

Ambient Intelligence in Food Quality and Safety
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The Wine Market Perspective

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Bio-Sense

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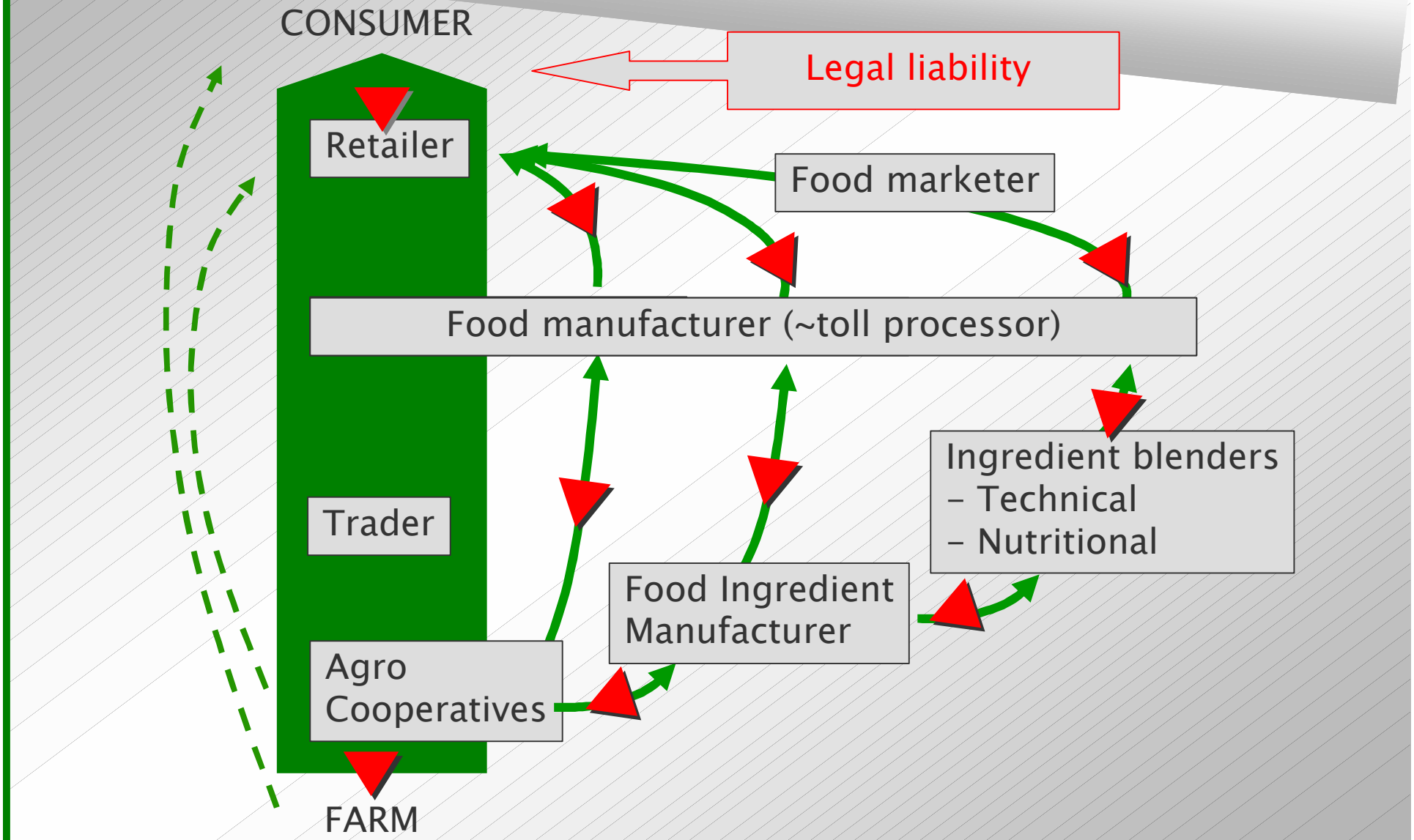
The food supply chain is rapidly changing

- Consumer: changing lifestyles and awareness
  - convenience, quality, health
  - safety, sustainability
- Power of the retailer > spending on food is reducing (UK now <10%)
- Regulatory pressure on safety and traceability > risk averse society
- Globalisation leads to polarising trends:



- Increasing complexity of the food supply chain > pressures on margin, cost and efficiency

Complexity of the food supply chain



Wine market trends

- Global wine consumption is stable > no growth market
- Consumer trend and retail power > heavy pressure on prices and margins
- Quality of imported wine from new world areas increases dramatically challenging European popular and premium wines (€ 3-5 level)
- Rapid rise of wine imports into Europe at competitive price/quality ratio
- Declining market share of European wines on the global market
  - Price/quality ratio is 'perceived' too high
  - Quality is 'perceived' to vary too much
- Demistification and commoditisation of wine with modern consumer > shift toward good price/quality ratio wines
- Imported wines use a branding strategy similar to 'icon' wines in Europe and are conceived based on consumer taste preference
- Increasing role of the media: e.g. Sideways 'induced' Pinot Noir rush

Competitive problems for European producers



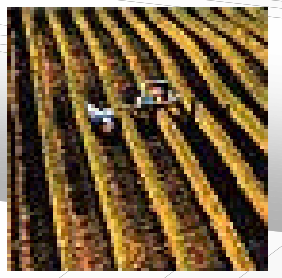
- Consumer approach

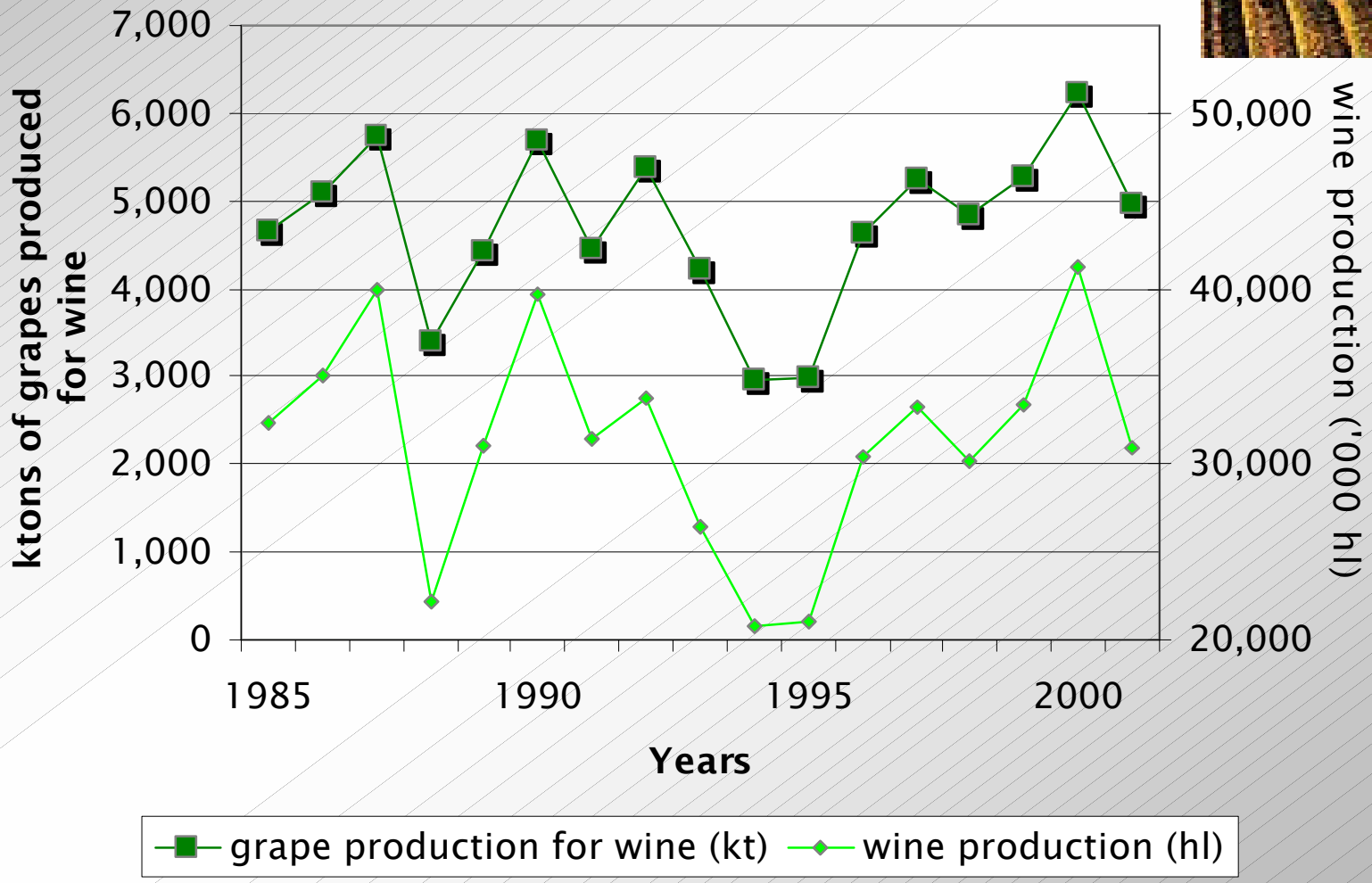
New world producers: wines that appeal to the consumer palate

European producers: try to win consumer palate for wide range of local wines

- Market and price dictated by quality, not by origin
  - Controlled bottling schemes (AOC, DOC) contributed little to quality
  - Consumers don't perceive them as a quality guarantee and switch to the perceived quality guarantee of a branded products
- Product differentiation and promotion: sustainable production and ecological values as part of the brand of new world wines
- Subsidies:
  - strong governmental support for new wine industry in New World
  - Recent EU subsidy to "reconvert to new grape varieties, relocate vinyards and improve vineyard management" – EUR 450 mio

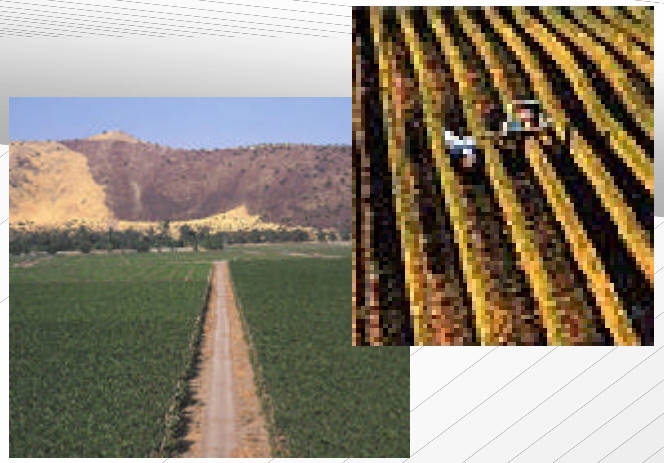
Variability in grape/wine production – e.g. Spain





Competitive problems for European producers





Industry structure as compared to the New World

- Large but fragmented: average size is small > high cost
  - France: 850,000 ha – 280,000 wineries – 46 mio hl ~ 160 hl/winery
  - Australia: 250,000 ha – 2000 wineries – 10.5 mio hl ~5000hl/winery
- Wide variety in climate (micro level) and topography combinations
  - more unpredictable and thus variable in quality
- Higher operational costs (accessibility, motorisation, blanket interventions)
- Regulatory pressure to move to more integrated agriculture

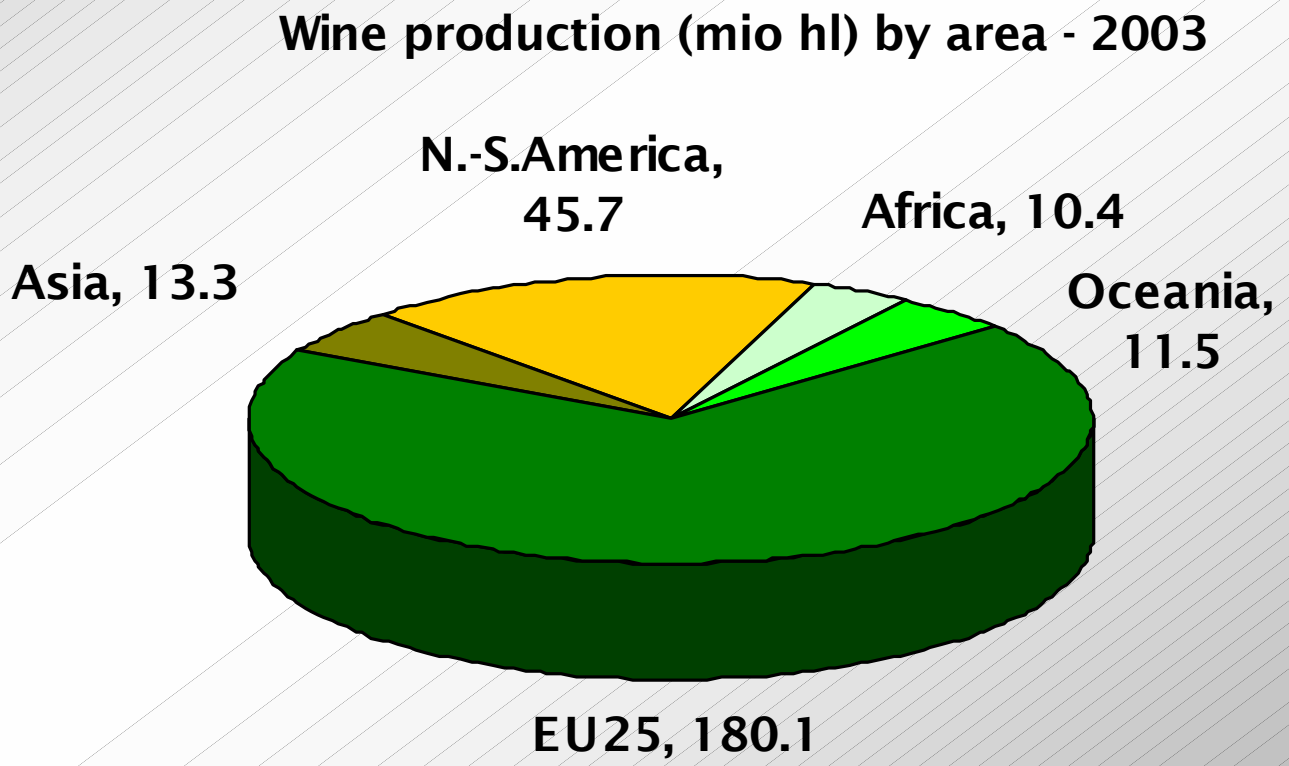
Competitive strengths of New World producers

Europe has difficulty to compete against:

- Availability of low cost labour (Chile, S.-Africa)
- Much larger size of the vineyard and thus more efficient use of resources/equipment
- More accessible vineyards and thus easier for mechanical treatment
- New installations with state of the art production technology
- New plantations with optimal combination of grape-variety and terroir conditions
- Selection of grape-varieties that cater to the more international taste palate.

Europe has a lot to loose!

- 68% of wine production in the world = EUR 100 billion retail value
- 75% of all wine trade, but rapidly declining and causing intra-EU surplus situations and price pressure = EUR 14 billion wholesale value

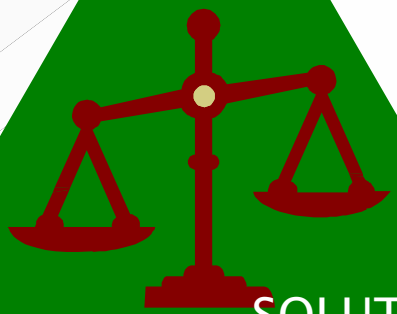


Strategies to rebuild European competitivity

CREATING A
BETTER IMAGE

For the wine industry
For the product

Barriers are:
- Traditional industry
- Cost driven
- Fragmented



ECONOMIC
BENEFIT

SOLUTION
COST

COST REDUCTION
(avoid losses)
In viticulture
In wine production

QUALITY
IMPROVEMENT OF

the grape
the vineyard
the fermentation
the wine

Parameters for cost and quality improvement



Viticulture: grape and vineyard quality management

- Optimise growth and ripening through control/monitoring of:
  - Soil (°C, moisture)
  - Air (°C, moisture, weather forecast)
  - Plant condition (grape diameter, colour)
- Micromanage local differences within vineyard
- Define optimal harvesting time (sugar, acidity, solids)



Oenology: fermentation control and wine quality

- Temperature, CO_2 (cellar, cask)
- Sensory analysis (colour, flavour, aroma from process/grape variety)
- Major composition: glucose, fructose, ethanol, $S0_2$, acetic, malic,
- Minor composition: tartaric, Cu, polyphenols, anthocyanins,



Marketing:

- Proof of origin, date of harvest
- Quality of storage/transport

What could AmI achieve in European wine-making

Purpose:

Reduce variability of the quality in the whole wine-making chain by reducing the risk factors and optimising grape quality in the vineyard and fine-tuning fermentation/maturation process in the cellar

- Improve the product image in the market by offering a more reliable and higher quality produce to better compete in the market
- Increase robustness in the wine-making process by verifiable and controllable parameters > stable performance/profitability
- Monitor local differences in the vineyard allowing precision viticulture and select proper grape variety/terroir combinations
- Improve implementation of integrated agriculture, thus avoiding pesticides and contaminants to comply with increasing safety regulations
- Reduce costs by avoiding unnecessary treatment (irrigation, spraying)
- Possibly turn European variety into a market strength

Economic relevance of Ambient Intelligence

Economic cost of variability in the vineyard:

- Loss in grape quality value
  - Wine grape price ~600 €/ton (300 -1200 €/t)
  - Estimate 20-25% of yearly harvest is of inferior quality for which there is a 30% price penalty
  - 1.2 bio € or 7% loss in wine grape value (16.5 bio €)
- Lost opportunity to sell a higher premium quality
  - Average premium of 0.9 €/bottle (1.95 vs 2.85 as super premium)
  - Estimate that 10% of yearly sales could is one quality grade lower
  - 2.5 bio € or 3.6% loss in wine wholesale value (68 bio €)
- Estimated total loss from vineyard variability amounts to € ~1100 €/ha or € 7500 €/average wine farm

Economic relevance of Ambient Intelligence

Economic cost of variability in fermentation

- Highest risk step in the wine making process
- Not all parameters are fully understood yet (science >< craft)
- 3 to 5% aberrant fermentation, leading to 1% disposal
  - Disposal of 1% represents € 0.6 bio wine wholesale value
  - Estimating that inferior fermentation performance results in a 0.9 €/bottle loss, affecting 1.8 bio bottles or a value of ~ € 1.8 bio
  - 2.4 bio € or 3.5% loss in wine wholesale value
- Total value loss from variability is estimated at
  - 4.9 bio € or 7.1% of wine wholesale value (68 bio €)

European wine farmers may loose from € 5,000 to € 50,000 per year due to lack of control of variability.

- In comparison: presently analytics are ~ € 2,500 (up to €30,000)

High enough incentive to consider new technology use, even if only partially successful

AmI Intelligence alone is not enough

AmI

Information:
- Detecting, networking, analysis

Scientific interpretation of the data (link process with quality):
- How much available?
- Empirical assessment of new parameters currently not used

Algorithm of the decision making system

- Scientific understanding:
  - on the relationship between grape variety/quality, environmental and fermentation parameters and final wine quality attributes
  - BUT: AmI may contribute to empirically establish this
- Reliability of the decision making system and benefits gained must be high enough to convince farmers to adopt it

Will AmI convert European wine industry?

- AmI will fundamentally change the way a vineyard and a winery will be operated
  - Fundamental mentality change of European wine-makers
  - Userfriendliness of AmI is a prerequisite
- Rebuilding consumer confidence in European wine will require also a dedicated and enormous (joint?) marketing effort
- New world producers will take much faster advantage (space-based analysis in USA, etc…)
- Fragmentation remains a barrier to investment of new technologies.

Wine is a good target market for technological innovation

- Wine is a value added product
  - the producer still earns a reasonable share of the value chain
  - Return on investment opportunities are reasonable > new technologies should find it easier to be adopted.
- Wine market is quality driven, including elements of origin and craftsmanship, which technology/information can help to reinforce, improve and to make it more consistent.
- The wine industry, being more traditional in Europe, has still a lot to benefit from technological and scientific progress both in the field as well as in the cellar.
- The new world producers caused a modernisation of the image of the wine industry and trade:
  - platform for a more 'high tech' approach in the marketing
  - trendy labels imply a 'modern product' image which may appeal more to a new and younger public, expanding wine consumption



In vino veritas

Thank you

Bio-Sense