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Food authentication and traceability: An Asian and Australian perspective

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ABSTRACT

This paper considers the current status, the changes, and the challenges of food authentication and traceability with specific reference to the Asian and Australian perspective. Building on the experience of the author (who has presented at seven International Atomic Energy Agency Regional Training Courses in Pakistan, Malaysia, Indonesia, Vietnam and The Philippines), and some relevant case studies, the use of chemical analysis for identification of the origin and potential adulteration of foods and beverages will be discussed. Examples of applications of these techniques include: 1) detecting passing off produce from country A as coming from other countries or conversely passing off non-country A produce as if they originated from country A, and 2) detecting, and prosecuting, people who were taking seafood from a protected marine area and claiming it came from another area. Some reasons why countries in the Asian and Australian region are interested in using these techniques to investigate food authentication and traceability include: desire to have confidence in what we are eating, desire to pay a correct price for the product, health and food safety issues, prevention of criminal activities, and safeguarding environments by preventing the spread of disease and invasion of non-indigenous species. Food and food security is a growing global concern and having a reliable, confirmable, diet is a daily concern for inhabitants of the Asian and Australian region.

1. Introduction

The aim of this paper is to consider the current status, the changes, and the challenges of food authentication and traceability – with specific reference to the Asian and Australian perspective. Some reasons why countries in the Asian and Australian region are interested in using these techniques to investigate food authentication and traceability include:

- desire to have confidence in what we are eating
- desire to pay a correct price for the product
- health and safety issues
- prevention of criminal activities and
- safeguarding environments by preventing the spread of disease and invasion of non-indigenous species.

Some aims of truth in labelling include:

- you get what you pay for
- content is as listed
- country of origin is as listed
- safe to eat and
- sustainable.

Food fraud can be a two-way traffic where a commodity from country/location A is passed off as coming from country/location B or vice versa. An example of this is wine from China being sold as if it was Australian and wine from Australia being entered into wine competitions as if it was from China (Walker, 2011). The reason behind passing a Chinese wine off as an Australian wine to the consumer is profit whereas, the reason for passing an Australian wine off as if it was from China at an International Wine Show is to get Gold or Silver Medals that can be put on bottles of wine and sold at a premium. However, the wine that is in the bottle is not the same as the wine that was tasted by the judges (Walker, 2011).

An holistic approach is required to combine information from a range of analysis to combat food fraud by improving the degree of food authentication and traceability.

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2. Discussion

2.1. Current status

According to the Australian National Anthem (McCormick, 1878), 'We've golden soil and wealth for toil; our home is girt[1] by sea.' The land-mass of Australia is 7,682,300 km^2 of 'golden soil' and the coastline is in excess of 36,000 km (Welcomeaustralia, 2015). To put Australia into perspective, if an overlay the size of Australia was placed over a map of the world, two 'Australia's' would fit into North America (one each over Canada and the USA), two over Africa, one over each of the Middle East, Russia and the combination of Continental Europe and the United Kingdom.

The reader is invited to consider what this means to the diversity of locations that Australia encompasses in their own geographical area. The climate ranges from tropical, through dessert, to Mediterranean and Alpine. For example food produced in 'Australia' may come from geographic areas as distant as Ireland and Turkey or Norway and Spain. This is a challenge that food authentication over a large country must take into account.

Records of The Australian Bureau of Meteorology (Trends in Rain Fall, BOM, 2015) indicate that rainfall can range from 3000 mm to zero mm a year and this can vary from year to year. Parts of Australia can experience a drought when others are affected by flooding.

Compared to many neighbouring countries in Asia that have population densities greater than 200 persons per square km (Grolier, 2015), Australia has few areas with more than 30 people per square km and the vast majority of Australia has less than 1 person per square km (Welcomeaustralia, 2015). Australia should therefore be in an ideal position to become a food bowl for the region and having suitable authentication and traceability is essential.

New Zealand has a similar, but different, opportunity to be a supplier of food to the region. Current reports (Food and Beverage Information Project, 2014) indicate that in 2013 export of food and beverage make up 45% of New Zealand's exports with 26% being services and the remaining 29% 'Other merchandise". Of this 45%, 52% (US$11.8b) is Dairy and 21% (US$4.7b) Meat, with the remaining segments, Processed, Produce, Beverage and Seafood making up 8, 7, 6 and 5% respectively. This indicates that New Zealand is highly exposed to fluctuations in exchange rate and to two primary product markets dairy and milk. With one company, Fonterra, responsible for 12% of the countries export income any problem with this commodity will have an extreme effect on the whole NZ economy as shown today (Lefort & Tajitsu, 2015).

> "May 15 [2015] The New Zealand dollar dropped [0.3%] on Friday after dairy giant Fonterra surprised markets by revising down its supply forecast."

Similarly, the markets that New Zealand exports to are dominated by one country with China accounting for 62% of business per year. Developing Asia, (Vietnam, Philippines, Indonesia, Malaysia, Thailand, Myanmar) takes 26% with developed Asia (Japan, South Korea, Hong Kong, Singapore and Taiwan) taking 10% and the remaining 2.3% going to the remaining countries (Mongolia, North Korea, Laos, Cambodia and East Timor) (Food and Beverage Information Project, 2014).

For Australia the dependency on food and beverage sales is not so essential with Meat and Wheat coming in as 9th and 10th top earners (Connelly & Olsen, 2013) with commodities such as iron, coal and gold topping the list. Education is the fourth highest foreign income generator in Australia and is, for some states, the second highest earner (Connelly & Olsen, 2013). These rankings are vulnerable to economic downturns in the importing country and fluctuations in the exchange rate. For example according to the records of exchange rate from The Reserve Bank of Australia (RBA www.rba.gov.au, 2015) the Australia Dollar was worth 125% more one year ago against the US$.

Despite being 9th and 10th on the list of earners Australia food and beverage (F&B) exports, US$14,834M, are still worth twice as much as New Zealand's F&B exports of US$7,932M (Food and Beverage Information Project, 2014).

Financial reasons are only one reason to protect these markets. Other reasons to provenance food and beverage are 1) the security of food supplies (which will be covered in other papers in this issue), 2) preservation of local agricultural industries, 3) economic protection from cheap imports and 4) prevention of spreading of disease. Again this is a two-way traffic as, for example, the export of prawns from a nutrient deficient area of Australian waters means instead of the prawns being in a life-cycle that returns their nutrients to their spawning ground for the next generation – there is a net export of nutrients leading to a reduction in available nutrients in Australia waters resulting in an unsustainable harvest. The import of overseas prawn could lead to the introduction of diseases if used for fishing or released into the environment. Being islands New Zealand and Australia have the opportunity to prevent contamination from overseas products and have some of the strictest food quarantine laws. Quarantine boundaries have been set up not only for imported produce but also to prevent the movement of certain fruit and vegetables within different areas of Australia. For example there are areas of South Australia that have a Fruit Fly Exclusion Zone (www.pir.sa.gov.au, 2015) and fines of up to Aus$100,000 may apply for being in possession of an illegal banana (www.murrayriver.com.au, 2015).

Attempts to regulate imported versus local produce have included the ability to fine companies who have been detected mislabelling fruit and one was recently fined Aus$61,200 for selling imported fruit as if Australian grown (news.com.au, 2013).

2.2. Changes

Both New Zealand and Australia have set themselves expansion targets so, for example, New Zealand exports of F&B which have grown from ~ NZ$10B in 1997 to ~NZ$30B in 2013 have been set a target of reaching NZ$60B by 2025 (Food and Beverage Information Project, 2014). One problem they face is that being a small land-mass (relative to Australia) most of the land that can be used for agriculture already is used so there is, if you'll excuse the expression, little room to grow. New Zealand F&B production is highly productive with the world's third highest exports per square kilometre ratio of US$29,327 per square kilometre in 2012 (Food and Beverage Information Project, 2014). Only the Netherlands with US$92k/km^2, Denmark with $41k/km^2 and Belgium with US$31k/km^2 are more productive than New Zealand (Food and Beverage Information Project, 2014). Australia on the other hand produces US$1.9k per km^2.

New Zealand intends to double its export value by concentrating on products for which there are both a high demand for import in to E/SE Asia and a high value (Food and Beverage Information Project, 2014). High value can indicate a premium product or a low cost product that has a large volume of sales. Table 1 lists the top products, and some low demand products as identified in UN FAO AgStat Database (Adapted from Food and Beverage Information Project, 2014).

There is no surprise that E/SE Asia produces 90% of the world's

[1] 'Girt' meaning surrounded by.