A View of the "Cider World"

A personal perspective from the UK

Presenter: Peter Mitchell, Director Mitchell F&D Limited

Personal Introduction

***Mitchell F&D Limited's* Cider & Perry Academy**

Based on over 30 years of practical experience, including as an award winning commercial producer

- Operates a range of scheduled courses
- Bespoke training programmes
- Consultancy work
- R&D

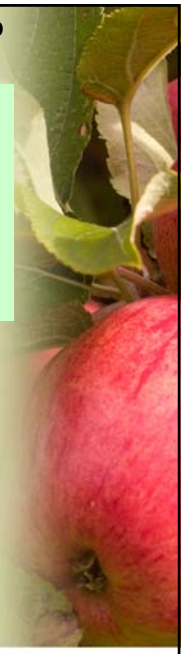
www.cider-academy.co.uk

What is Cider *(& don't forget perry)*?

- ✓A long drink
- ✓An alternative to wine
- ✓ Different packaging presentations
- ✓ Still/sparkling
- ✓ Sweet/dry
- ✓ Cloudy/clear
- ✓ Dessert vs. cider fruit
- ✓ Blend, single variety
- ✓ LA, LC, organic
- ✓ In-bottle fermented, conditioned
- ✓Methods of serving e.g. "over ice", with lemon

- Flavoured
- Cross-over
- Fortified
- Ice Cider
- Distilled

"Cider does not know what it is"
But should it?



Definitions of Cider & Perry

Oxford Dictionary

- ***An alcoholic drink made from fermented apple juice.***

WET Act

- *A beverage*
- *A product of the complete or partial fermentation of the juice or must of **apples** or **pears***
- *Containing **no** ethyl alcohol from another source and **no** liquor or substance (other than water or juice/must of apples or pears) added to give colour or flavour*

Cider Making: The Core Principle?

"The U.S. is apple crazy, the U.S. Department of Agriculture's most recent data found. It is the nation's most popular fruit." **(USA Today; 8th November 2017)**

However, in Australia, the banana is favourite & apples are second (Nielsen, February 2017)!

And what about avocados or tomatoes?

Strengths Weaknesses Opportunities Threats

Strengths include:

- Refreshing; Unique; Natural, pure & simple (*apples, "organic"*); Easy to drink & safe (*18th & 19th centuries consumed by whole family*); Healthy (*antioxidants*); Optimistic association (*summer days*); Social & fun (*alcohol, friends*);
- Versatile and a base for innovation;
- A cultural experience (*rural, historic, traditional, national drink*); Long heritage (*in certain regions of world*); easy to make (*DIY, development of interest*);
- Eco-friendly (*orchards*); a "local food" (*provenance, food miles*)
- Generally flexible legislative position with (typically) favourable levels of excise duty;
- Broad appeal (gender & age groups)
- In growth, fashionable

*S*trengths *W*eaknesses *O*pportunities *T*hreats

Weaknesses include:

- Category awareness outside non-traditional cider areas (*what is it?*);
- **Lack of understanding** by consumers;
- **Confused messages** (*tries to be too many different things to too many different people*);
- A fashionable trend;
- Legislative position outside non-traditional cider areas;
- Image and 'historical baggage'; (cheap) (sweet) alcohol; **undervalued**, price (*cheap*), positioning.
- **Poor quality** common, does not hide technical faults;
- Sector price wars. Sections of UK industry reactive (*not proactive*). Volume vs. value as key driver/indicator of success

*S*trengths *W*eaknesses *O*pportunities *T*hreats

Threats

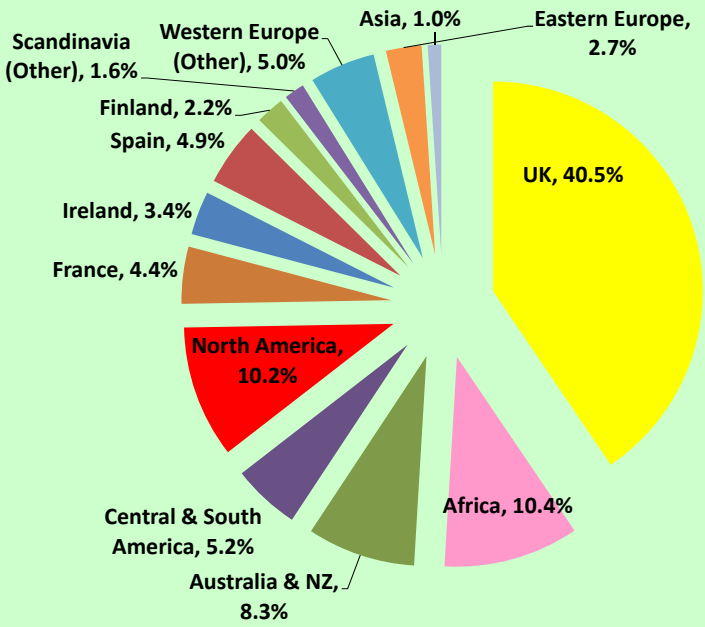
- Competition by other drinks (*e.g. FABs again*);
- Competition by other makers of same product;
- Legislation;
- Retailers (*power*);
- Attributed value; External perception;
- Constant innovation (*short-lived novelty, confusing messages*).
- Product consistency
- Supply of materials & support
- Climate change

Our Great History: Scientific Innovation

- Processing equipment
- Fruit selection
- Use of SO_2
- Yeast nutrition
- Production of a sparkling drink and in-bottle fermentation
- Long Ashton
- X-Flow filtration

✓ **Packaging – the next innovation?**

Cider & Perry: *World Market*



Market Trends

Traditional Market (UK) Trends

- **On-trade**: 36% vol; 63% value @ + 2.2% growth
- **Off-trade**: 64% vol; 37% value & declining
- **Premium:** + 15.8%, **Super Premium** + 24%
- **Flavoured:** + 14.5%
- **Mainstream:** - 6.6%

New Market (USA) Trends

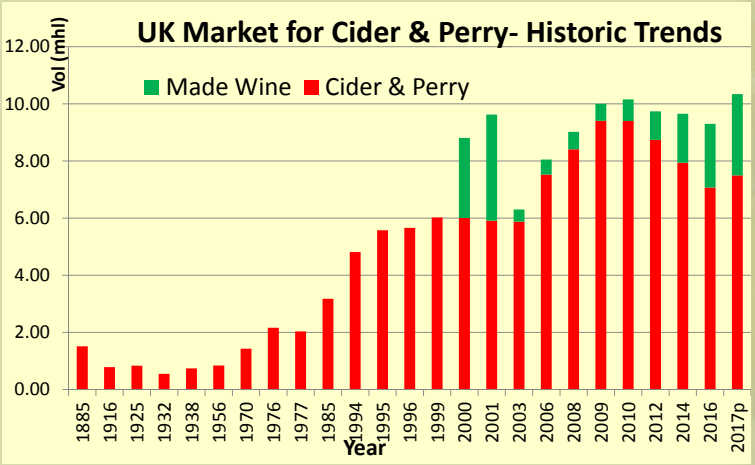
- Rapid growth between 2008 – 2016
- - 4% decline in 2017, but .....
- + 30% regional brands (off-trade)
- Growth in cans & 4-packs
- + 50% in flavoured ciders (off-trade)

Consumer studies identify attractive colour, distinctive / recognisable flavours & sweeter tastes as key drivers. But, attracted by 'the apple' (NWCA, 2017)

"The new leading the new"?

Market Trends in the UK: *The Long View*

- From the 12th – 19th Century, cider was highly valued as a safe drink and used as a means of paying farm workers.
- In the 18th century, a significant proportion used to produce "Cyder Brandy"



Cider & Perry Production Strategies – *An Overview*

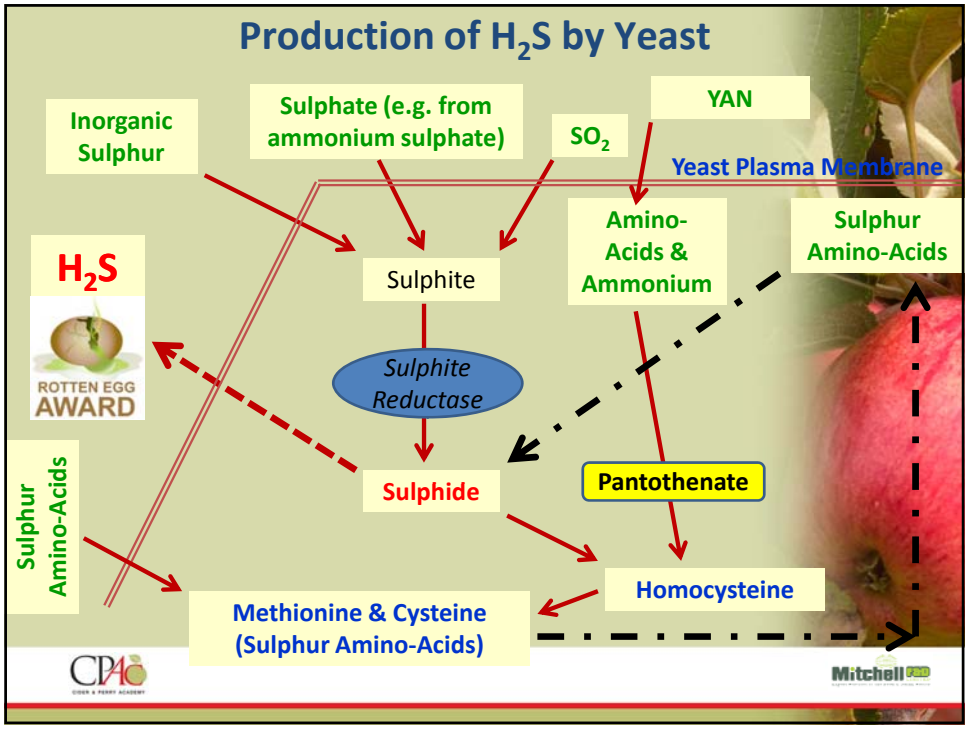
Two main approaches to making cider & perry:

- **"Wild"; minimum intervention.**
- **Understanding & utilisation of science and process control.**

Also: A 'hybrid'

Cider Making as a Science: A Case Study
H_2S Production & Control

- The production of H_2S during cider & perry production has been – and continues to be – a major (but preventable) problem.
- H_2S can also lead to the production of other organic sulphur compounds: ***Thiols & disulphides***
- All are regarded as having unpleasant aromas and have very low sensory thresholds: ca. 1.5µg/l
- Production of H_2S can also (in many circumstances) be viewed as indicative of an – overall- unhealthy fermentation yeast.


Production of H_2S by Yeast
Inorganic Sulphur
Sulphate (e.g. from ammonium sulphate)
SO_2
YAN
Yeast Plasma Membrane
Amino-Acids & Ammonium
Sulphur Amino-Acids
H_2S
ROTTEN EGG AWARD
Sulphite
Sulphite Reductase
Sulphide
Pantothenate
Sulphur Amino-Acids
Homocysteine
Methionine & Cysteine (Sulphur Amino-Acids)


What about Art?
• Its all in the blending
• Skill & craftsmanship
• Nature as art

"***Good cider is a much greater rarity than good wine, which all will admit is scarce enough***" (J.M. Trowbridge, 1890)

"A pure article of cider, skilfully made from select fruit in perfect condition, should have perfect limpidity and brightness, even to sparkling in the glass; it may vary in colour …. it should be fragrant …. it should be tart … it should have a pleasant fruity flavour …… feel warming and grateful to the stomach ….. it should have a light body … and it should leave in the mouth an abiding and agreeable flavour as of rare fruits and flowers"

"We don't drink stuff because it is made in a certain way; we drink it because it tastes good"

Richard Jones, President of the Leeds University Real Ale Society (Quoted in the FT, 5th August 2016)

Quality Assurance & Quality Control

Quality Control (QC) vs. Quality Assurance (QA)

- **QA**
  1. Define standards / criteria
  2. Develop & implement controls & procedures to ensure standards **will be met** (& potential problems are avoided)
- **QC**
  - Activities designed to ensure standards **are being met**
  - Includes detection activities that checks that criteria / standards are being achieved

Case Study: *Cider Production at the Orchard Centre*

Our core principles / objectives:

- The apple (& pear) are at the core and focus of what we produce
- Healthy enjoyment for the consumer
- Full transparency for the consumer e.g. Ingredients labelling
- Quality Assured good **VALUE!**
- **Product INTEGRITY**

How:

- Gaining a full **understanding** of the science & the processes
- Application of science, process control …….& art
- Continual learning & improvement

So, you want to make some cider?

Is it ……?

- Let's make some cider…
- Let's charge $10.00 a bottle…
- Let's see if we can sell it.

? **Product orientation.**

Or is it …..?

- Let's find out what people want ….
- Let's find out how much they want …
- Let's find out how much they will pay ….
- Let's decide if it is profitable …..
- Now let's make some cider.

? **Market orientation**

*S*trengths *W*eaknesses *O*pportunities *T*hreats

Opportunities

- Exploit market drivers (e.g. health, premium, bespoke, fun) – including "regional", "local" and "craft"
- Cider re-positioning (*between beer & wine, uniqueness*); Niche (*single varieties, regional, organic*); Low alcohol products;
- Re-establish ***value*** (*taking a different view*); Promote quality not quantity; (Re)-Building/promoting strengths (*See before*).
- Adding value & promotion of whole experience (*cider routes, history, tourism, orchard walks, cultural events, leisure, DIY*);
- (Re)-Engagement with consumer (*labelling, trace-ability, honesty, integrity*);
- Collaboration – in planning, production and marketing

Heritage of Cider – *What we already have*

- A long history
- A key part of the rural life between 1300 to mid 1800's
  - A safe drink
  - Strong links with rural economy
  - Shaped the country-side
- Drunk instead of wine in 17th Century
  - Pioneered 'in-bottle' fermentation methods/products & other technologies
- Defines regional cultures – West of England, Asturias (Spain), Normandy (France), The American Revolution, Quebec Ice Cider
- Customs, religion & mythology
  - Wassailing
- A very versatile drink

Opportunities - *Market Place Trends*

- Identifying & paying attention market trends in food & drink are central to marketing and new product development.
- These are equally relevant to small-scale producers as they are to large corporations. Currently recognised as being:

1. Health
2. Convenience
3. Premium & indulgence
4. Authenticity / Craft
5. Ethnic influences
6. "Free from" foods
7. Good vs. bad (fats) (alcohol)
8. Bespoke foods

Should also include:

- **Food provenance**
- **?**

Opportunities – *Adding value*

- Organic products
- In-bottle fermented perry (& cider?)
- Distilled products
- Vinegars
- Range extension – to juice
- ??

Matching Cider & Perry to Food

Considerations

- Size & weight and flavour intensity between cider/perry and food
- Compliment or contrast
- Careful with bitter ciders and salty foods
- Astringent products can match well with protein-rich foods
- For spicy foods – match with refreshing styles of cider – but sweeter, 'tannic' products also work well. The more spice, the sweeter the cider

Ideas

- **Pork** – A classic match – not over assertive, but good acidity
- **Fish** – traditional "Sauvignon Blanc" style perries
- **Red meat** – Full bodied, mature "bittersweet" cider
- **Pasta** – match to the sauce
- **Salad** – Aromatic & fruity ciders with a tangy salad
- **Desserts** – Sweeter than the food
- **Cheese** – The two were designed for each other!

CPAC

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Cider goes with anything!

Summary: *Sustainability of the Cider Industry in Australia*

What is Sustainable Development?

"Meeting the needs of the present without compromising the ability of future generations to meet their own needs" (*Brundtland Report, 1987*).
Two key concepts:

- **Needs** & **Limitations** (**A balance**: "*maintaining processes of productivity **indefinitely***")

For the Australian Cider Industry, sustainability potentially includes:

- **Satisfying consumer needs / requirements, plus 'delight & surprise'.**
- **Responsible marketing of alcoholic drinks**
- **Minimising environmental impact**
- **Building & maintaining an appropriate infrastructure & support mechanism to mitigate current & future challenges: Fruit supply, access & supply of equipment / materials, R&D, a knowledge & skills base and training.**

CPAC CIDER & PERRY ACADEMY

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Process Control for Cider Making including Yeast Management

Presenter: Peter Mitchell, Director Mitchell F&D Limited

CPAC CIDER & PERRY ACADEMY

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Fruit & Juice Specification for Fermentation

- Maximum sugar
- No starch
- Absence of contamination – chemical, microbiological
- Low levels of SO_2 binding compounds
- Low levels of pectin
- A suitable pH
- Phenolics?
- Precursors of yeast-generated aroma compounds
- Particulates?
- A pre-established level of yeast nutrients
- Adequate DO_2 and a suitable temperature before yeast pitch

Process Control – Preparation of the Fermentation Media

- **pH control**
  - Target: pH 3.3 – 3.6
  - Adjustments using:
    - Fruit selection & mix
    - Malic acid, Lactic acid, (~~Citric acid~~)
- **Alcohol yield**
  - Target: 6.0 – 15.0% ABV
  - Chapitalisation
- **Other**
  - (Pasteurisation)
  - ('Natural' protection against spoilage microorganisms e.g. Pre-inoculation with *Metschnikowia Fructicola)*
  - Addition of SO_2 : 25 – 150 mg/l dependant on pH and/or pre-pasteurisation and/or pre-inoculation.
  - FAN analysis
  - Juice oxygen & temperature control

Fermentation Management

Fermentation management itself will involve the following aspects:

- Yeast selection and handling
- Yeast nutrition
- Implementation of yeast survival strategies
- Temperature & oxygen control
- Monitoring
- Trouble-shooting (if necessary)
- Racking at the end of fermentation

Native Microflora vs. Inoculated Fermentations

Advantages of native microflora fermentations:

1. Increased microbial-derived complexity in the cider
2. Usually, slower fermentation rates – thus less heating and (potentially) less loss of volatile characters
3. Philosophical and possible marketing advantages: Unique (own) character (Terroir)? Vintage to vintage differences (unpredictability)? Being able to claim less intervention and (maybe) a more "natural" (nature-based) approach to cider making?

Advantages of inoculated fermentations:

1. Predictability
2. Low risk of off-character formation
3. Potential neutrality i.e. enhancement of fruit-derived characteristics in the finished cider or perry.
4. Faster fermentations – even at lower temperatures if an appropriate "low-temperature" strain of yeast is used
5. Enables effective planning e.g. tank scheduling

Yeast Selection for Cider Production

Criteria:

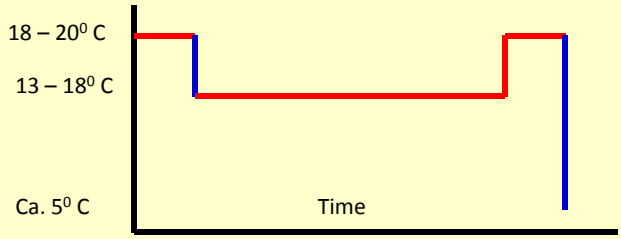
- Usually, complete attenuation. Efficient utilisation of sugar
- Acceptable rate at selected temperature
- Short lag; Good flocculation; Low foaming
- Tolerance up to 15% ABV, low pH, SO_2
- Limited production of SO_2 binding compounds
- Neutral organoleptic properties**?**
- Low production of H_2S & other by-products
- Resistant to autolysis

Fermentation Objectives

- Sufficient biomass
- Healthy & fully functioning yeast
- Efficient production of alcohol (& full sugar attenuation?)
- Fast (cool?) fermentation – no excessive temperatures
- Absence of off-flavours & other faults
- Attractive flavour profile & **appropriate** complexity

Fermentation Management – A Case Study

- Oxygen control – juice aeration (& re-aeration if necessary)
- Temperature control:



- Planned (& adjusted if necessary) nutrition & chapitalisation
- Ongoing monitoring: SG, temperature, pH, H_2S
- Lees stirring @ ca. SG 1.003
- **Fermentation end:** Chill over 2-3 days then rack after another 3 – 5 days, sulphite & mature for (usually) at least 6 months

Nitrogen Requirements

- Ideal levels of nitrogen for cider production not established – will vary according to type/style of cider required, yeast selection & fermentation conditions.
  - Quoted figures vary – typically between 200 - 300 mg (assimilable (YAN) – FAN + NH_4^+) N per litre (possibly up to 400 mgN/l!)
  - Will need to run trials

Amino Acids in Cider Apple Juice

- **Asparagine**: 0.19 – 17.5 mg/nitrogen/100ml (**NB 1 unit Asp. = 2 units available N**)
- Aspartate: 0.35 – 1.5
- Glutamate: 0.21 – 0.31
- Serine: 0.04 – 0.65
- Alanine: 0.03 – 0.18
- Trace amounts of valine, leucine and isoleucine

Based on very limited data

The amino acid concentration in apple juice varies considerably, with a number of factors influencing it e.g. apple variety, stage of ripeness, degree of juice (apple derived) particulates...and??

Typically, insufficient available nitrogen (YAN) in apple juice. There is very little or no inorganic nitrogen present (*unless added*!).

In addition to NH^{4+}, yeasts preferentially utilise asparagine, glutamate & glutamine as a nitrogen source

Yeast Nutrition – Timing

- General guide:
  - Half of the required dosage of nutrients added 6 – 12 hours after the yeast addition. Remainder added at 1/3rd fermentation.
- Micronutrients can be added to the yeast during rehydration
- Slow release nutrients are also available (e.g. Microessentials Complete TR)
  - The traditional and classic "leg of mutton" approach!

Helping the Yeast to Survive

- Thorough aeration of ADY during re-hydration
- Juice oxygen concentration: 8 – 12 mgl^{-1}. A small addition of oxygen after yeast growth phase (after 2 – 3 days fermentation) may help.
- Use SO_2 with cider fruit – inhibits polyphenoloxidase, which converts diphenols to quinones using large amounts of oxygen
- Utilise a 'balanced' yeast nutrition strategy
- For highly chapitalised juices and/or clarified juices, use yeast hulls at ca. 0.2 g per litre
  - Detoxification
  - Supply of unsaturated fatty acids and sterols
  - Facilitates release of CO_2
- Fermentation in presence of mash particles
- Addition of ergosterol
- Yeast selection (high sterol content)
- Increase yeast addition rates at low pH (< pH 3.3)

Yeast Nutrition – An Example

Scenario: Target YAN = 275mgl^{-1} Nitrogen;
Initial juice nitrogen = ca. 100mgl^{-1}
Target Alc: = 6.0 – 8.5%ABV

- Thoroughly aerate the juice.
- Rehydrate yeast using rehydration nutrients & add to juice.
- 6 - 12 hours later add half dose of proprietary yeast nutrient.
- After gravity drop of 10^0 add second dose of proprietary nutrient ***plus*** DAP.
- Additional gravity drop of 10^0 - add more DAP – ***and*** again after another 5^0 drop

- **The fermentation should always be monitored for H_2S.**
- **There is no simple "recipe" for yeast nutrition!**