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**Identity preservation: Lessons from a Case Study Addressing GM and Non-GM
Maize Supply Chains**

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Abstract:

Identity preservation (IP) refers to a system of production, handling and marketing practices that maintains the integrity of and purity of agricultural commodities. Products segregation plays a key role in IP, but an IP system is more demanding, namely due to testing requirements.

Labelling regulation for GM containing or derived food and feed in EU, as well as some food manufacturers' prerequisite of GM-free raw materials, prompted new developments of IP systems that are now part of the modus operandi of major supply chains.

A research on the Portuguese maize bread supply chain, a minor maize supply chain in value but large due to the myriad of actors it involves, was conducted in order to understand if and how GM labelling regulation is accomplished.

Direct interviews to several stakeholders along the maize bread supply chain evidenced a large heterogeneity in awareness and performance of GM-labeling rules. But results also reflected heterogeneity in awareness and performance regarding other traits, including traits envisaged by Codex Standards or traits associated to traditional maize bread, as it is the case of flint type varieties and, moreover, the IP of maize landraces, traditionally grown for bread making and that are still grown by some farmers.

Altogether these results encouraged a comprehensive discussion of implementation of IP systems and suggest that isolating non-GM maize IP and its costs from the comprehensive IP system of each supply chain might be misleading.

Keywords: Identity preservation, maize bread, segregation

JEL codes:Q13

1. Introduction

Identity preservation (IP) refers to a system of production, handling and marketing practices that maintains the integrity and purity of agricultural commodities and in its simplest forms it has been employed since the beginning of agriculture (Sundstrom et al., 2002). The simplest IP form is segregation, consisting of separate production, trade, storage and processing of goods; recordkeeping and testing across the supply chain are minimal. Trade and manufacture developments, namely in food, feed and seed industries, increase the quality and purity expectations of buyers and processors that are translated into new or stricter standards. Therefore IP systems go beyond segregation, as they call for recordkeeping and testing activities (Muth et al., 2003). Ultimately, some IP systems must be complemented with traceability that allows information on the product path since its original source.

Genetically modified (GM) crops made agriculture commodities more diverse, broadened the choice criteria of stakeholders along the supply chains and are therefore at the basis of new standards in trade and manufacturing. The heterogeneity of these standards across the world is well known and its discussion goes beyond the scope of this research.

In Portuguese maize supply chain GM and non-GM maize coexist either in production or imports, and the systems of segregation and identity preservation are generally quite clear: on the one hand, the feed industry, which absorbs 94% of maize, opted for positive labelling for the presence of GMOs, acquiring wholesale GM and non-GM maize, with the exception of a single organic feed manufacturer that observes the legal EU limits for this type of product (0.9%); on the other hand, major food industries - breweries, starch, breakfast cereals, baby food – demand non-GM maize, requiring either the legal EU threshold of 0.9% or the technical zero (0.1%) for the presence of GMOs. These industries, for their concentration and size and its close relationship with the primary production of maize (mainly Portuguese, sometimes also border regions of Spain), have stable supply circuits and are currently routinized in IP for several traits, GM-absence included.

Maize bread is a type of traditional bread in some regions of Portugal, but it is available anywhere in the country. There are no official statistics on this product, but, according to one of the largest retail groups, the maize bread corresponds to 1% of the bread turnover.

The bread industry is essentially different from other food industries that operate with maize: scattered all over the country, atomized, with numerous actors, ranging from own production of single bakeries to industrial bakeries; final product usually not packed; overwhelming majority of production based on cereals other than maize.

Bakery business splits between bakery retail (10%) and non-specialized retail (supermarkets) that might include in-store bakeries (Statistics of Portugal, 2014).

A study aimed at evaluating the accomplishment of EU GM-labelling rules in maize bread supply chain, based upon direct interviews to stakeholders – maize producers, stockists, millers and bakers – made possible to gather data about adoption along this supply chain of Identity Preservation (IP) intended beyond GM and non-GM separation. Reporting and discussing this information is the aim of this paper.

2. Material and methods

Questionnaires targeting different classes of stakeholders along maize bread supply chain were drawn and applied by direct interviews to seventeen maize producers, nine stockists, twenty two millers and forty bakers.

3. Results

All 17 farmers grow non-GM maize, either white maize cvs., the most popular for maize bread, or yellow; most use conventional hybrids, but two still cultivate landraces. Only 25% of farmers mentioned the need of recordkeeping or written statements to meet their customers' requirements. The types of documents consisted of seed batch, seed batch plus cultivation register, declaration of integrated production or a statement that the maize is non-GM. As GM-seed bags must be labelled in regard, seed batch provides information on whether the crop is conventional or GM. However, integrated production only demands proofs on fertilizers and pesticides, not on seed.

No maize producer has been asked to provide test results to his customers.

Most stockists in this research deal only with domestic maize; only 22% trade also imported maize, coming from Spain. Though most stockists don't ask (78%) or provide (67%) documentation about the maize they trade, 67% run tests on maize; however GM-testing is seldom included (one case out of six). Nevertheless, 78% stated to handle only non-GM maize, the remaining stating dedicated lines or cleaning procedures to insure segregation and all stockists providing records to their customers (33%) take the GM issue into account.

While 77% of mills stated at least one form of ensuring separation of non-GM and GM-flour - handling only non-GM maize (36%), running segregation procedures (32%) and/or flour testing (41%) -, 23% indistinctly process non-GM and GM maize, suggesting their main business is feed industry supply.

Records and testing among mills are summarized in table 1. Interestingly the demand of records from suppliers and testing exceed the request of customers, particularly when information on GM-presence is concerned.

Within bakeries both industrial and individual were included. Most (83%) demand records from their suppliers, though only 9% of these require records informing on GM-presence.

4. Discussion

IP systems are in progress constructions, building in handling, recordkeeping and testing activities to meet new criteria and standards. The inclusion of new activities is driven by stakeholders' awareness of new criteria and standards and consumers' exigency, and its routinization depends on costs and complexity of new procedures and on operators' skills and resources. Costs very much depend on tolerance levels (Huffman, 2004), might be overstated by who are unconvinced of the need to undertake IP and reduced as industry learns how best to organize it and as the volume of material involved increases (Buckwell et al., 1998) and can be offset by premium prices (Sunstrom et al., 2002).

By its characteristics, namely the myriad of small businesses that coexist with major players, in maize bread supply chain it's possible to observe different stages of IP systems adoption between and within classes of stakeholders.

Except for white maize production, that gets a premium price due to the common lower yield compared with yellow maize cvs., along maize bread supply chain there is no premium price to be shared and cover IP system costs.

IP adoption is quite frequent among millers that are likely pushed by food industry customers other than bakeries. Among those running IP, most have already built in GM control. Farmers secure segregation of white and yellow maize and supply of non-GM maize, though this is seldom documented. While several stockists perform tests on maize, this information not always (50%) flows downstream; besides in all cases of documentation to customers GM matter is included; this could suggest they might easily play their part in IP systems as far as they are asked to do it. Most bakeries show to be attentive to IP systems, considering the percentage of those demanding documents, but they look scarcely concerned with GM issues, namely the labeling rules they should meet. Bakery industry in general is largely regulated and information in regard must have reached the operators, but the same does not apply to GM-labeling regulation that, by now, interests only a small niche of the business: maize bread. Additionally, the pressure of consumers' awareness or exigency seems absent, but we have no data to support a discussion in regard.

5. Conclusions

This quick overview of IP adoption in maize bread supply chain suggests a stakeholders' distribution ranging from early adopters to laggards, where adoption is due more to personal communication than to mass communication arising from consumers' organizations or regulators. This might encourage to further address IP adoption in the sociological framework of diffusion of innovation theory (Roger, 2003) and model (Bass, 1969), an approach that, to our knowledge, has not been used so far.

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Table 1. Overview of IP items requested or developed by twenty two mills and relevance of GM information among these items.

IP items	Overall	Share of those that include GMO
Records from suppliers	59%	69%
Records to customers	55%	17%
Maize testing	14%	67%
Flour testing	64%	64%