INF.12   Document submitted by COPA/COGECA on Draft Revised UNECE Standard for Apples

Contribution from COPA/COGECA

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Introduction:

During the 51st Session of UNECE Specialized Section on Standardization of Fresh Fruit and Vegetables, held in Geneva in March 2005, the delegation of COPA-COGECA presented a research on maturity and quality of apples, carried out in Italy and Belgium for six different cultivars. The results of this work indicated <u>the existence of a good correlation between size and °brix value</u> of the fruits, therefore making size the simplest and more accurate quality parameter.

The delegations attending the meeting, while not fully agreeing on this conclusion, recognized that quality is difficult to define, and adopted as a revised UNECE standard the inclusion of a section on minimum quality requirements but without recommending any values for brix values. Some minimum °brix requirements where adopted as a new UNECE recommendation for a two-year trial period. The Assembly also <u>urged the industry to continue their studies on quality parameters for apples so that the decision after the trial period could be taken on the basis of sufficient data.</u>

Furthermore, on 28 July 2005, EC Regulation 1238/2005 recognized that "minimum size is also a ripeness criterion", and as the study on quality parameters "must be conducted over at least three marketing years, application of the size reduction[1] should be postponed to 1 June 2008 and the transitional provisions on sizing extended to 31 May 2008".

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[1] Regulation EC 85/2004.

On this basis, <u>the II year of research was carried out in Italy and Germany</u> (as representative of Southern and Northern European countries average conditions), involving nine cultivars and considering also – together with size/quality parameters relations – the innovative approach of experts' and consumers' tasting (panel tests).

Methodology notes:

<u>Cultivars:</u>

Italy: Golden Delicious, Red Delicious, Gala, Renette du Canada, Cripps Pink, Fuji

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

<u>Parameters measured:</u>

1. Content of soluble solids (refractometric method)
2. Firmness
3. Starch conversion
4. Acidity
5. Streif Index
6. Perlim index (Italy)
7. Background color (Germany, cv. Gala)
8. Fruit development on the tree (Germany)

Parameters variability has also been considered with Low and High crop load.

Results Analysis and Considerations:

a)   Analysis of weight/sugar content correlation, compared with 2004 results:

The study held in 2004 and presented to UNECE in March 2005 emphasized the **existence of a direct correlation between weight/size and °brix level**, which could assure the level of quality needed on the market utilizing traditional parameters (weight or size) without imposing on the production world a set of requirements that couldn't be easily measured on 100% of production with the actual technology.
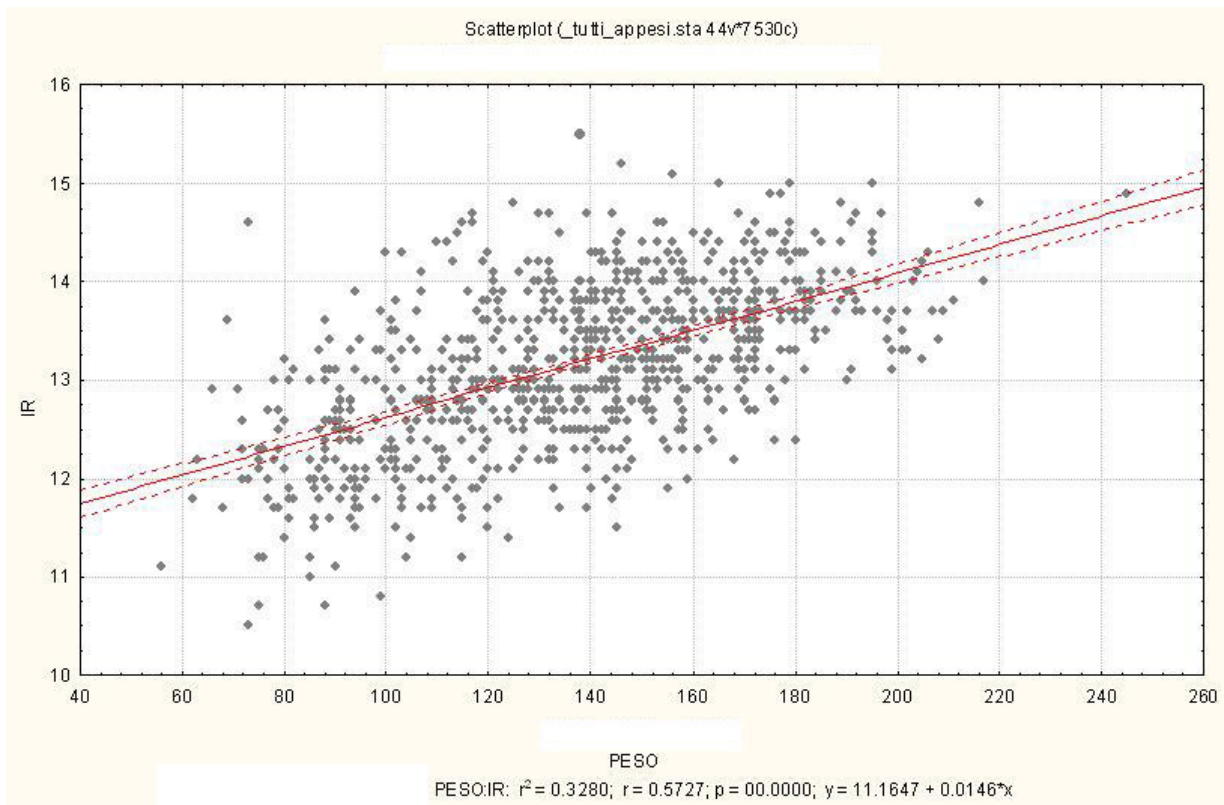
In particular – as a consequence of the correlation between the parameters – COPA-COGECA highlighted that a quality system based on weight/size was <u>already able to remove from the market the bulk of apples not reaching a sufficient degree of ripeness</u>, was simple to be implemented – being based on a well-know technology – and allowed controls to be performed in a continuous way, and not merely by sampling.

The **2005 research fully confirmed the results of the previous year** from the point of view of the existence of a good correlation between weight/size and °brix level.
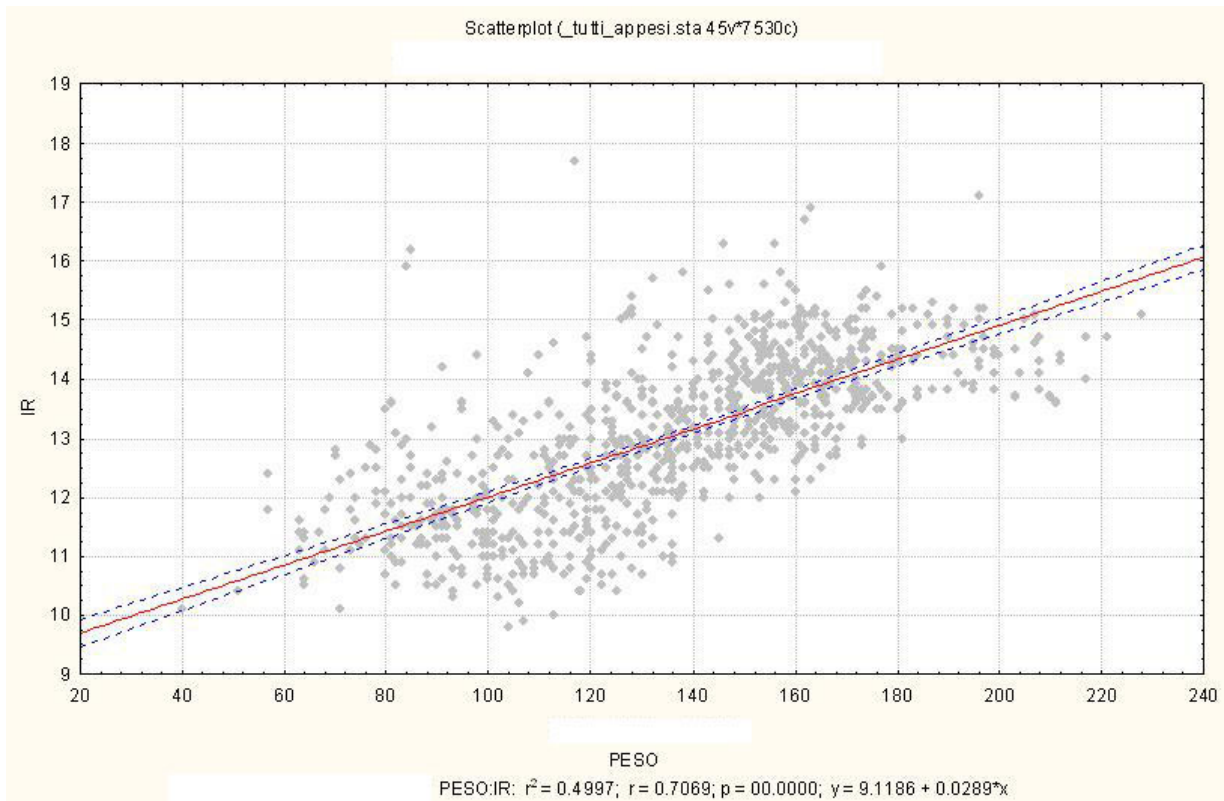
Fruits from the same batch were tested at harvest and after storage (220 days in Controlled Atmosphere plus 8 days of shelf-life at environment conditions), giving the following results:

Southern European Area, *Trentino (Italy), Cripps Pink, 210 m.*

Scatterplot (_tutti_appesi.sta 44v*7530c)

PESO:IR: $r^2 = 0.3280$; $r = 0.5727$; $p = 00.0000$; $y = 11.1647 + 0.0146*x$

Scatterplot (_tutti_appesi.sta 45v*7530c)

PESO:IR: r² = 0.4997; r = 0.7069; p = 00.0000; y = 9.1186 + 0.0289*x

Not only the correlation is <u>confirmed</u>, but the **r²** - which denotes the percentage of variation in the dependent variable (°brix) accounted for by the independent predictor variable (weight) – is higher after storage, stressing that the **<u>correlation tends to increase after storage</u>**.

The <u>same positive correlation pattern is showed for Northern European Countries</u> as highlighted in the example below.

Northern European Area: *Germany, Golden Delicious.*

$y = 0{,}0156x + 10{,}083$
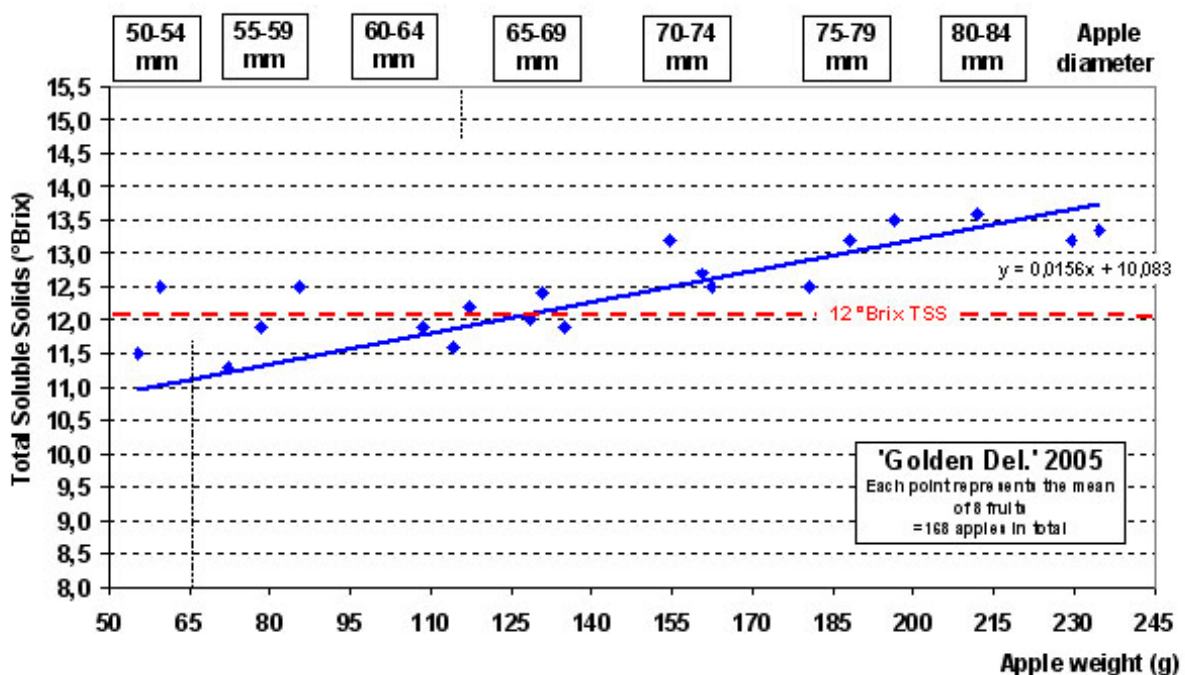
		Correlation coefficients	Fruit weight (size) in relation to:			
		TSS (~sugars)	Firmness	Acidity	Starch degrad.	Ripening index
GALA	<10% blush colour	0,28	-0,91	-0,27	0,12	-0,80
	>75% blush colour	0,78	-0,81	-0,34	0,09	-0,88
BRAEBURN		0,79	-0,62	0,41	0,48	-0,94
PINOVA		0,93	-0,34	0,89	0,24	-0,78
GOLDEN DEL.		0,64	-0,84	0,63	-0,58	-0,73
JONAGOLD		0,85	0,11	0,88	-0,30	-0,36

Furthermore, in the German research, the correlation between size/weight and °brix content was also **analyzed "on tree", to take into account the different stage of fruit developments**.

In this case (graph below), the soluble solids concentrations of the apples of the different size categories were not different in the first period of fruit development, but **differed more and more with ongoing ripening progress**.

At harvest, there were considerable differences in soluble solids content between smaller and bigger sized apples:
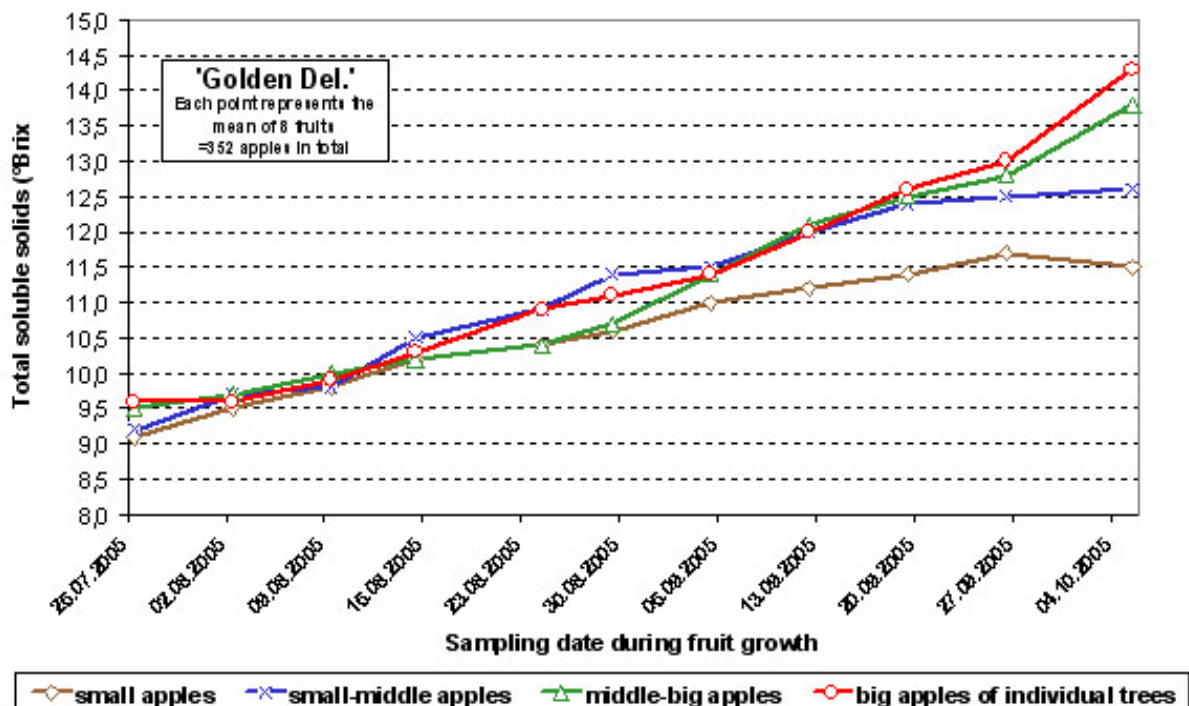
b)   Panel tests results and consumers' preferences:

As consumers' preference is one of the key factor to be evaluated while considering the different issues related to fruit and vegetables quality and marketing standards, the research focused on an innovative approach, i.e. **panel tests with experts and consumers**, in the aim of understanding if consumers were able to distinguish between different samples of fruits (fruits of different size were cut and presented as cubes of the same size, not to influence perception and therefore decision).

After a sugar analysis for different fruit sizes (near-infrared spectroscopy), samples were presented to panellists for tasting by "triangle test", with the following model:

Comparison of 3 samples:

    2 = same fruit size
      (e.g. 55-60 mm)

    1 = different
      (e.g. 60-65 mm)

Questions asked to panellists:

   ¤   *Which sample is different?*

   ¤   *Which sample is better?*

The main **aim of this test** was to check the ability of all panellists to determine sensory difference between samples and, limited on panellists that where able to distinguish the different samples, the existence of a preference between compared samples.

Some results (cv. Golden Delicious, Italy) are shown in the chart below:

Sample 1	Sample 2	Sample 3
70-75 mm	60-65 mm	70-75 mm

Number Panellists	Right differentiation (Significance)	Preference (Significance)
82	57 panellists (p=0,1%)	55 of 57 for sample 1,3 (p=0,1%)

Fruit size	°Brix	
< 55mm	10,65	c
55 - 60 mm	10,27	c
60 - 65 mm	10,69	c
65 - 70 mm	11,06	c
70 - 75 mm	12,23	b
75 - 80 mm	12,69	ab
80 - 85 mm	13,05	ab
85 - 90 mm	13,00	ab
> 90 mm	13,36	a

In several cases the panel results are statistically significant; it is therefore possible to conclude that **panellists are able to distinguish the quality of apples related to their fruit size, for every variety and tasted combination.**

Furthermore, **panellists preferred larger sized fruits, for every variety and tasted combination.**

Conclusions:

Research on quality parameters conducted in **2005 confirmed the results of the previous year**. As in 2004, furthermore, the correlation is stronger outside the top producing areas, where climatic conditions are able to prevail over size/quality consideration. But this areas represent a minor percentage of world production, obviously.

We confirm, as European Producers, that the **correlation between size/weight and °brix values** is able to offer a simple and valid system to remove from the market the bulk of apples not reaching a sufficient degree of ripeness. From this perspective, we wholeheartedly believe that **size** is a **quality parameter**.

In 2005 consumers' preferences were specifically taken into account, as we believe that no quality system aiming to be effective can overlook consumers' opinions. The panel tests, as showed above, scientifically confirmed consumers' capability to distinguish – through tasting – size differences, and highlighted EU consumers' preferences for bigger sizes.

We trust this Assembly will take into consideration these results, and commit ourselves in continuing with one more year of study (already planned), applying also different approaches, to be able to submit more results in 2007.