Geotraceability in agricultural chains, an urgent demand in Brazilian agribusiness

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Abstract
The demand for quality in agricultural chains has required information about the products, from the farm to the fork. Geotraceability provides the ability of describing the history, use, and location of a product. This paper discusses the need of storing and retrieving data within the agricultural chains (*tracing*), as well as following the location of the product in real time (*tracking*), particularly for recall operations in case of a crisis. Many of these tools are still to be improved, but their development will add value to products and enhance food safety to consumers.

Keywords:
Geotraceability, agricultural chains, Brazilian agribusiness

1 INTRODUCTION

Although facing internal and external difficulties every year, Brazilian agribusiness is responsible for aproximately 37% of the country's Gross Domestic Product (GNP). The numbers speak by themselves : annually, Brazil produces more than 50 million ton of soy bean, approximately the same amount of corn, 12 million ton of rice, 5.5 million ton of wheat, 3.2 ton of bean, and 1.7 ton of cotton seed. The country is still the world leader in coffee production and is responsible for 80% of the orange juice consumed in the world. Sugar cane production is reaching 300 million ton per year and beef exports have already surpassed Australia.

The environmental, social, and economic impacts of agricultural expansion and intensification in Brazil deserve attention. This paper will focus on a cutting edge aspect related to sustainable product development, potentially suitable for adoption in integrated production systems, i.e. geotraceability. In particular, we consider the need of geotraceability within the beef cattle production chain.

The importance of such topic is related to the recent demands and regulations taking place in countries consuming the beef produced abroad. In particular, geotraceability can contribute to respond to the current European policies, strategies and action plans, such as:

- **General food law 178/2002 and "hygiene package"** (Regulation 852-853-854/2004) and implications for non EU Countries of the new legislation on Food and Hygiene; geotraceability systems can comply with requirements all along the whole food chain;
- **European action plan for organic food and farming**: the principle of a "trace and track" decisional operational system based on a multicriteria approach could be applied to organic farming and further away, for example, in terms of landscape management or risk assessment;
- **Environmental Technology Action Plan (ETAP)**, which encourages developing countries to use environmental technologies, for their potential to improve both the environment and competitiveness; a geotraceability system can promote new communication technologies to provide management tools allowing impact mitigation of beef cattle production on natural resources and fostering best land use practices.

In fact, the adoption of geotraceability systems can enhance food safety and quality, providing consumers with a level of information compatible with the demands of a globalized market and with the need of better local management [1] [2].

2 THE STATE OF THE ART OF GEOTRACEABILITY IN BEEF PRODUCTION

What is geotraceability in agribusiness? It is the ability of describing the history, the use, and the location of an agricultural product, allowing tracing and tracking it from its production to its consumption. Thus, it is necessary to retrieve and store information about the characteristics and the history of the product (*tracing*), as well as to follow the real time location of the product (*tracking*), in particular for recall operations in crisis situations, such as the avian influenza.

The potential of such tools is evident to map agricultural activities at the property level, to add value to market products, to certification and labelling in retail business, to communication with consumers, and to subsidize future policies for the sector.

Geotraceability may be used to increase confidence in products being acquired by consumers through the knowledge of its trajectory, safety, and quality from production to consumption. The process is carried out through standard spatial indicators, in conformity with defined norms, to integrate information from various sources, quality, and scales of observation. Much has to

be improved in terms of standardization, but efforts have been made in several countries.

All these issues are associated with the availability of information and knowledge about the food chains. Research, development, and innovation will contribute effectively to this demand.

The first workshop on geotraceability in agriculture was held in Italy in 2003. The European Union has funded initiatives on traceability, some of them including a geoinformation package. In Brazil, various sectors are interested in such tools, as they may become crucial in the near future.

Embrapa Satellite Monitoring, for example, has strenghten the cooperation with University of Laval (Canada), Cemagref, and Cirad (France). Two workshops were held in 2003 and 2005 to discuss priorities for the Southern Cone - European Union relations, including opportunities for geotraceability. A partnership was established for the next few years and a general framework was designed trying to integrate spatial information with the beef production chain (Figure 1).

Some food chains are particularly important due to the emerging sanitary risks attached to international commercial relations [3]. For obvious reasons, beef is among the most important products to be tracked and traced using a spatially explicit system.

3 THE NEED OF A STEP FURTHER IN BRAZIL

Brazil already has an operational traceability system for beef cattle, the SISBOV (Brazilian System for Identification and Certification of the Bovine Sector). It includes a set of actions and procedures to characterize the origin, the sanitary condition, the production, and the productivity of beef catle production, as well as to enhance food safety in products originated from such economic activity. In practice, the animals are identified using various devices allowing the monitoring of the production system. SISBOV is controlled by the Ministry of Agriculture, but it opened an important market, for example, to certifying businesses. The system still lacks the use of geoinformation and thus does not allow the integration of spatial information.

Through geo-referenced and product information, an improved geodecisional information system would provide verifiable facts as well as information on origin and movement of the animal, the history of its life, and adherence to production standards, enabling quality and authenticity to be guaranteed besides providing risk assessment and crises management tools for policy markers.

The step further in beef traceability is to develop and put in place an operational and integrated geodecisional system to track and trace emerging risks in beef production as well as risk management that will be acceptable, workable and usable by the scientific community and actors associated to the beef sector.

The overall goal of such system is therefore to strengthen consumer confidence through a sustainable and easily understood extensive beef production and risk management scheme, which is financially acceptable by all stakeholders. Among other goals, such system should focus on providing:

- An innovative, economically viable, spatially explicit set of methods and tools for recording accurate and reliable data on primary production practices at the farm level, including animal condition, mobility, origin, and quality;
- Cutting edge capabilities to track and trace emerging risks in beef production based on standardized, factual trace data in an easily understood and easily accessible format, and that take in account the Brazilian production context (animal mobility, number of animals, size of the farm and herd, etc.);
- Information that is acceptable, workable and usable by all actors in the beef production chain as well as for primary producers in case of a crisis event. When including retro-traceability, the system can become an important instrument for crisis management helping decision makers to limit the impact of possible crises and to facilitate the product withdrawal.

Traceability systems should satisfy the demand for methodologies and protocols needed to prevent frauds. The satisfaction of the consumer in relation to the origin and mobility of the product in the food chain is an important task. Specific or generic traceability systems based on analytical markers, aspects related to the production system, species, varieties, and geographical origin have been developed using natural or synthetic tracers. The process will be implemented in information systems allowing the authenticity checking and the quality monitoring for agribusiness products. These are cutting edge technologies that still have much to be developed, but when implemented they will:

- Add new value for primary beef producers (market niche of products through better traceability, differentiation of products, management, regulations, etc.);
- Provide new services for the intermediaries that will have to trace and track cattle as well as managing risks or potential crises;
- Provide new operational tools and system for producers to follow national and international regulations.

Such geotraceability tools would gain power if embedded in a system suitable for use in environmental analysis and management (Figure 2).

4 SUMMARY

This paper summarized aspects related to the urgent demand for geotraceability tools in agricultural chains, particularly for the beef cattle sector.

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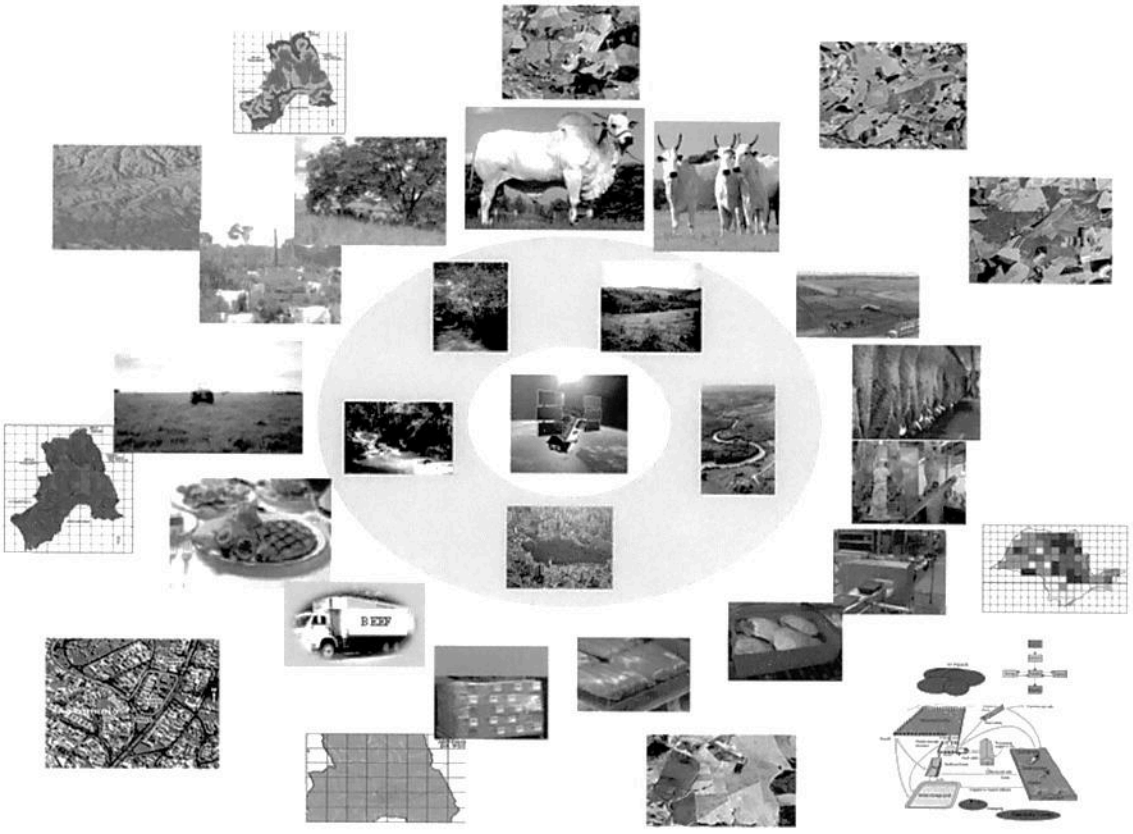
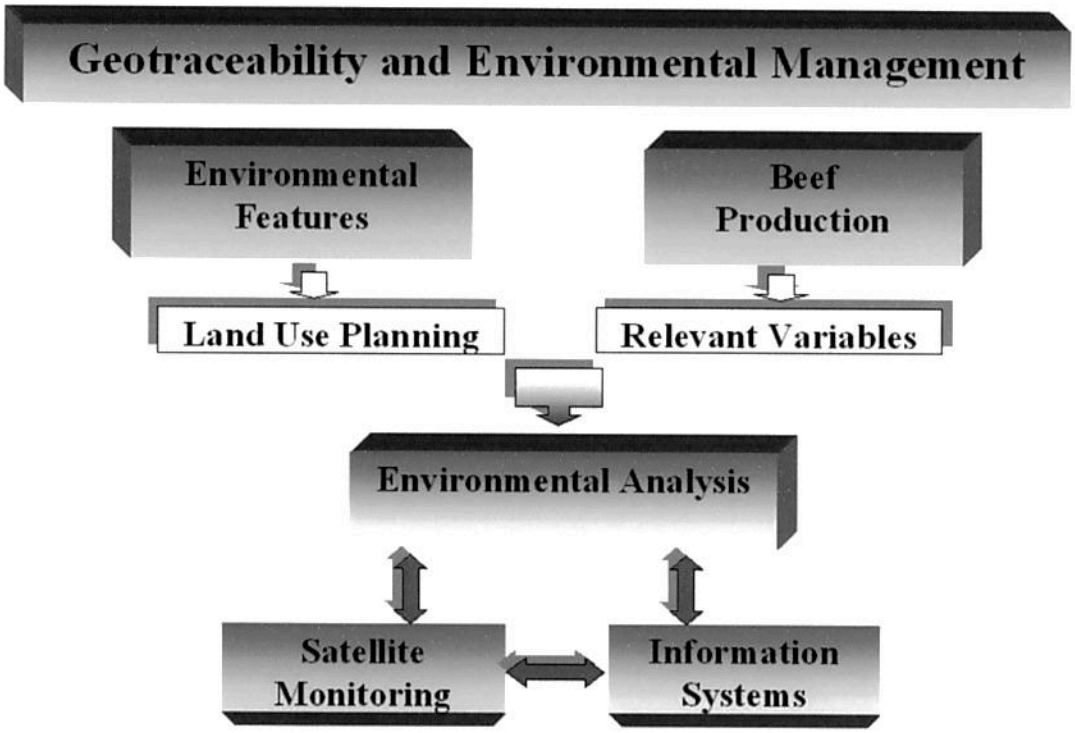


Figure 1: Spatial information and the beef cattle production chain



Adapted from Souza, 2001 [4]

Figure 2: Geotraceability and environmental management systems