APPLES – QUALITY STANDARD

To be presented to:

UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE
COMMITTEE FOR TRADE, INDUSTRY AND ENTEPRISE DEVELOPMENT
Working Party on Agricultural Quality Standards
Specialized Section on Standardization of Fresh Fruit and Vegetables
Fifty-third Session
Geneva
21-25 May 2007
Item 4(e) of the Provisional Agenda

Transmitted by:

COPA/COGECA, on behalf of all members

Members organising and coordinating the Field Studies:

ASSOMELA
Association of Italian Apples Producers,
Via Brennero, 322
38100 Trento
ITALY

BVEO,
Adenauerallee 127
53113 Bonn
GERMANY

DPA,
Postbus 2031
299 Barendrecht
THE NETHERLANDS

Bundes-Obstbauverband Österreichs
Schauflergasse 6
1014 Wien,
AUSTRIA

DEG
Axelborg, Axeltorv 3
1609 Koebenhavn V
DENMARK

NFU
Adrian Barlow, Forest Lodge, Bulls Hill, Walford
Ross-on-Wye
Herefordshire
UNITED KINGDOM

VBT
Tiensevest 136
3000 Leuven
BELGIUM

Research Institutes participating in the Field Studies:

Experimental Fruit Tree Research Institute - Trento
Via della Val, 2
38057 - Pergine Valsugana (TN)
ITALY

Experimental Institute of San Michele all'Adige
Via Edmondo Mach, 1
38010 - S. Michele all'Adige (TN)
ITALY

Research Centre for Agriculture and Forestry Laimburg
Pfatten/Vadena
39040 - Auer/Ora (BZ)
ITALY

KBO - Kompetenzzentrum Obstbau Bodensee
D 88213 Ravensburg,
Germany

Vlaams Centrum voor Bewaring van Tuinbouwproducten
De Croylaan 42
3001 Heverlee
BELGIUM

Introduction:

UNECE Standard FFV-50 concerning the marketing and commercial quality control of APPLES -as adopted by the Working Party at its 59th session- will conclude its trial period in November 2007.

On the European side, on 1st August 2005 Commission Regulation (EC) No 85/2004 has fully entered into force in the European Community, providing minimum size reductions.

Both UNECE and EC requested interested parties and Member States to provide research data and scientific opinions to evaluate and consider the suitability of current standard provisions for sizing and quality criteria and their potential effects in the global fruit markets.

Copa-Cogeca coordinated some studies conducted at European level by five Research Institutes in different areas. The first results have confirmed what European apple growers expected.

In the meantime the European Commission approved Regulation 1238/2005, delaying the application of calibre reduction until May 31, 2008.

In this paper COPA/COGECA presents the final research results of the studies conducted during the period 2004/2005/2006 in Southern and Northern Europe (Italy, Germany and Belgium) and sustained by a considerable number of Members States' producers organisations.

Methodology notes:

Cultivars:

Italy: Braeburn, Fuji, Gala, Golden Delicious, Granny Smith, Morgenduft, Red Delicious (Red Chief clone), Renetta

Belgium: Elstar, Jonagold, Braeburn

Germany: Gala, Braeburn, Pinova, Golden Delicious, Jonagold

Parameters measured:

1. Content of soluble solids (refractometric method)
2. Firmness
3. Starch conversion (only Belgium)
4. Streif Index
5. Background colour
6. Polyphenols and anthocyanins content

The Italian researches have also considered parameters variability with Low and High crop load.

During last year, researchers in Italy have specifically focused their attention on apple quality measured through sensory analysis.

Results Analysis and Considerations:

a) Really High Inter- and Intra-Regional differences:

The researches have confirmed as expected from the beginning, a really elevated interregional variability. Different cultivars grown in different countries cannot be easily reduced to a single quality provision, because of all the environment variables which are involved in fruit growing, dependent also on the seasonal trend.

In addition to interregional variability, our studies have stressed a set of intra-regional differences. In particular, the Italian area of Trentino highlights unexpected relevant differences between °brix values in the valley and mountain areas belonging to the same productive region.

In this frame, environment has to be considered as a basic variable which could overcome any quality/size consideration.

b) Correlation weight/sugar and weight/firmness:

The studies emphasize the **existence of a direct correlation between weight/size and °brix level, as well as a stricter correlation between weight and firmness**, which could assure the level of quality needed on the market utilizing traditional parameters.

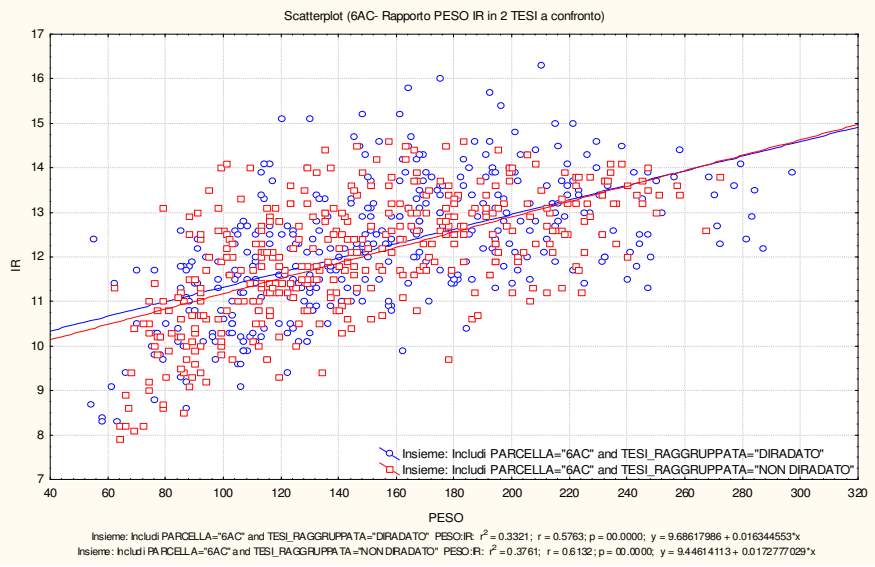
In particular – as a consequence of the correlation between the parameters – a quality system based on weight/size appears already able to remove from the market the bulk of apples not reaching a sufficient degree of ripeness, is really simple to be implemented – being based on a well-know technology – and allows controls to be performed in a continuous way, and not by sampling.

The results are clearly applicable for the condition in the research areas.

Some examples

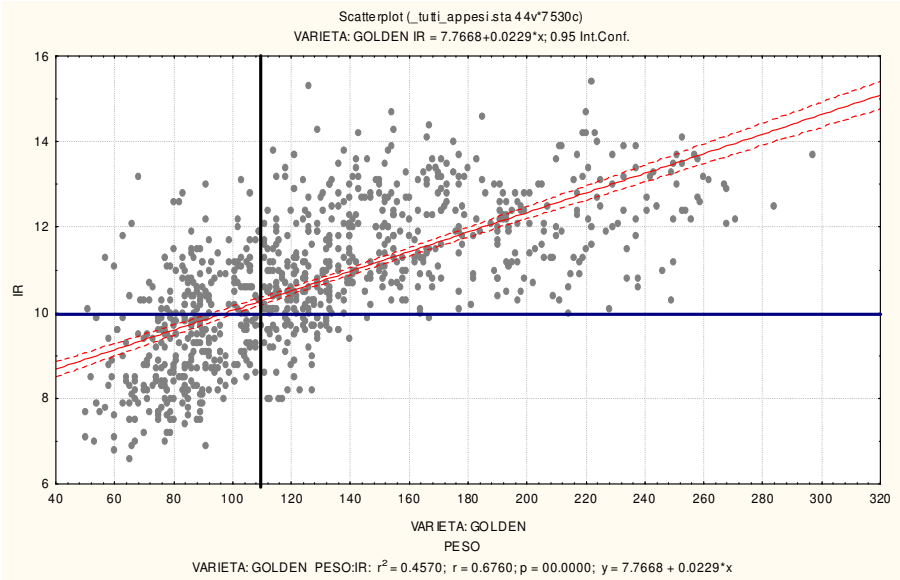
Southern European Area, see below: *Trentino, Golden Delicious, 210 m. – year 2004*

2004 - GOLDEN DELICIOUS (valley) thinned and un-thinned



The results show a positive and comparable relation even after 1 or more month of storage, as highlighted the charts below:

2005 - GOLDEN DELICIOUS after storage (valley)



Northern European Area, Elstar

Vlaams Centrum voor Bewaring van Tuinbouwproducten - Belgium

Duncan Grouping		Mean	N	size
	A	12.6775	160	m75
	A			
B	A	12.5419	160	m70
B	A			
B	A	12.4618	140	m65
B				
B		12.3161	140	m60
	C	11.8222	160	m55

Northern European Area, Jonagold

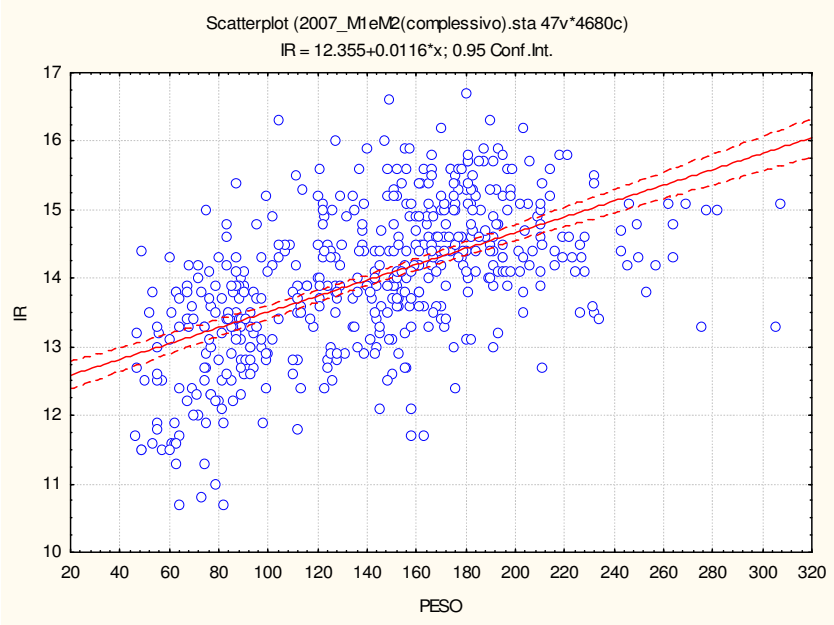
Vlaams Centrum voor Bewaring van Tuinbouwproducten - Belgium

Duncan Grouping	Mean	N	size
A	13.5358	159	m80
A			
A	13.5328	160	m75
B	13.2300	160	m70
C	12.8423	160	m65
D	12.5604	159	m60

When letters showed in the column "Duncan Grouping"[1] are different (A, B, C, D), a **statistically significant correlation** is established, meaning that **°brix value and weight/size are directly related**.

Same considerations can also be applied to Fuji variety

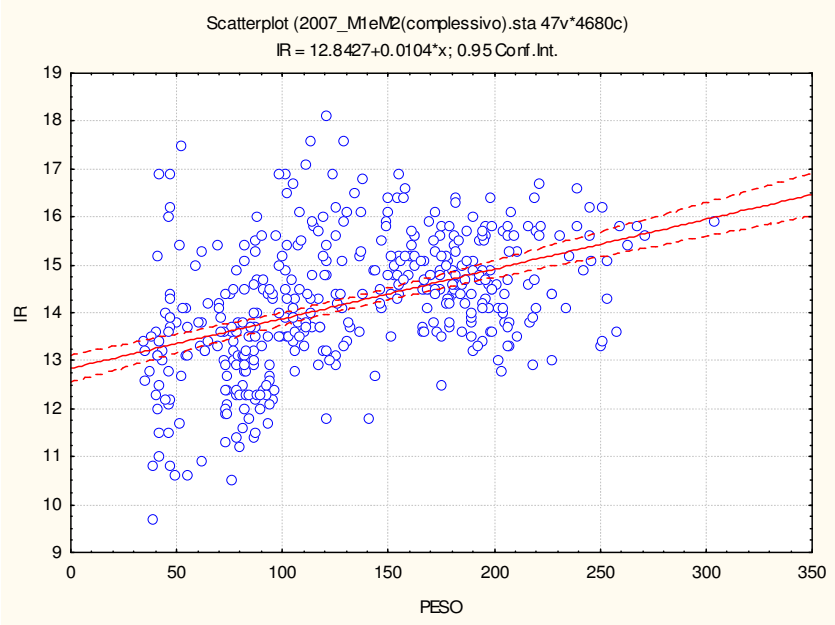
2006 - FUJI (mountain) harvest time



MOMENTO: RACCOLTA, VARIETA: FUJI PESO:IR: $r^2 = 0.3058$; $r = 0.5530$; $p = 00.0000$; $y = 12.355 + 0.0116*x$

[1] *Duncan's new multiple range test* is a type of multiple test used to make comparisons of means after a significant result has been obtained.

2006 - FUJI (mountain)
after storage



MOMENTO: POSTCONSERVAZIONE, VARIETA: FUJI PESO:IR: $r^2 = 0.1980$; r = 0.4450; p = 00.0000; y = 12.8427 + 0.0104*x

KBO - Kompetenzzentrum Obstbau Bodensee Germany
year 2005

JONAGOLD: correlation calibre / °Brix

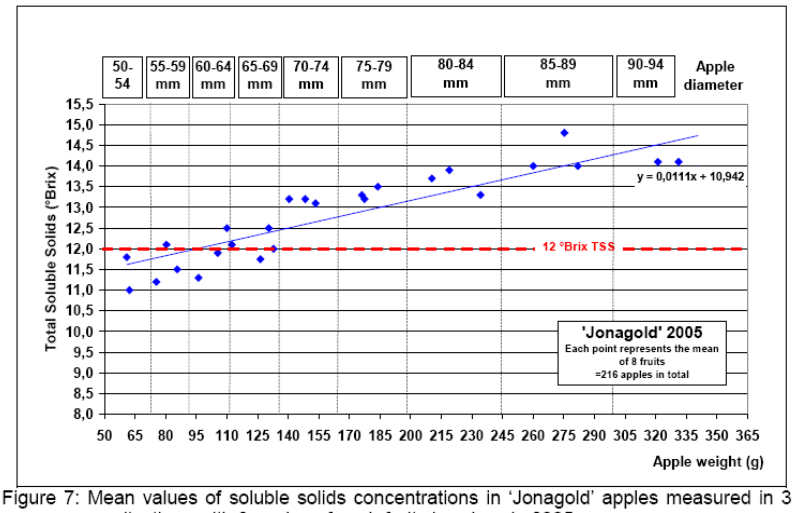


Figure 7: Mean values of soluble solids concentrations in 'Jonagold' apples measured in 3 replications with 8 apples of each fruit size class in 2005.

Even in this case, a statistically good correlation is demonstrated

c) Correlation size/quality: tasting with triangle test

A group of expert panellists and consumers has been involved in a study aimed at determining the relevance of the relation between size and quality through tasting.

The results clearly show that there is a positive feedback: in almost every case, both experts and consumers were able to recognise apples of same dimension and appreciated fruit of bigger size, because of their different taste, even if offered slices were all of the same aspect and dimension.

Tasting of different varieties, experts and consumers.
Research Centre for Agriculture and Forestry of Laimburg, 2005-2006

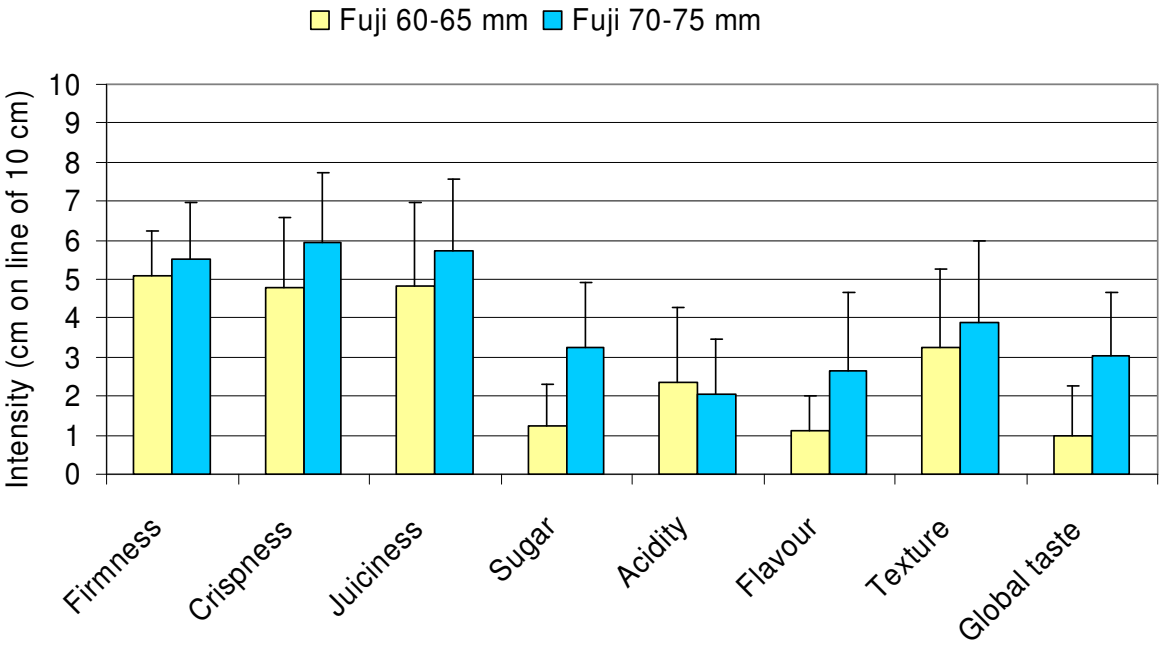
Test	Number Panellists	Variety (ground colour)	Origin (Harvest)	60-65	65-70	70-75	75-80	80-85	Right differentiation	Preference
10	22	Golden Delicious	Val Venosta (2004)						not significant*	-
11	74	Golden Delicious	Trento (2005)						significant (0,1%)	significant (0,1%)
12	82	Golden Delicious	Trento (2005)						significant (0,1%)	significant (0,1%)
13	54	Golden Delicious	Trento (2006)						not significant	-
14	83	Red Chief (yellow)	Trento (2005)						significant (0,1%)	significant (0,1%)
15	65	Braeburn	Trento (2006)						significant (0,1%)	significant (0,1%)

Significance means statistical evidence

d) Correlation size/quality: scale test and internal properties

The scale test on overall quality parameters conducted by expert panellists, confirmed expected results, showing the direct correspondence between size and tasting properties.

Fuji apples, not thinned out, 22 expert panellists, *Laimburg, 2005*

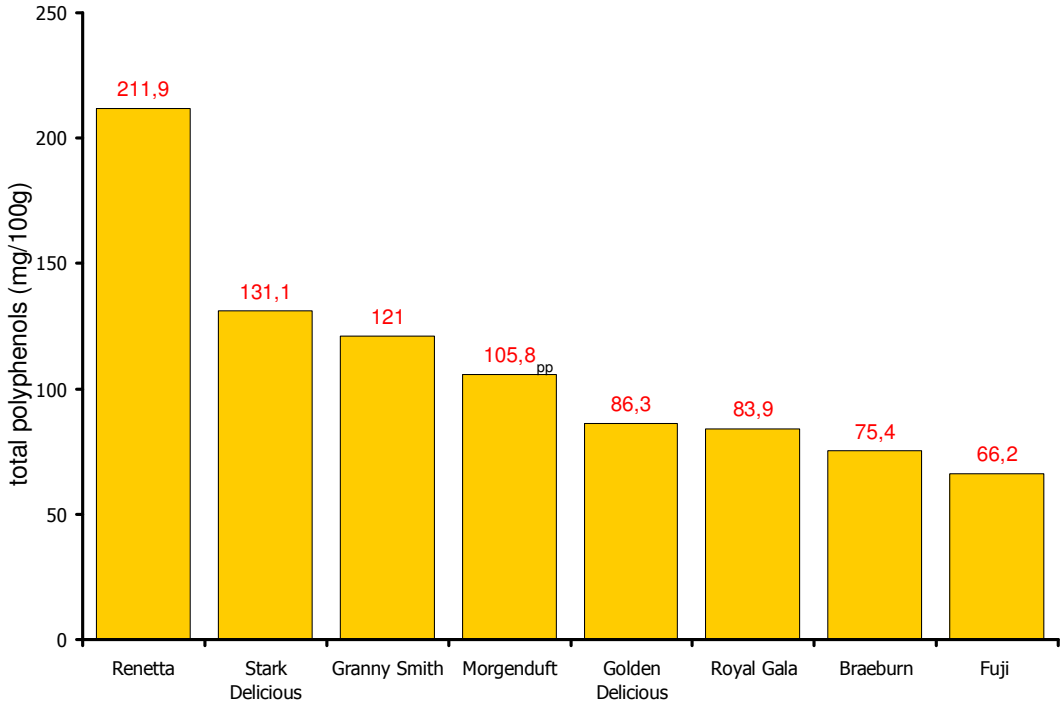


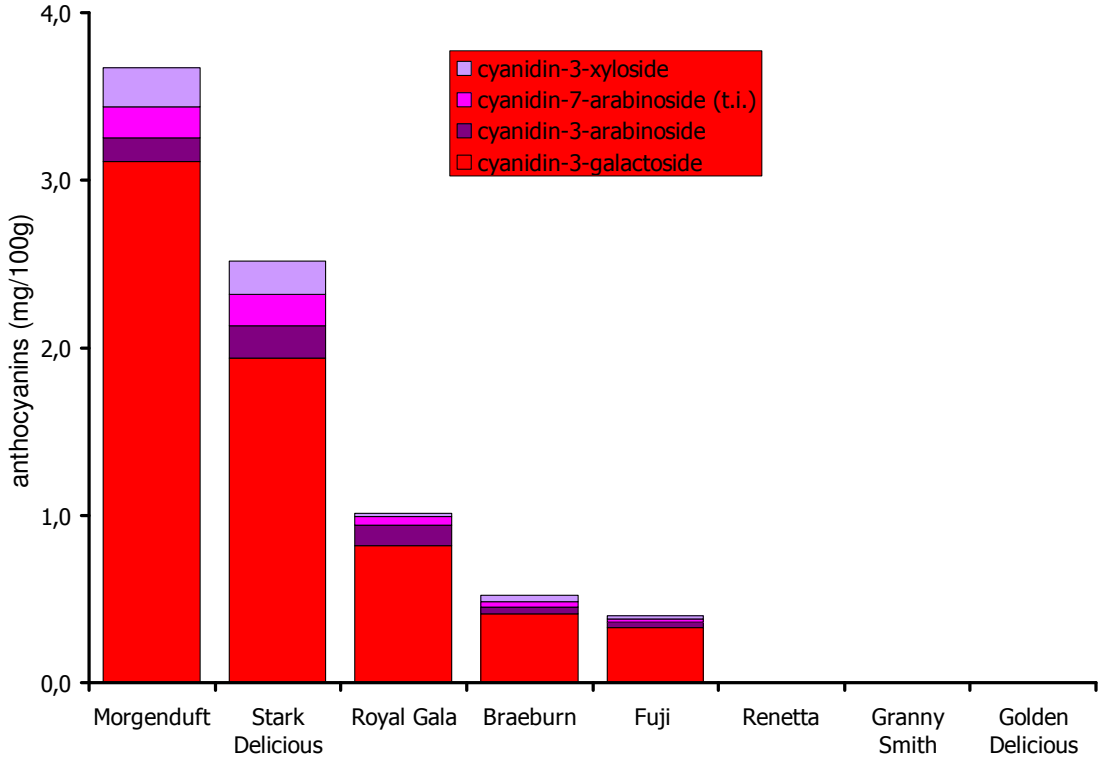
The clear ability of consumers to distinguish apple qualities among various parameters is therefore confirmed, particularly referring to differences in apples dimensions (calibre).

e) Other parameters on quality

Even though scientific and empirical evidence clearly shows a positive correlation, the general idea of quality cannot be easily defined, due to the large number of parameters contributing to taste and properties of different apple varieties.

Polyphenols and anthocyanins content of apples is a suitable parameter for a survey on antioxidant properties, but their presence in each variety does not show a uniform convergence.





Average values
Istituto Agrario di San Michele all'Adige, 2007

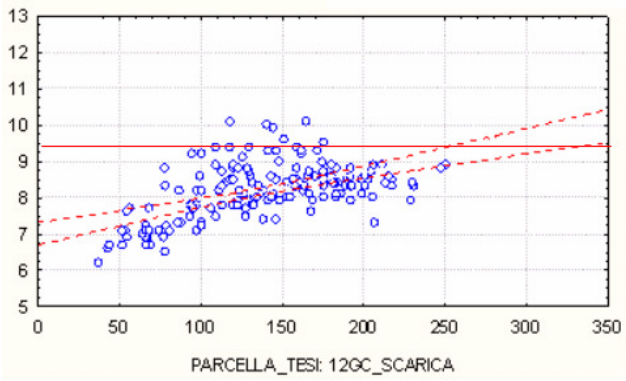
The test shows once more the discrepancy of data existing among different apple varieties, confirming the impossibility to compose a scheme of standardized values suitable for all marketable apples.

Given the difficulty to reach a general definition of quality based upon chemical properties, every effort to define a common standard must be related to a simplified method.

The correspondence between apple size and overall quality is profitably suitable for every purpose of standardization, being simple and immediately applicable, but also truly representative of relevant virtuous properties.

It is therefore very important to maintain an open approach to apples quality properties, in order to allow the commercialisation of different varieties. Even apples with low sugar content –e.g. Stark Delicious, see next chart- are, in fact, rich in other components proved to be useful in correct nutrition practice.

The case of Red Delicious – clone Red Chief Spur



The **graphs above** show that,

if complete studies on cultivars and clones will not be carried out before the legislation come into force, **some cultivars and clones production could be cut off of 90% and therefore will not be marketable at all.**

f) Importance of Good Agricultural Practices (GAP):

EU, UN and many related international institution stressed – in the last 20 years – the need to conform agricultural production to a set of general rules known as *Good Agricultural Practises:*

> *"Good practices related to crop and fodder production will include those that **select cultivars and varieties on an understanding of their characteristics**, including response to sowing or planting time, productivity, quality, market acceptability and nutritional value, disease and stress resistance, edaphic and climatic adaptability, and response to fertilizers and agrochemicals"*[2]

EU producers have understood since many years the advantages of conforming to such a set of general rules in the aim of reaching a major quality and to maintain a sound environment.

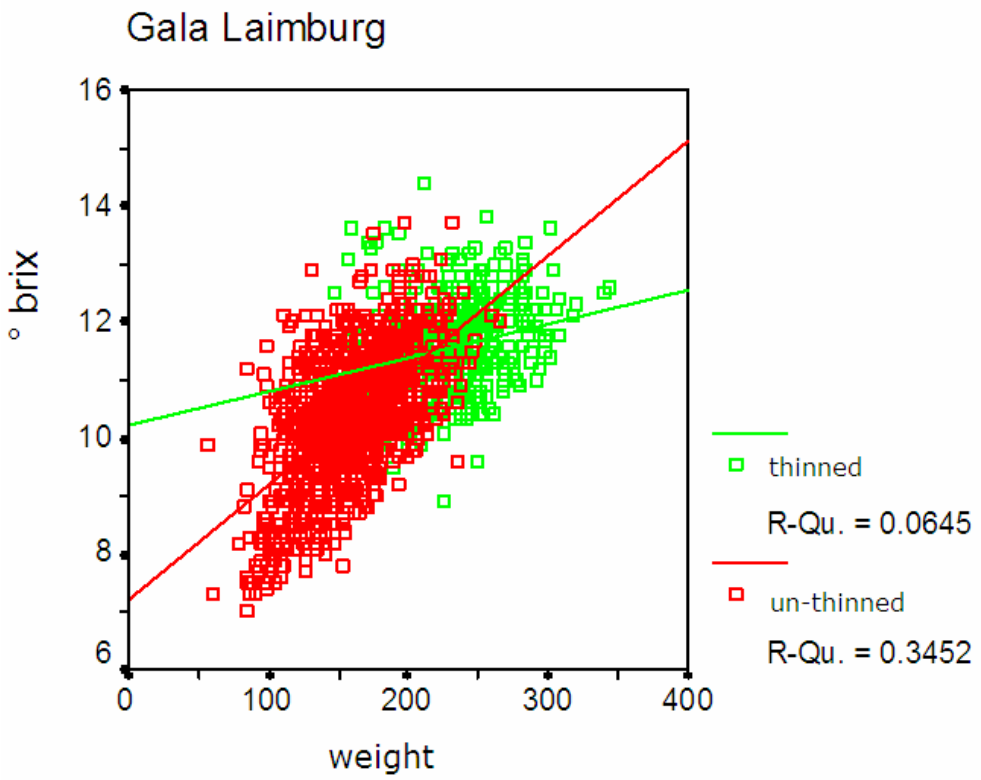
In this perspective, our research has studied and confirmed the effects of *thinning* in improving general quality, particularly with regard to sugar content.

[2] FAO, Committee on Agriculture, Seventeenth Session, Rome, 31 March-4 April 2003, *"Development of a Framework for Good Agricultural Practices"*, Annex, point vi

Southern European Area, see below: Gala[3], Laimburg (Südtirol, 250 m. ca.)

Please note:

- *Green dots:* production from thinned trees
- *Red Dots:* production from un-thinned trees



The graph above clearly shows that **applying Good Agricultural Practise reduces the need for quality parameters**, satisfying any sugar content minimum provision.

It is therefore possible to affirm that international institution should extensively focus on the GAP implementing process, which represents the **easiest and safest way to reach a quality level acceptable in a global perspective for consumers, traders and producers.**

[3] Because of cultivar's characteristics, Gala has been picked in two different moments, not on the same day, in order to reach an acceptable maturity level. For such a variety this practice has to be considered as normal and wholly accepted.

Conclusions:

Considering that in a) we verified the existence of an **high inter- and intra-regional variability**, which **cannot be ignored** if the main aim is to establish fair and scientifically reliable regulations, and we revealed unexpected relevant differences between °brix values in areas belonging to the same productive region, such to underscore that environment has to be considered as a basic variable;

Considering that in b) we demonstrated the **existence of a direct correlation between sugar content (°brix) and weight of fruits**, which has to be regarded as a way to avoid further useless complications in the field of fruit quality and that we do not feel any need for a new system, based on the assumption that technologies needed to meet the new regulations are today normally available to European farmers;

Considering also that **controls** on quality parameters – i.e. brix content – are not as easy to conduct as controls on size which, as demonstrated, can give an adequate result in avoiding inappropriate fruits to get into the market;

Considering, as seen in c) that fruit size is actually related to the overall perception of quality;

Considering, as seen in d) that both expert panellist and ordinary consumers have proved their statistically meaningful ability to distinguish overall quality parameters through the appreciation of larger apples;

Considering – as stated in e) – that apples content in other healthy and quality-related components varies significantly depending on different varieties; as it occurs with Red Chief and, in general, with Red Delicious variety as a whole, that cannot be valued exclusively for its sugar content, if the aim is the elaboration of general quality provisions;

Considering, as seen in f), that **Good Agricultural Practises**, as actually managed and applied in the most advanced fruit growing regions, are able to reduce the need for quality parameters, satisfying any sugar content minimum provision, and represent the easiest and safest way to reach a quality level acceptable in a global perspective for consumers, traders and producers;

1. *Reaffirm*s European producers commitment to quality and consumer safety and satisfaction, nevertheless considering the whole fruit sector's need to univocal and scientifically based regulations considering all the data available and not implying contradictions which could lead to disputes and market crisis;

2. *Underscores* the need to establish a quality system technically easy to be implemented, avoiding any misunderstandings on which products are acceptable for the world fruit market and allowing international institutions to set an effective scheme of controls,

3. *Highlights* that the positive correlation between °*brix* value/fruit dimension and the use of minimum size/weight as a quality standard represent the possibility to prevent that apple not meeting a minimum size will be marketed, but also to safeguard nutritional properties of different varieties, even for those with low sugar content;

4. *Emphasizes* the wide agreement between European producers in putting into practice all the Good Agricultural Practises needed to enhance quality of the products and – in the same time – guarantee an acceptable environmental impact;

5. *Reminds* that the researches confirm the utility of calibre or weight - used by producers until today- as good quality parameters;

6. *Copa-Cogeca underlines* the necessity to follow the path of simplification taken by International Institutions, through maintaining flexible but precise classes, in order to endorse clarity and quality towards distributors and consumers.