



Second International Conference on

AGRICULTURE IN AN URBANIZING SOCIETY

Reconnecting Agriculture and Food Chains to Societal Needs

14 - 17 SEPTEMBER 2015 | ROME | ITALY

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ISBN
978-88-908960-3-3



Scrutinizing Visual Quality Assessment of Fresh Produce as Entry Point toward Strengthening Local Food Systems

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Abstract – In this study we hypothesize that one of the most significant steps toward promoting local food systems is through both analyzing consumer's demands and revisiting mandatory/ voluntary guidelines on cosmetic defects of food. The objective of this study is to provide a holistic analysis to whether "blemished" fresh produce entering the food supply chains carry food safety risk or rather opportunities to promote local food systems. This work was conducted studying various sources of information, including: i) quality standards (both voluntary and mandatory) and other regulatory tools; ii) analysis of range of characteristics prevalent in assessing visual quality of selected fruit and vegetables along the supply chain; iii) survey to consumers of locally produced fruit and vegetables. The results demonstrated that standards for grades of fruit and vegetable indirectly exclude local food producers. Moreover, terminology used by current standards to describe physical defects is confusing which has influenced the way to assess produce by actors in the supply chain, as well as consumers. We conclude that better understanding of field-physical/pest damaged fruit and vegetables and its scientific validation of the relative food safety risk may become an important additional tool toward stimulating consumption of local produce.

Keywords – blemish, credence parameters, foodsafety, postharvest, standards.

INTRODUCTION

Local fresh horticultural food systems are often linked to several positive factors contributing to a sustainable society, including better standard of living in rural areas, a fairer income along participants in the food system, a more diverse diet for urban dwellers (Dimech et al., 2011). However, with the spread of global trade agreements and the increased establishment of rigorous quality standards (e.g. by new grocery stores), the inclusion of local products in food systems has shrunk (Wirth et al., 2011).

Social movement in the past years have made substantial efforts to include local producers in food systems (Winter, 2003), but clear limitations for expansion remain. The offer of local/indigenous varieties, commonly produced with low inputs, is increasingly non-alluring to buyers and the general public, given the long established popular wisdom that relates heterogeneous food surface with lower overall quality.

We propose to look more in-depth into the current quality standards, and determine whether those by default exclude local products that often reach harvest physiological maturity with high incidence of cosmetic

defects. With up to 50% losses of fruit and vegetables worldwide (Gusttansson et al., 2011), and similar high losses in potential nutritional benefits (White et al., 2014) the only acceptable reason for excluding fresh local production from the market must be a well-evidenced high food safety risk.

Our objective was to analyze the way visual quality of fresh produce is assessed and regulated, and determine opportunities to promote higher acceptance of local products by improved education and more science-base specificity in quality standards.

METHODOLOGY

This work was conducted investigating various sources of information, including: i) quality standards (both voluntary and mandatory) and other regulatory/public health information, ii) analysis of a range of characteristics prevalent in assessing visual quality of selected fruit and vegetables along the supply chain. Moreover, five consumers known to be driven by "credence" parameters (i.e. frequent buyers of a local organic food box scheme, Le ZolleSrl, Rome, Italy) when assessing quality of fresh produce were asked to express purchasing preference among fruits (oranges, apricots) that had different type of blemishes including fungi, mites, ethylene driven, thrips and other insects, as well as physical damages ranging from mechanical damages from field to nail punctures. In all cases the incidence of quality defects of the fruits was above 10%.

RESULTS AND DISCUSSION

The tendency to propose homogenous visual quality of food has resulted in most retailers establishing stringent measures in standards for products, which has in turn led to a major losses in previous steps in the supply chain (HLPE, 2014).

After revising a number of quality standards, we concluded that essentially in all cases fruits with 10% of area cosmetically damaged is what is tolerated for the lowest quality standard, including official measures as US number 2 grade (e.g. US Standards for grades of tomatoes, lettuce, oranges) or CODEX Class 2 (e.g. CODEX standards for bananas, oranges, tomatoes). There are a few exemptions as with apples cv. Yellow Newtown for which up to 20% of smooth russetting would be acceptable (US standards for grades of apples). However, there are a number of fruits (apples in this case) that will be prone to high incidence of russetting; in fact it is known that in the past, many popular apple varieties were often covered with russet without affecting eating quality (Watkins and Cole, 2013).

Moreover, terminology used by current standards to describe visual defects is vague, which hinders interpretation. Blemish, a common word used in all

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standards, defined "as a noticeable imperfection, especially one that seriously impairs appearance"(Merriam-Webster Dictionary, Encyclopaedia Britannica), while originating from the Old French word "blesmir" meaning making pale by wounding, does not explicitly refer to an injury that is open or internalized.

Under the premise of reducing the waste of food and the resources necessary to obtain it, in assessing quality the only ethical reason that justifies rejection of food is consumers' safety. In this regard, research shows that only blemishes that penetrate tissues could be associated with high food safety risk (McDowell et al., 2007). Data on food borne outbreaks does not clearly support a correlation of blemish incidence with pathogen-derived diseases. In fact, the only clear trend shown in the past few years relates to a great number of food borne outbreaks with cross contamination occurring during postharvest handling stages, most often at catering points; regardless of the origin of the product (Gormley et al., 2011). While clinical pathogens have increased survival in porous surfaces (e.g. stomata, lenticels) and could become internalized through broken tissue, more than in smooth surface, natural skin cracking and healing during growth of fruits have not been associated with proliferation of clinical bacteria (Gautam et al., 2014). Blemishes in fruits, if not caused by reaction to environmental or pest stress, may normally be classified as whether originated from low calcium intake, chilling injury or ethylene driven (Watkins and Cole, 2013), none of which commonly derive in internal injuries unless mishandling occur.

Consumers can learn how to differentiate produce that has strict cosmetic defects from those that have high safety risk, and this better understanding of field physical/pest and postharvest damaged fruits and vegetable, and its scientific validation of the relative food safety risk, may become an important tool toward stimulating consumption of local produce. However, the willingness or inclination to "sacrifice" visual quality may vary among different groups of the population (Dimech et al., 2011; Wirth et al., 2011). Consumers have long used visual quality as a proxy when forming an opinion about the healthiness, nutritional value, and general safety of food (Dimech et al., 2011). Decision on purchasing "sustainable" food relies heavily on visual and aroma perception, along with health related attributes (Moser et al., 2011), even though evidence attributing different sensory attributes to produce grown from different production systems is still lacking (Murphy et al., 2011).

This non-well evidenced quality attributes often associated with credence parameters may be an opportunity but also a point for caution when strengthening efforts toward local production. The survey to regular buyers of local produce showed that absolutely all consumers would accept produce with visual quality defects even when those were finger nailmarks and internal injuries. This revealed that "trust to a provider" tops any visual quality attribute of the food for certain consumers. This finding is in agreement with Murphy et al. (2011) that concluded that among credence features, "local" is commonly ranked on top of organic, certification, origin, even when there is no clear evidence of a regulating body.

Our work revealed that the potential for improving penetration of local fresh produce may be prompted

through efforts to better understand the connection of visual quality with safety, and with further exploiting increased appealing of credence parameters. We propose to educate consumers, both conventional and those driven by credence attributes, with the typology of cosmetic blemishes, so as to more efficiently reduce food losses and protect consumers from high food safety risk. This may need the revision of current quality standards.

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