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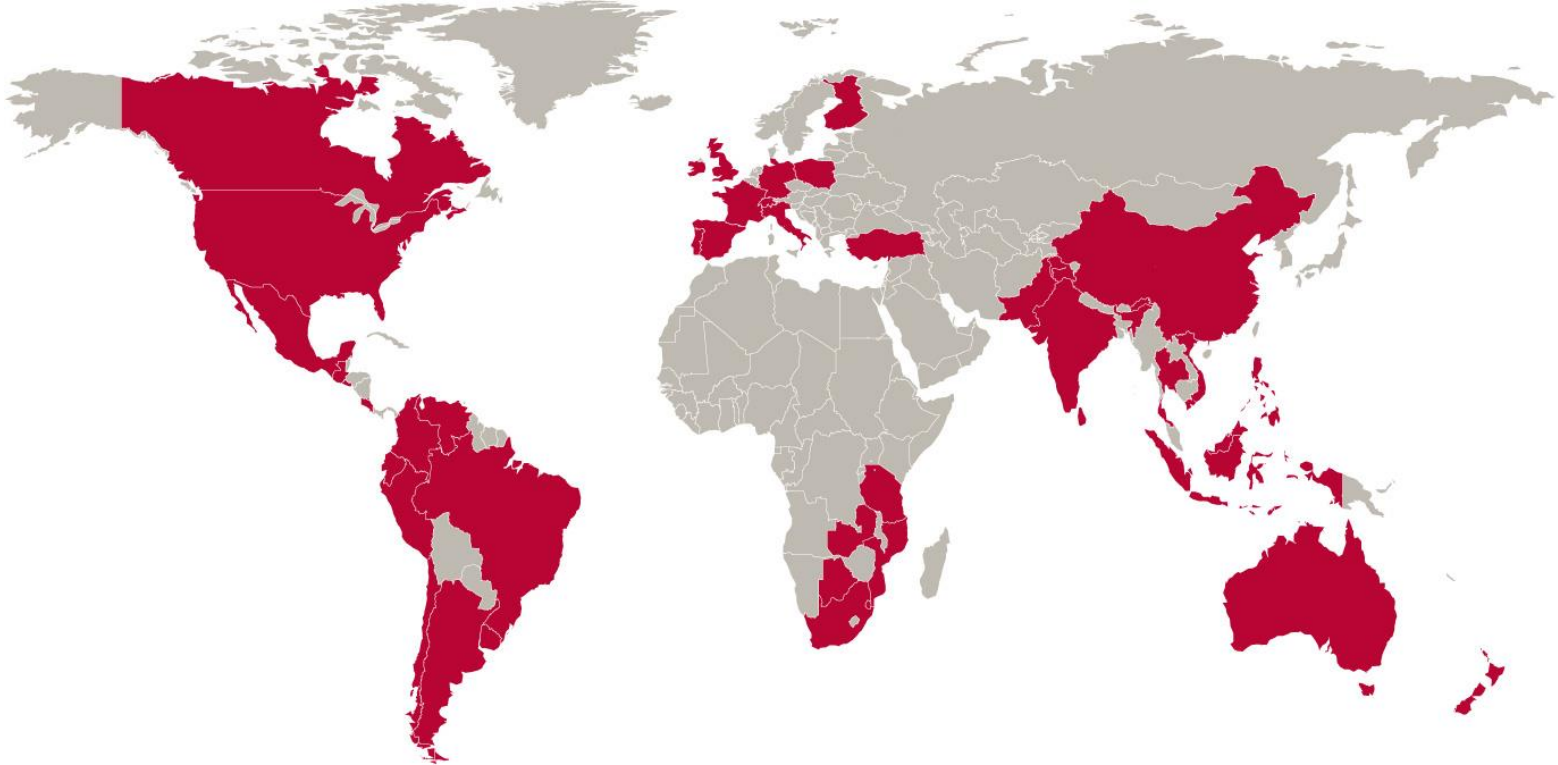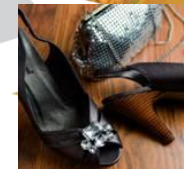Aunir

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Global Presence

Associated British Foods is a diversified international food, ingredients and retail group with sales of £10.2 billion and 96,000 employees in 44 countries

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ABF Overview

Sugar & Agriculture
2nd largest world sugar producer
Expanding agribusiness operations
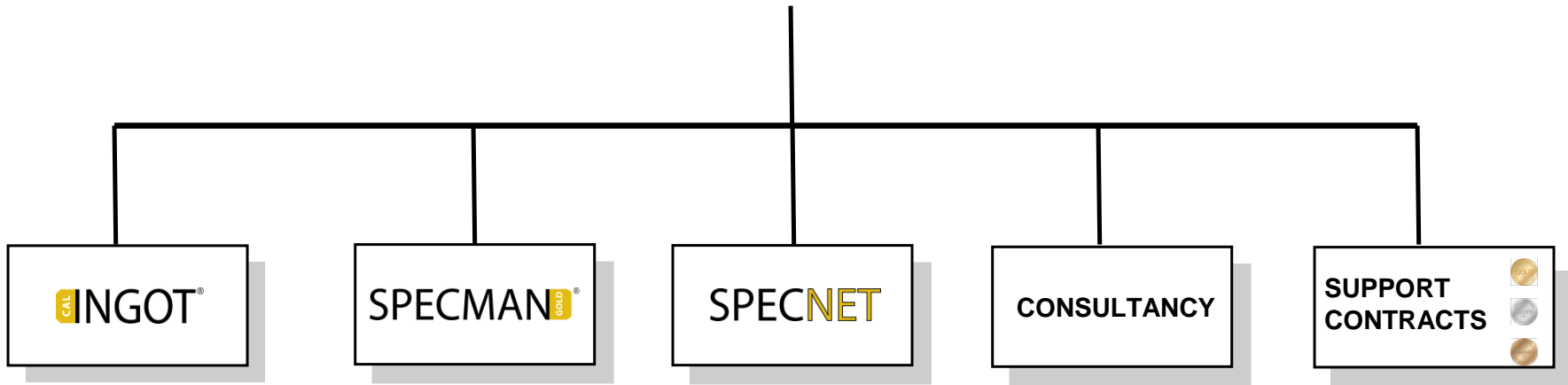
Grocery
Branded and private label
groceries

Ingredients
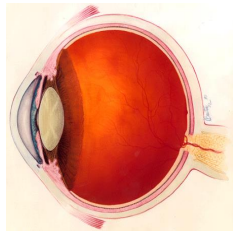Yeast production
Bakery ingredients

Retail
Fashion stores

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The difficulties & opportunities associated with large volumes of data that can be generated by NIR

Data = Knowledge

Image → Detector → Processor → Data → Answer

Animal
Dog
Alsatian
German Shepherd

Deutscher Schäferhund

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Knowledge = Data

| Image | Detector | Processor | Data | Answer |

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Large datasets

Including different materials of similar type e.g. cereals helps to identify relationships between the spectra and the reference analysis.

A wide ranges of values in the properties will improve the robustness of the calibration

Statistics

Scatter plot

Slope: 1.000   RSQ: 0.962
SEP: 0.440 BIAS: -0.009 SEP(C): 0.440
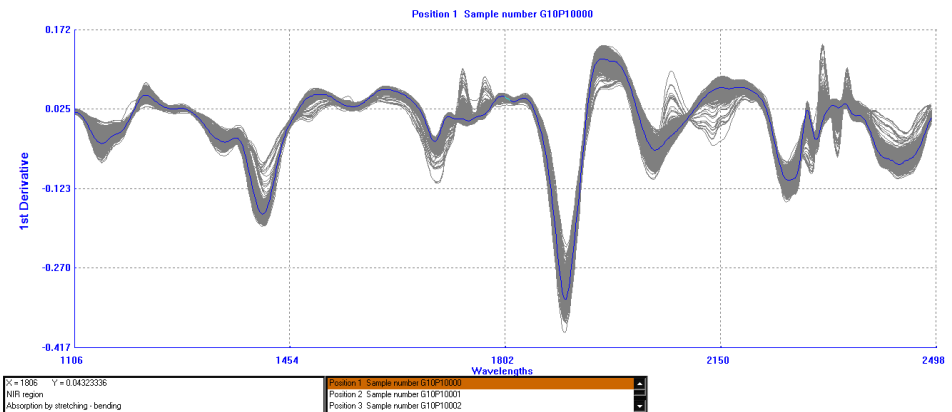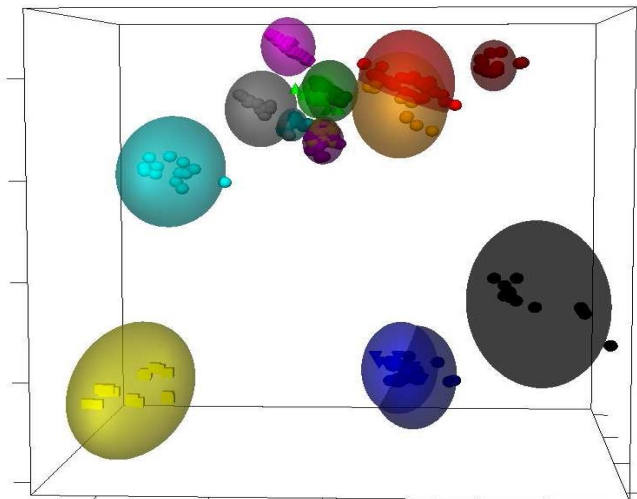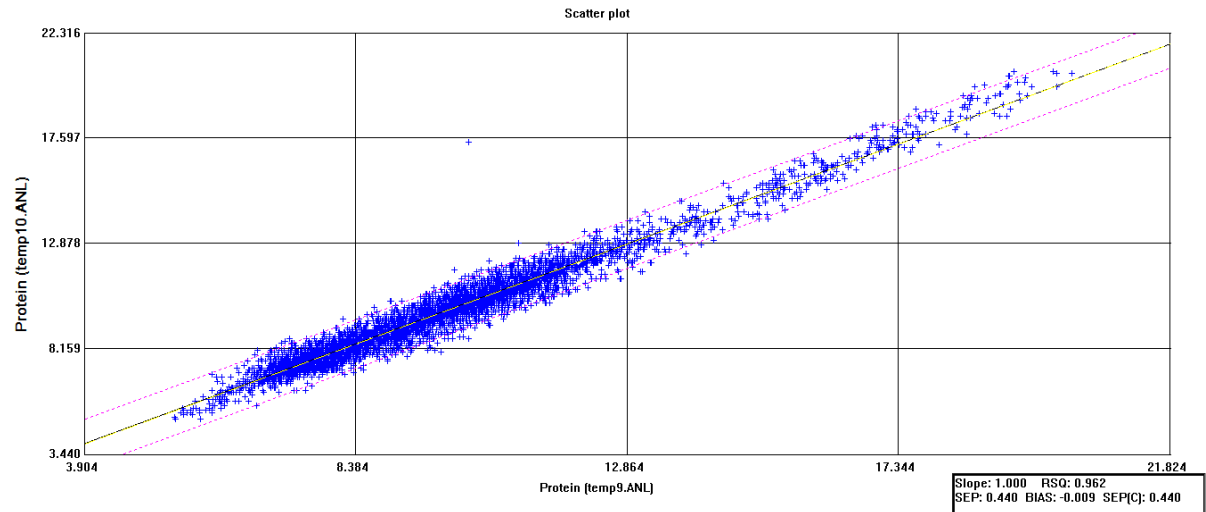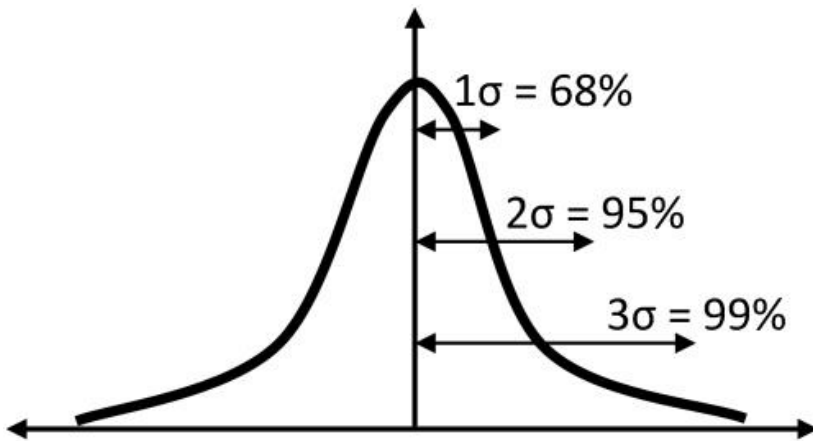
Statistics

TABLE 1
Analytical Variations (AV) in [%]; x = analyte concentration

Analyte	AV (%)
Moisture (Dry Mass)	12
Protein	20/x + 2
Fat	10
Crude Fibre	30/x + 6
Ash	45/x + 3
Total sugars as invert	12
Calcium	10
Phosphorus	3/x + 8
Salt	7/x + 5
Vitamin A	30

Source: From the Association of American Control Officials 2011, Official Publication 2011, page 298-299.

Lab Error Protein:

$$\frac{20}{9.7} + 2 = 4\%$$

The NIR target error is:
4% of 9.7 = 0.39

Property	N	Mean	Min	Max	SD	SEC	SEP	RSQ
Protein	6513	9.68	2.70	20.60	2.32	0.42	0.42	0.967

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Pros and Cons

Pros:

-Less reliant on individual potentially wrong result

-More chance to characterising unknown population

-Less likely to have outliers in prediction

-More accurate because individual samples have less effect

-Fewer terms are used per sample (less over fitting)

Cons:

-More costly

-Need more pre-processing; sometimes too complex

-Need more powerful pc's

-Needs of expertise knowledge

Conclusion:

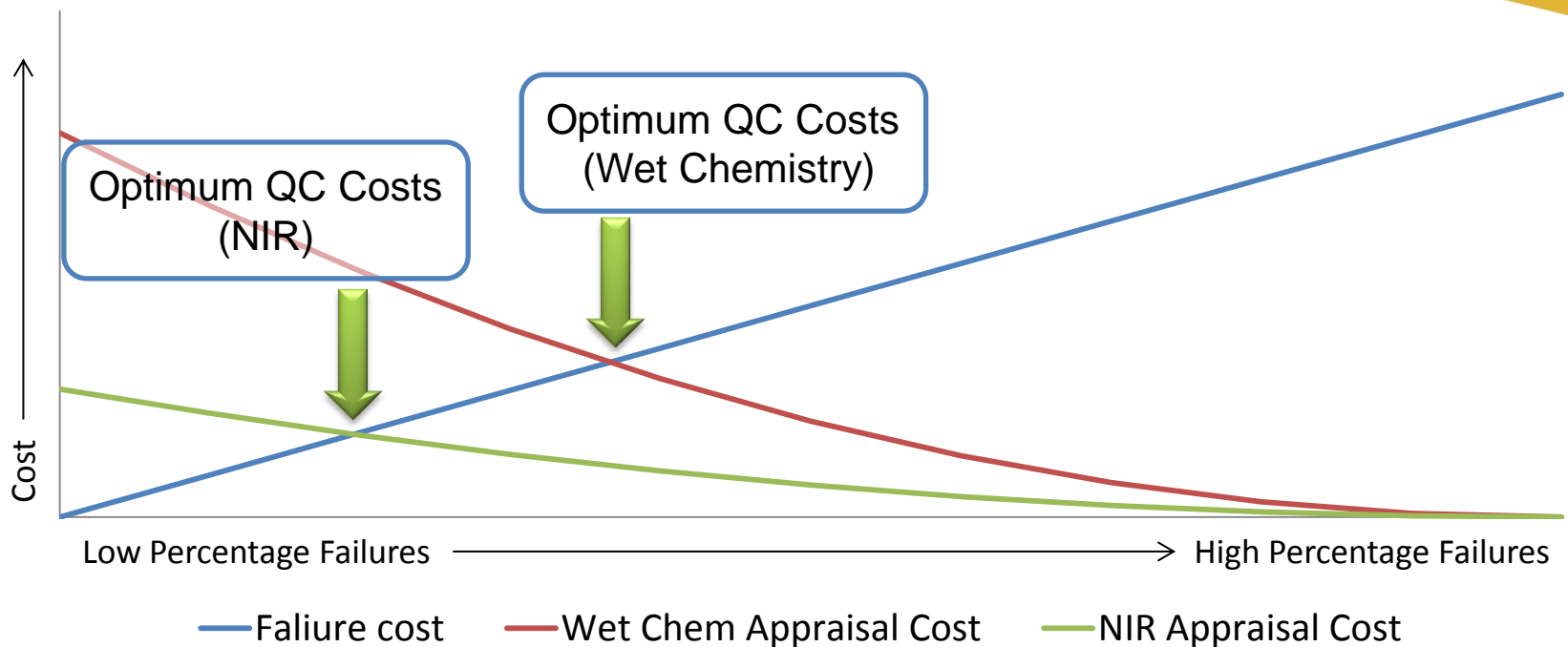-It benefits the user but is more costly to the developer

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NIR in QC Applications

Factors affecting overall product quality:

- Appraisal Costs
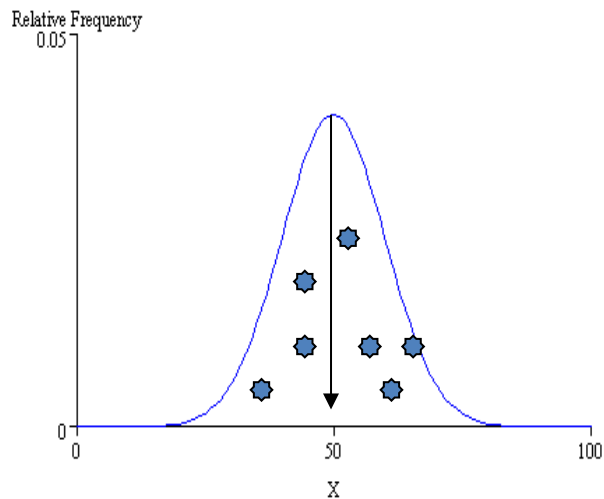- Failure Costs
- Prevention Costs

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NIR in QC Applications

More Statistics...

$$Number\ of\ Samples\ = \frac{4(Standard\ Deviation^2)}{Required\ Accuracy^2}$$

$$Accuracy\ = \frac{2(Standard\ Deviation)}{\sqrt{Number\ of\ Samples}}$$

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NIR in QC Applications
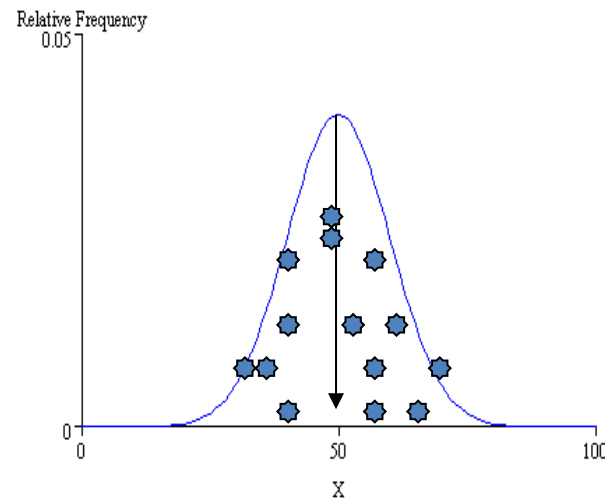

Normal distribution.

Number of Samples = 10
Standard Deviation = 1.25
Accuracy = ±0.79

Number of Samples = 50
Standard Deviation = 1.25
Accuracy = ±0.35

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"The more samples you analyse, the better you will understand your ingredients"

"The better you understand your ingredients, the more control you have over your finished products"

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Improved Control = Improved Profitability

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