Chapter 10

Digital Traceability System: A Tool for Grain Segregation and Quality Management

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ABSTRACT

Digital traceability is a computer-based system that provides unique identification for wheat lots based on production and post-harvest records. The digital traceability system can be accessed at the Website http://www.e-rastrear.com.br. In the production step, the system is operating specifically for each plot, which corresponds to a uniform area sown with the same wheat cultivar. In the field, the record system includes the following information: crop rotations, seed treatments, fertilisation methods, monitoring of diseases and pests, and pesticide applications. Similarly, the digital post-harvest system was designed to retain information on wheat lots in all different stages of storage and processing, in addition to keeping the results of quality and technological analyses. All records can be viewed in an integrated manner according to the date of execution, and summary reports may also be obtained in a printable format.

INTRODUCTION

The increasing demand for feeding a hungry world has led to a more input intensive agriculture. Consequently, raising concentration of residues in delimited areas with a significant impact on the environment, is causing accumulated problems such as exhaustion of the soil arable layer, soil and water contamination, significant increases in production costs and rural exodus. Therefore, sustainable agricultural practices are currently recommended to promote sustainable development,

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Digital Traceability System

protect natural resources, rationalise the use of external inputs, and ensure food safety. The basic premises of sustainable development include not only preservation of the environment and social aspects but also the promotion of innovative and economically feasible opportunities for farmers, in agreement with market demands. Indeed, in order to achieve sustainable food security, it is necessary to produce more food at affordable prices to ensure livelihoods for farmers and to reduce the environmental costs of agriculture (Seufert et al., 2012).

Organic and integrated production systems represent the main types of sustainable agriculture worldwide (National Research Council, 2010). These systems involve the adoption of good agricultural practices (crop rotation, integrated pest/disease management and soil conservation), in all the stages of production and the establishment of a traceability system, which allows the segregation and certification of products, ensuring that it were obtained according to technical standards. Compliance with the criteria of sustainable production is a commercial requirement that influences consumers’ purchase decisions.

Another tendency of these systems is the promotion of market expansion for different products exhibiting specific characteristics regarding their quality, technological performance, and/or geographical indications, which, therefore also increase the demand for traceability systems to comply with standards and consumer market requirements. Traceability also provides a tool to hinder the counterfeiting of products with differential attributes, such as those with a registered designation of origin.

In addition, food safety-related incidents have led to the need to establish traceability systems that are able to identify contaminated foods and remove them from the market, thus assuring consumers of the quality of products. In the case of wheat and other cereals, the presence of chemical contaminants, such as toxic pesticide residues and mycotoxins poses a challenge regarding the production of food safety, as these contaminants are visually imperceptible in the final product. The management of contaminants has become a source of growing concern; therefore, increasingly restrictive maximum tolerance thresholds are being established and regulated through legislation, based on monitoring data, to ensure the safety of marketed food products.

An available traceability system, allowing demonstration of the origin and quality of products, is important for the segregation and differentiation of lots on the market to achieve high trading liquidity and increase their earned value. Grain lots could be segregated according to their cultivar, commercial class, and quality attributes, such as moisture contents or mycotoxin levels, indicating the quality and end use purpose. These characteristics are influenced by genotype and environment, demanding a traceability system to indicate the origin, type of crop management, and industrial quality of the product. The preservation of grain identity provides greater value to the productive chain, minimising losses and increasing quality, based on production planning from cultivar selection to the segregation of lots as the product moves through supply chains.

Written versions of traceability systems can function sufficiently. However, the time and resource consumption of this type of system makes it difficult to implement in complex food supply chains. A computerised traceability system based on database management is suitable to capture, store, and organise information among all partners. Hence, sophisticated software engineering techniques are needed to adjust the system to the varied demands of supply chain members, preventing both to distort information and to lose its intrinsic value.

The objective of the present study was to present a digital traceability system applied to wheat chain production that allows information about the origin and quality of wheat lots to be entered and displayed to ensure safe products. The specific objectives of the study were as follows: