

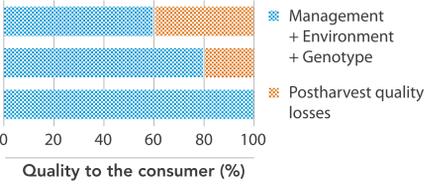
# FRESHNESS OR QUALITY? EVALUATION BY INNOVATIVE SYSTEMS

**F**reshness: definite and quantifiable parameter. It is the elapsed time from harvest to consumption (it is difficult to define when the produce is no longer fresh).

**Q**uality: trait influenced by many factors and by available technology.

## How is quality of a produce?

The quality of the produce to the consumer depends on the losses during the entire production chain.



## Vitamin C

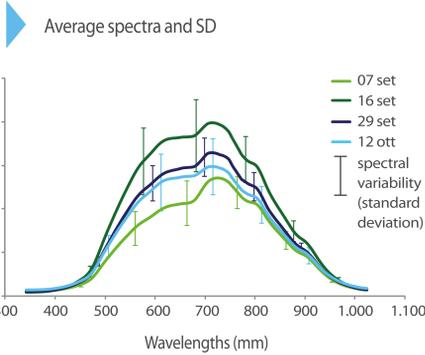
The vitamin C content is maintained in **apple** stored for 6 months in storage rooms equipped with modern storage facilities.



## Ethylene

Ethylene is a **plant hormone** involved in the ripening. The 1-Methylcyclopropene (compounds that does not leave residues) is used for treating fruits and is possible maintain the quality during storage.

## Field: quality

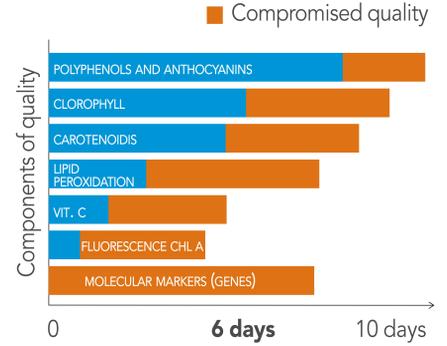


Evaluation of **grape ripeness using optical techniques** directly in the field in order to determine the optimal harvest time. The study of the spectral properties of the grape allows to predict the ripening level.

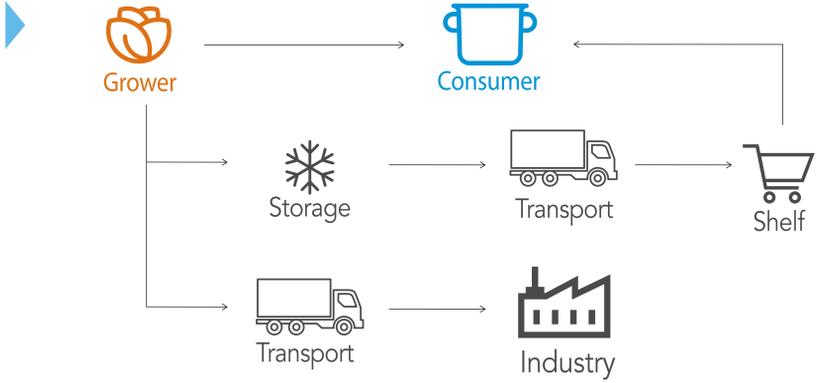


## How to measure produce freshness and quality

Produce quality and freshness may be measured by destructive or non-destructive methods. The graph shows the unstable factors depending on growing and storage conditions of produce. Some of these parameters can be excellent quality indicators.



## Fruit and vegetables chain



The quality of fruits and vegetables is obtained in field thanks to:

- ▶ characteristics of **genotype**;
- ▶ growing management and **environment**;
- ▶ correct **harvesting** time.

After harvest, the quality obtained in field can be only preserved and maintained, but surely it cannot be improved.

The traditional concept of quality, (colour, size, form, sweetness, acidity, firmness), nowadays other important aspects :

- ▶ **healthiness**: absence of residues and environmental impact;
- ▶ **food safety**: absence of contaminants and pathogens; nutritional value;
- ▶ **vitamins content**, antioxidants and fiber.

Every fresh produce can maintain the initial quality for:

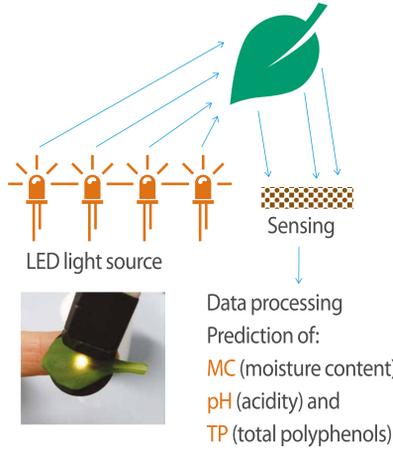
- ▶ **few hours** (salad, raspberries,...);
- ▶ **few days** (apricots, squash,...);
- ▶ **for months** (apples, kiwi, potatoes,...)

Technologies allow a precise storage environment management, to which ripening control techniques are associated.

Freshness and quality can be measured using **non-destructive techniques**, in particular optical analyses for rapid evaluation of fruit and vegetable products without destroying them. These technologies allow the monitoring of the entire fruit and vegetable chain, from the field to the point of sale. Operators can take immediate decisions in order to preserve the **consumers' expectations** providing additional selection criteria.

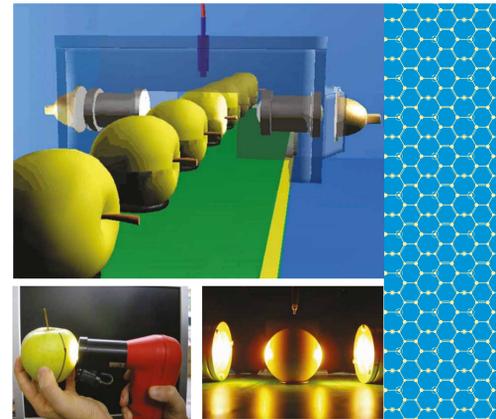
## Shelf life: freshness

Concept of an **optical device** based on 4 wavelengths for the prediction of the **freshness** level of fresh cut lamb's lettuce.



## Storage: quality

**Optical systems** for quality analysis of apples directly at the warehouses during storage. The prediction of **apple texture** could be useful to sell only the apples with the right crispness.



Progetto

