Identity Preservation in International Feed Supply Chains

Préservation de l'identité dans les filières d'aliments du bétail internationales

Identity Preservation in der internationalen Futtermittelkette

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Identity Preservation (IP) literally means preserving the unique characteristics of a product through its isolation and identification throughout the supply chain. As many authors have observed (e.g. Lin, 2002; Smyth and Phillips, 2002), IP is often associated with three types of product certification schemes that differ in terms of objectives and the stakeholders involved: 1) Identity Preservation and Product Marketing (IPPM); 2) Segregation; and 3) Traceability Systems (TS). IPPM typically relates to voluntary standards introduced by private companies to exploit marketing opportunities. It may require more or less tight management schemes depending on the product and the market served. In the next section, we will discuss how IPPM works in the case of non-GM feed and food products. Segregation aims at limiting the presence of goods that could lead to potential food safety concerns; for example, Canada requires mandatory segregation for high erucic acid rapeseed due to potential impacts on human health (Smyth and Phillips, 2002). TS creates an effective linkage between final consumers and producers. Segregation and IPPM systems have a formal structure requiring that 'crops are kept separate to avoid commingling during planting, harvesting, loading and unloading, storage and transport' (Lin, 2002). But it is important to note that while IPPM is a purely private mechanism, segregation is typically promoted by public intervention.

The importance of all three types of certification schemes for trade in agricultural commodities is associated with the structure of the international supply chain. Since many imported products often undergo aggregation in handling and processing to achieve economies of scale, uncertainty about product quality has increasingly become a driver for the implementation of IPPM, segregation and TS (Varacca *et al.*, 2014). An effective supply management system must therefore involve all the actors operating along the supply chain (farmers, marketing cooperatives, mills and crushers, international trading companies, compound feed producers and distributors), and must efficiently assign liability in case of failure to maintain product integrity.

Although many products are handled under distinct certification schemes, there are situations in which two or even all three schemes coexist and compete with each other. In this article we focus on IPPM, discussing how it is structured (and how it works) for the marketing of non-Genetically Modified (non-GM) crops within the European Union (EU).

Segregation and IP in the market for non-GM feed and food products

For products of animal origin, a 'non-GM' label can be used in several Member States (e.g. Austria, France, Germany, Italy) when animals are raised with feed containing less than 0.9 per cent of GM material for each ingredient. GM labelling applies to feed and food products when the

Modular loading and unloading system for cargo ships at the port of Ravenna.

DOI: 10.1111/1746-692X.12118

threshold is exceeded, which is typically the case for feed containing soybeans. IPPM generally involves tighter restrictions as the allowable GM threshold is, in general, lower than the EU one. The IPPM adopted for non-GM products implies a sophisticated arrangement of private standards, with certification of suppliers and audits at each stage of the supply chain. Standards are typically promoted and set by companies that are in direct contact with the final consumer and are pursuing branding strategies, i.e. food manufacturers or food retailers. Upstream firms (compound feed producers, livestock breeders, international traders, cooperatives and farmers) willing to join the 'non-GM' supply chain must follow the defined standards. However, downstream actors often collaborate with key upstream suppliers in setting private standards resulting in knowledge transfer and increased vertical coordination (Passuello *et al.*, 2015).

Critical steps in the non-GM supply IPPM process

When a product originates from overseas, international traders play a key role in guaranteeing compliance with technical requirements. The GM threshold required (often 0.5 per cent) when purchasing non-GM commodities from overseas suppliers is typically lower than the legal threshold (0.9 per cent). This provides a buffer aimed at reducing the risk of non-compliance through any downstream commingling (the so-called 'technical effect') when the product is unloaded and stored at the destination port. Trading companies may also require stricter thresholds to be able to comply with stricter private standards of some of their customers. Although IP practices start from seed production and end when products reach final consumers, the IPPM system for non-GM agricultural products involves three critical steps: product management at the origination/destination port, product transportation and product processing in dedicated plants.

At the origination port, ships' holds are inspected and cleaned before the product is loaded and polymerase chain reaction (PCR) tests are carried out after loading. These tests, which identify the genetic fingerprint of products, are crucial since, in case of non-compliance with the GM threshold, a shipment can be redirected to other destinations or customers. Tests at destination ports are carried out as well, since trading companies are typically liable for non-compliance until the product is sold and loaded onto customers' vehicles. In this context, the use of certified terminals at a destination port is necessary, and product management at the port is critical in the non-GM supply chain. Without the implementation of best management practices, commingling and adventitious presence issues could easily arise.

> “Les programmes de préservation de l'identité demandent une coordination très étroite entre les acteurs concernés.”

Besides terminal certification, it is necessary to coordinate all the activities of the actors involved in handling at the port, namely: terminal operators, shipping agents, port overseers and final customers. Coordination mechanisms are aimed at ensuring that the product correctly flows throughout ports and reaches customers at the agreed time. In particular, terminals are required to employ dedicated handling capacity that is properly cleaned before the non-GM product is loaded and the use of dedicated vacuums and blades for discharging products. The latter is perhaps the most important precautionary measure a port terminal can adopt, since discharging non-GM goods with the same vacuum employed for GM products would almost inevitably lead to commingling problems. Finally, terminal operators (and any other port operators involved in handling the products) require specific training so that they can manage both GM and non-GM products to guarantee effective IP.

Port elevators can be operated by the terminal operator or by multinational trading companies. The important feature is that GM and non-GM batches are stored in dedicated facilities. Shipping documents should also be kept separately in order to avoid product misplacement.

Transportation represents another critical point in the IPPM system. Trucks transporting non-GM products should be systematically cleaned and should not be used for the delivery of GM products. This is the main reason why strong coordination of both inbound and outbound logistics for non-GM products is a preferred option for most feed and food manufacturers. Although various degrees of vertical coordination for product transportation exist, the full integration of inbound logistics is unlikely but long-term contractual relationships between producers and private truckers often apply. Building a relationship based on mutual trust is perhaps the best way for feed producers to make sure that the inbound product will be free from GM components.

The last critical step for non-GM IPPM is the adoption of dedicated processing plants for feed manufacturing. Experience shows that temporal segregation is not a feasible option since machinery cleaning using inert material (typically bran) does not ensure the elimination of residues. Any feed processor willing to engage in the production of non-GM products would need to invest in dedicated plants. Depending on the structure of local demand, three differentiated production strategies can be identified: 1) small or medium enterprises doing business with non-GM feed only; 2) large feed producers with dedicated non-GM product plants; 3) medium or large producers outsourcing non-GM production to small/medium specialised enterprises. While the first case is basically a niche strategy, the decision to adopt either the second or the third strategy has important organisational implications. The second strategy requires a more rigid organisational structure, and non-GM volumes may be insufficient to

Agricultural commodity silos at the port of Ravenna.

exploit economies of scale. This would result in higher costs due to underemployed processing capacity. The third option (outsourcing) provides more flexibility, while requiring greater horizontal coordination in managing sales and logistics.

> „IP-Systeme erfordern eine sehr enge Zusammenarbeit aller Beteiligten."

Since the exploitation of economies of scale is fundamental to competitiveness in the feed sector, it is not uncommon to observe extreme cases of firms with dedicated non-GM plants selling part of their non-GM output as 'conventional'. This way they can use their processing capacity optimally. In other words, if the market for non-GM feed does not adsorb the entire production, it is preferable for feed processors to sell part of their output as GM at a lower price. In other cases, for the same purpose we observe feed processors complementing non-GM processing with the organic one. In this case both products are non-GM and segregation works the other way around: it is the organic product that needs to be IP from the non-GM one. However, this can be easily managed within the same processing plant.

IPPM beyond European boundaries: overseas product management

Maintaining control over overseas production is crucial to avoid the adventitious presence of GM and non-GM material in imports. Therefore, IPPM and TS typically extends to overseas operations, with international trading companies representing the link between the two sides of the supply chain – domestic and international. To reduce quality uncertainty at destination ports, tight organisational structures with highly formalised contracts and process certification are typical for supply chains for non-GM agricultural products in countries such as Argentina and Brazil (Varacca *et al.*, 2014). In this context, Pelaez *et al.* (2010) provide a case study of an upstream IPPM built and validated by a large international certification body in partnership with Brazilian soybean crushers and an international trading company (see Box 1).

The aim of this IPPM system is to provide European customers (typically feed producers) with a consistent and reliable flow of non-GM raw material. The certifier attests to the absence

> IP schemes require very tight coordination between the actors involved.

of GM material in the soybean meal by certifying each stage of the supply chain, namely: production and multiplication of seeds, grain production, industrial processing and delivery for export. Crushers carefully monitor each stage, with meticulous sampling techniques and product testing procedures, ranging from rapid strip tests to more sophisticated PCR analysis.[1]

Since the risk of admixture between GM and non-GM products is particularly high at the port terminal, crushers' monitoring activities are intensified at this stage of the supply chain. Moreover, the international trader must deploy a system which guarantees compliance with the GM threshold required by final customers, as discussed earlier.

Dependency amongst actors

What emerges from our description of non-GM IPPM systems is the high degree of dependency between the actors involved in the (international) supply chain for these products. Although 'formal' vertical integration through mergers and/or acquisition is rare, IPPM schemes require very tight coordination which is enforced through downstream-driven technical requirements and process certification schemes. Therefore, these highly formalised coordination frameworks accomplish in practice the same purpose as vertical integration in reducing the uncertainty of transactions in terms of product quality and information (Varacca *et al.*, 2014). However, non-GM certification systems are challenged by the uncertainty that characterises the supply and demand of non-GM feed and food products. On the one hand, the long-run availability of non-GM agricultural goods is unclear (this is particularly true for soybeans and soybean meal; Tillie *et al.*, 2012); on

Box 1: The Brazilian supply chain for soybeans

Soybeans are currently one of the most important agricultural products imported by the EU, both in terms of volume and value (Eurostat, 2015). The largest share of imports originates from Brazil (roughly 47 per cent of imported beans and 48 per cent of imported meal in 2013) as well as almost all non-GM IPPM soybean meal. Therefore, it is important to understand what the Brazilian supply chain for this agricultural commodity looks like.

Farm structure. Ownership structure and the degree of vertical integration of soybean farms differ across regions in Brazil. Cooperatives help to offset the lack of economies-of-scale in the southern states due to small farm size; large farms in the centre-west typically achieve an efficient scale and sell their products directly to large trading companies. An example is provided by the privately held company Amaggi Group (Grupo André Maggi) which is the leading soybean operator in Mato Grosso (Ribeiro, 2007). This company has strengthened its position in soybeans through vertical integration both upstream (crushing and trading) and downstream. Amaggi Group also applies an IPPM system for non-GM IP soybeans (Ribeiro, 2007). With proximity to the Amazon river (one of the most important transport routes in Brazil), soybean production has expanded in the northern states and over the last 20 years, public incentives have attracted investment by farmers from the south and large multinational companies in the Amazon's port terminals.

Storage and elevation. The structure of the Brazilian storage capacity is one of the weak points of the soybean supply chain (PwC, USITC, 2012), mainly due to the shortage of warehouses close to the most productive regions and the inadequacy of the facilities themselves. These limitations preclude the supply chain from exploiting market opportunities and the lack of sufficient storage capacity generates additional costs for the implementation of the non-GM IPPM system.

Infrastructure. Infrastructure represents the other limiting factor for Brazilian agricultural competitiveness: the poor conditions of transportation routes have a significant negative impact on both delivery costs and the reliability of supply (USITC, 2012; World Bank, 2010). For this reason, many agricultural producers (at different stages of the supply chain) have invested in local road networks and port terminals to improve logistics and reduce transportation costs (USITC, 2012). Although often unpaved and unevenly distributed across states, roads represent the main transportation route for agricultural products, while railroads and waterways are still largely underused. Truckers are mostly self-employed, unregulated and operate in a highly price-competitive market. Drivers often cut down on basic expenses causing overloads and poor maintenance. Under these conditions, product quality is typically compromised. It is worth noting that these issues are even more relevant for producers wishing to ship IP products.

Ports. The Brazilian port system typically suffers from lack of professional administration, obsolete equipment (including limited dredging capacity), inefficiencies in labour allocation and labour development, and lack of harbour capacity (World Bank, 2010). Many ports are operating at more than full capacity, which translates into long berthing times, lack of storage, and overall increases in bottlenecks in the supply chain. Costs resulting from these inefficiencies are of increasing relevance (World Bank, 2010), and they may obstruct the development of IP programmes.

Blades for soybean meal discharging at the port of Ravenna.

the other hand, profit margins are at risk as the price premiums paid for the non-GM crop are increasing while retail prices for non-GM products are constrained by consumers' willingness to pay for these products. This market uncertainty poses a risk for those players investing in assets, such as transportation and processing facilities, in the non-GM supply chain. From an upstream perspective, even though non-GM production calls for specific assets such as dedicated processing facilities, such assets can be redeployed to GM production under suitable market conditions. This differs from the situation for actors downstream in the supply chain, such as food retailers, for which the non-GM attribute constitutes part of their brand equity. For these players it will be crucial to assure product availability and to have consumers who are willing to pay the extra costs if IPPM systems are to be economically sustainable over the long-run.

Note

1 A strip test is a simple detection method for the presence of GMO proteins that uses a dipstick coated with an antibody specific to those proteins, which is submersed in a homogenized fluid test sample of the product.

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Summary

Identity Preservation in International Feed Supply Chains

With the progressive internationalisation of food and feed supply chains, Identity Preservation (IP) has become an important feature for traded agricultural products to ensure that the right product reaches the right customer. In this article, we focus on IP based on voluntary technical schemes for non-Genetically Modified (non-GM) crops. Three critical steps are identified along the supply chain: product management at the origination/destination port, product transportation and product processing in dedicated plants. Best management practices and coordination mechanisms are implemented by actors along the supply chain to ensure that the product maintains its IP. This translates into a higher degree of dependency among actors. Although 'formal' vertical integration through mergers and/or acquisition is rare, voluntary schemes require very tight coordination which is enforced through downstream-driven technical requirements and process certification standards. Market uncertainty is also observed, as the future availability of non-GM crops could become scarce, raising input prices for downstream firms. Food processors and retailers that invested in the non-GM attribute as part of their brand equity are those at higher risk. For these players it is crucial to assure product availability in the long run and to make sure consumers are willing to pay the extra costs of IP goods.

Préservation de l'identité dans les filières d'aliments du bétail internationales

Avec l'internationalisation des filières alimentaires et d'aliments du bétail, la préservation de l'identité (PI) est devenue importante dans les échanges pour assurer que les bons produits agricoles parviennent aux bons consommateurs. Dans cet article, nous nous intéressons à la PI fondée sur des systèmes techniques volontaires pour les cultures non-génétiquement modifiées (non-GM). Trois étapes critiques sont identifiées au long de la filière : gestion du produit au port d'origine ou de destination, transport du produit, et transformation du produit dans des entreprises dédiées. Les meilleures pratiques de gestion et mécanismes de coordination sont mis en œuvre par les acteurs le long de la filière pour assurer que le produit conserve sa PI. Ceci entraîne une plus grande dépendance entre acteurs. Bien que l'intégration verticale formelle par fusion et/ou acquisition soit rare, les systèmes volontaires demandent une coordination très étroite qui est assurée par des exigences techniques provenant de l'aval et des normes de certification des processus. Des incertitudes existent aussi sur les marchés car la disponibilité des cultures non-GM pourrait devenir rare à l'avenir, entraînant ainsi une hausse du prix des intrants pour les entreprises d'aval. Les transformateurs et détaillants alimentaires ayant investi dans l'attribut non-GM comme faisant partie de leur réputation sont les plus exposés au risque. Pour ces acteurs, il est crucial de s'assurer de la disponibilité du produit à long terme et de la volonté des consommateurs de payer les coûts additionnels des biens PI.

Identity Preservation in der internationalen Futtermittelkette

Mit fortschreitender Internationalisierung der Lebens- und Futtermittelketten hat sich Identity Preservation (IP) zu einem wichtigen Aspekt für den Handel mit landwirtschaftlichen Erzeugnissen entwickelt, um sicherzustellen, dass das richtige Produkt beim richtigen Verbraucher ankommt. Dieser Beitrag befasst sich schwerpunktmäßig mit IP, die sich auf freiwillige technische Regelungen für nicht genetisch veränderte Feldfrüchte stützt. Es werden drei kritische Prozesse entlang der Wertschöpfungskette identifiziert: Produktmanagement am Herkunfts-/Bestimmungshafen, Produkttransport sowie Produktverarbeitung in spezialisierten Anlagen. Die besten Managementmethoden und Koordinationsmechanismen werden von den Beteiligten entlang der Wertschöpfungskette implementiert, um IP für das Produkt zu gewährleisten. Hieraus ergibt sich eine stärkere Abhängigkeit der Beteiligten voneinander. Fälle von ‚formeller' vertikaler Integration durch Zusammenschlüsse und/oder Übernahmen sind zwar selten – allerdings erfordern die freiwilligen Regelungen eine sehr enge Zusammenarbeit, die mit Hilfe von auf nachgelagerte Bereiche ausgelegten technischen Anforderungen und Prozesszertifizierungsnormen durchgesetzt wird. Eine Unsicherheit auf dem Markt ist ebenfalls zu beobachten, da sich die Verfügbarkeit genetisch veränderter Feldfrüchte in Zukunft verknappen könnte, wodurch sich die Faktorpreise für nachgelagerte Unternehmen erhöhen. Jene Lebensmittelverarbeiter und -einzelhändler, die mit dem Merkmal der nicht genetisch veränderten Inhaltsstoffe in ihren Markenwert investiert haben, sind stärker gefährdet. Für diese Unternehmen ist es wichtig, die Produktverfügbarkeit dauerhaft sicherzustellen und dafür zu sorgen, dass die Verbraucher dazu bereit sind, die Mehrkosten für IP-Ware zu bezahlen.