



# A real-time agro-food authentication and supervision system on a novel code for improving traceability credibility



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## ABSTRACT

Counterfeiting products and abusing labels lead to less credibility for traceability system in China recently. Authentication and supervision agencies driven by government departments play an important role for ensuring the quality safety in the case of lacking the willingness and credit of enterprises. A complete authentication and supervision flow framework was constructed based on an identification code (IdC) for authenticated origin base, which linked two actors of the agencies and the enterprises, and three subsystems of On-line Authentication Subsystem (OAS), Safety Production Management Client (SMC) and Mobile Supervision Application (MSA). IdC consisted of longitude and latitude of origin base as position code, production code and authentication type code. With a relative position partition method on 6 zones every 27° for China map and a coordination transformation algorithm, an absolute longitude and latitude value was converted into a relative position value and a zone mark value. IdC and packaging date code formed initial traceability code (TC). 8 digits packaging date code was reconstructed into 3 digits relative time value and 1 digit period mark according to a relative time period partition method with a period of 999d as time intervals and four periods form a cycle. Validation code was generated integrating the zone mark value, period mark value and authentication type code. Therefore, transformed 20 digits TC with the characters of shorter code length and stronger encryption was formed with IdC, relative time value and validation code. Three subsystems for different actors which provide the main function such as origin base registration, agency authentication, QR code generation, data uploading and product verification, were developed. The system has been used in Tianjin city from 2012. 213 enterprises were audited through OAS and used SMC. Through investigating 8 supervision agency staffs, 30 origin base owners, and 50 customers, it is shown that the positive effects are approved by most of the investigators and two negative effects for enhancing the costs and doubting the authentication reliability are laid by 17 enterprises and 12 customers. Furthermore, 4 typical cases for counterfeiting and abusing the labels were exemplified and can be solved to a certain extent with the system. However, except for the technology itself, a management measures fitting the supervision flow and system need to draft in order to improve the system application well in the future.

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## 1. Introduction

In the last three decades, some astounding events, such as the BSE crisis and the problems posed by foods ingredients from genetically modified (GM) crops, have strongly focused attention on the topic of agro-food safety (Bertolini, Bevilacqua, & Massini, 2006). The General Food Law, i.e., Regulation (EC) 178 of the European Parliament and the Council published on 28 January 2002, outlines the general principles and requirements of food law,

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