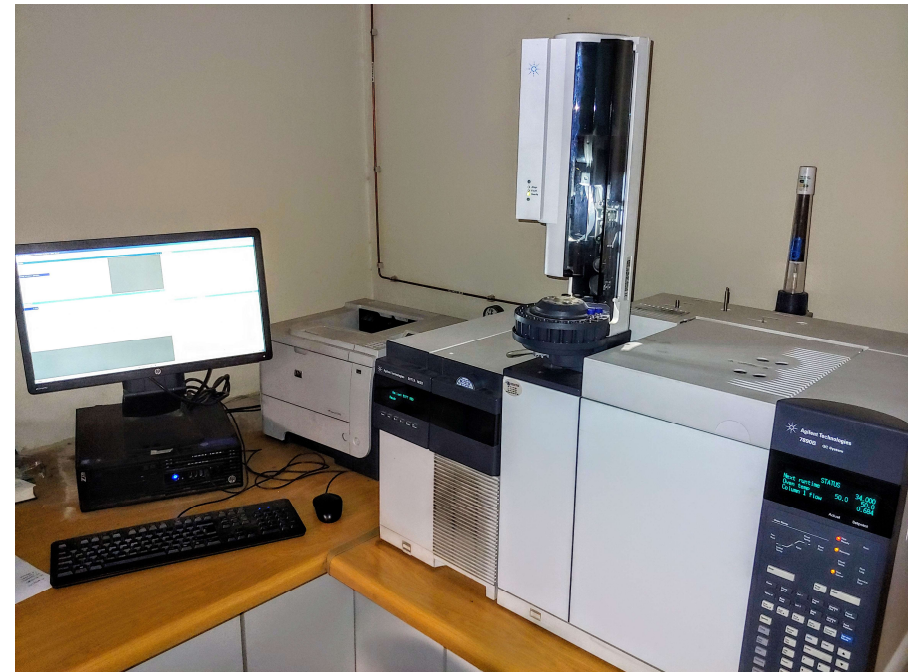
Cleaning



Air Fresheners

LESSONS LEARNT IN THE CITRUS INDUSTRY

- **Quality is Key**
- Due to the consumer becoming more stringent, quality has become more and more key.
- Every year new parameters are set which citrus oils have to comply but old specs have to meet as well.
- It is vital to know your markets requirements on quality.



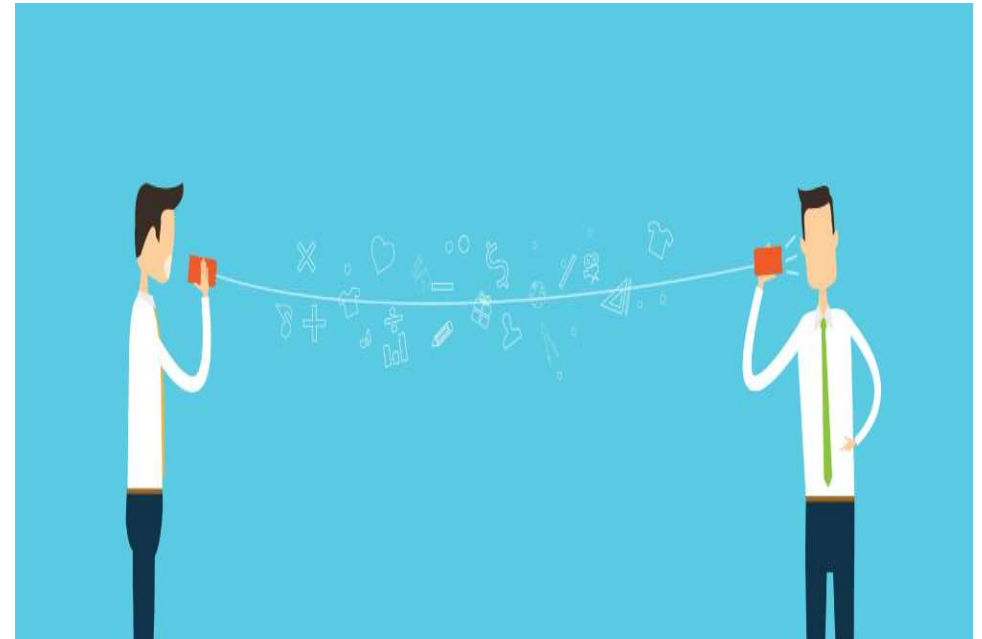
LESSONS LEARNT IN THE CITRUS INDUSTRY

- **Optimisation**
- When extracting oil from fruit or leaves it is always best to be able to optimise the amount the oil that can be recovered, obviously this leads to a better bottom line.
- The juice processors have all put in state of the art centrifuges and dewatering machinery because they realise that, even though the oil is a by product it can still have significant impact on their profits.
- It will be the same with other essential oils and it is vital that the steam distillation is running to the best of its ability and that you are not wasting time and effort in distilling parts of the plant that have no oil to extract.



LESSONS LEARNT IN THE CITRUS INDUSTRY

- **Communication**
- In order to meet these quality criteria, communication is vital.
- Discussion with ourselves and the citrus juice processors and farmers are a regular occurrence because we have to let the processors know the markets requirements on quality, especially on pesticide requirements (What are banned and what are at excessive levels) in order to improve the quality for the following season.
- Communication with consumer is also vital because that way you can keep track of updated and changed specification requirements.



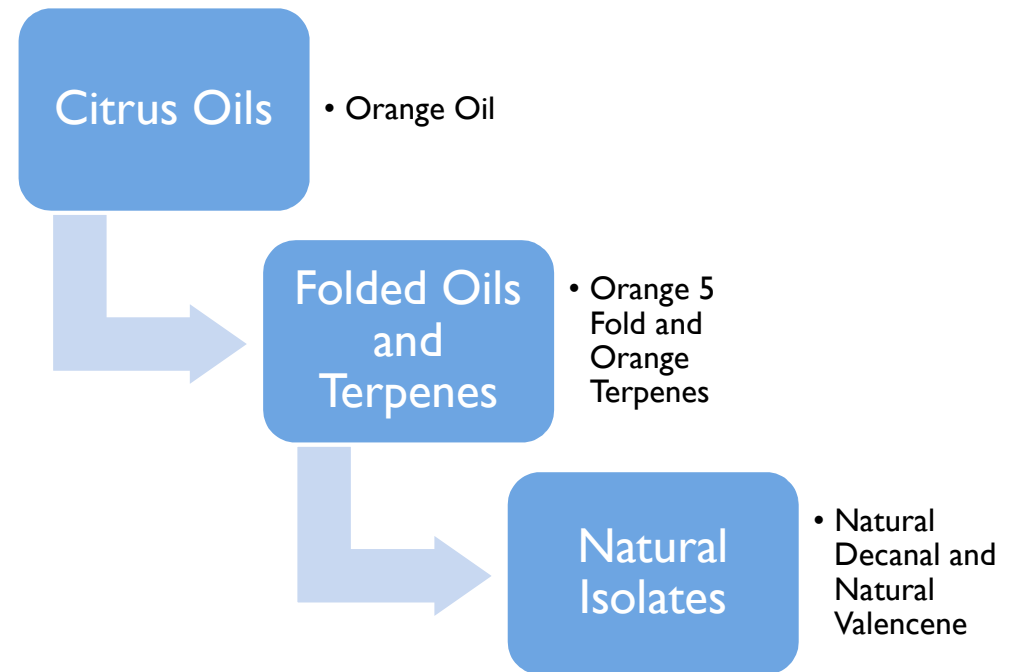
LESSONS LEARNT IN THE CITRUS INDUSTRY

- **Diversity**
- It is always good to have a few products in your portfolio.
- With citrus there is very rarely an oversupply of all types worldwide, so if there is an abundance of Orange oil in the world there would still be a market for Lemon or Tangerine or Grapefruit oils.
- The citrus farmers and juice processors also adopt this strategy and often farm and process other fruit crops such as mangoes or apples, to cover any down time or problems with their primary crop.



LESSONS LEARNT IN THE CITRUS INDUSTRY

- **Adding Value**
- It is advisable to be able to add value to the product rather than just sell on the commodity.
- These value-added items might be able to open doors into other markets eg. Fractionating the d-limonene from Orange oil to offer a natural cleaning solvent or degreaser.



POSITIVE AND NEGATIVES

■ **Positives**

- The South African citrus industry is known for excellent overall quality of oil (strong reputation in major international markets).
- High level of investment in current technology within pack houses and processing factories leading to larger yields of oil
- Good relationships with major International Flavour and Fragrance Houses.
- Stable and established markets.
- Strong and existing formulations using South African Citrus oils.
- Production season falls in the window when the Northern Hemisphere has finished and fills this gap.

POSITIVE AND NEGATIVES

- **Challenges**
- Production is largely dependent on climatic conditions which can only be partially manipulated by man through irrigation.
- Pesticide residues due to the focus on the fresh fruit
- Saturation of traditional export markets.
- Relatively high input and capital costs.
- Volatile fruit prices
- Lack of industry control on efficiency and productivity in supply chain beyond farm gate and pack house door.

POSITIVES AND NEGATIVES

- **Threats**

- Increased competition from the Southern Hemisphere counterparts like Chile, Brazil, and Argentina.
- Oversupply of oil into established export markets.
- Availability and cost of irrigation water.
- Impact of climate change especially in the Western Cape.
- Currency variability.
- Citrus fruit diseases.

POSITIVE AND NEGATIVES

- **Opportunities**

- Market access initiatives to the Japan, Asia (India, Indonesia) and China.
- Increasing demand due to the consumers demand for buying more natural flavours.
- Potential for increased local market consumption.
- Environmentally friendly applications

CONCLUSION

- **Conclusion**
- Quality is key
- Optimisation is vital
- If possible, look at adding value to the essential oil
- Always communicate with suppliers and customers
- Look at producing more than one crop to prevent over reliance
- Thank you