FOOD FRAUD: RISK RANKING OF RAW MATERIALS USING DATA MINING

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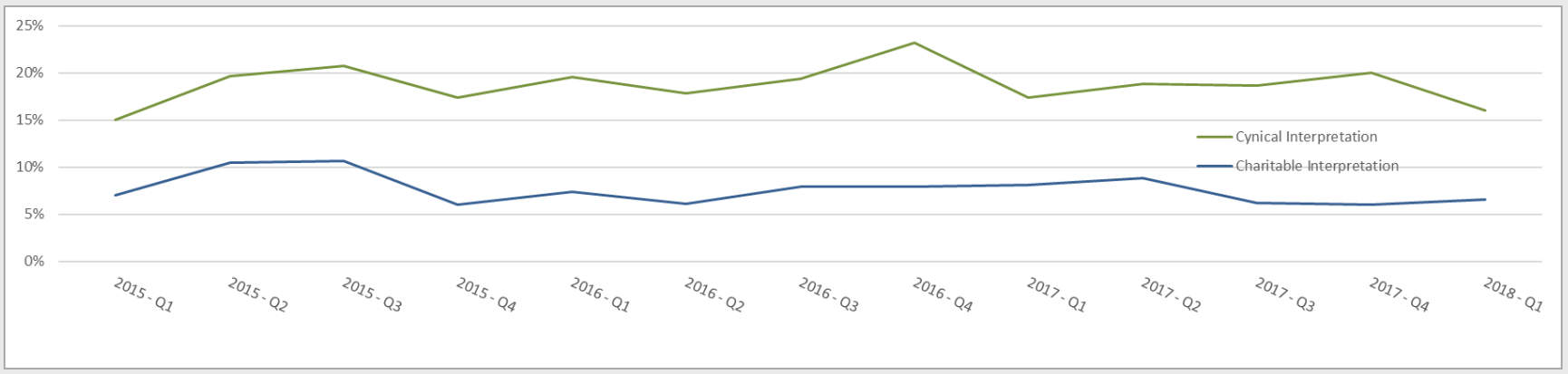
Forward horizon scanning for fraud is difficult. It requires critical assessment of economic incentives and supply chain vulnerabilities. But looking in the rear-view mirror can also be helpful for prioritising audit and testing resources. What has been publicly reported by other companies or authorities? The Horizonscan database is a comprehensive collation of global reports of food safety and compliance incidents. Data must be interpreted carefully to draw trends, and always sense-checked. As well as the pitfalls of under-detection (or lack of looking) and under-reporting of food fraud, there is also the thorny issue of intent. Incidents are publicised factually, without necessarily the detail to infer whether, for example, a "labelling non-compliance" is deliberate falsification or is simply omitting to translate the label into the local language. Researching this detail for the thousands of incidents needed for trend analysis would be impractical, even when an explanatory comment has been entered on the database.

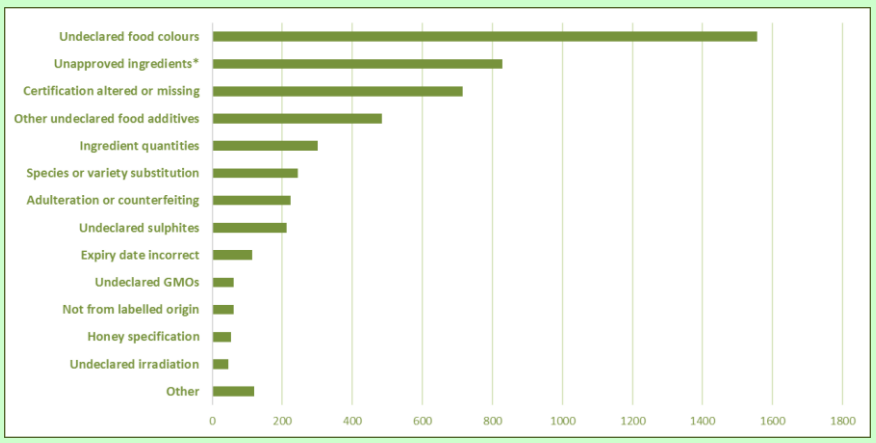
One approach is to assume both a "cynical" interpretation (all grey-area incidents are intentional fraud) and a "charitable" interpretation (grey-area incidents have no fraudulent intent). This gives a lower- and upper- bound range. When plotted as a percent of total safety/quality incidents (to normalise for improved Horizonscan data-sourcing over time), it can be seen that the incidence of reported fraud cases has remained surprisingly consistent over the past three years, despite increased industry focus and testing.

Food Fraud Incidents, as a Proportion of Global Reported Safety and Compliance Incidents January 2015 – March 2018.



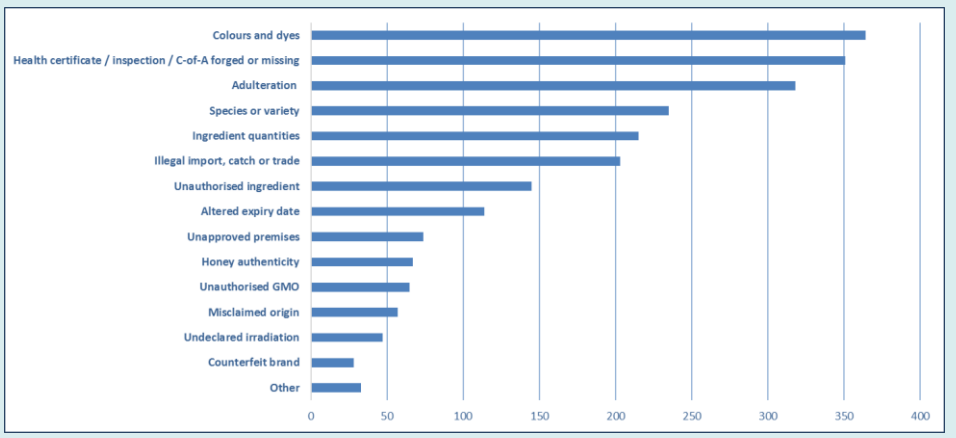
The insight comes from drilling into the data. Some examples are shown below, and some trends start to appear.

Cynical Interpretation: Categorisation of Incidents

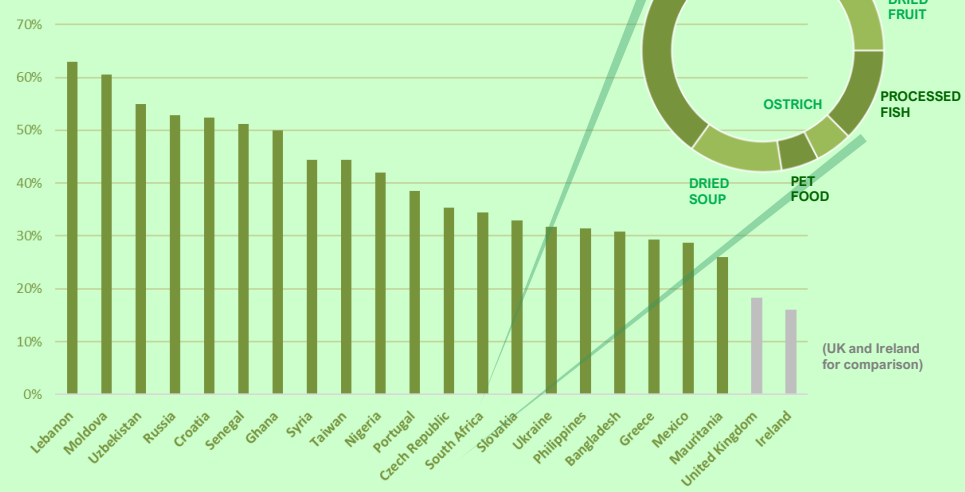


* Most unapproved ingredient incidents relate to supplements

Charitable Interpretation: Categorisation of Incidents

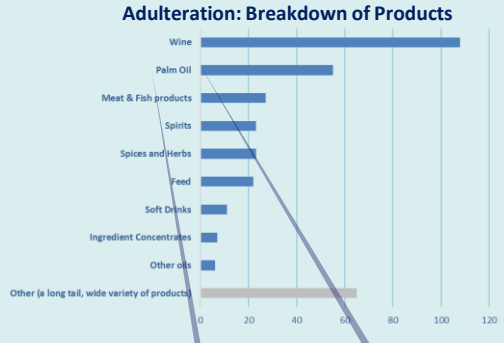


Top 20 Source Countries (as % of Total National Incidents)

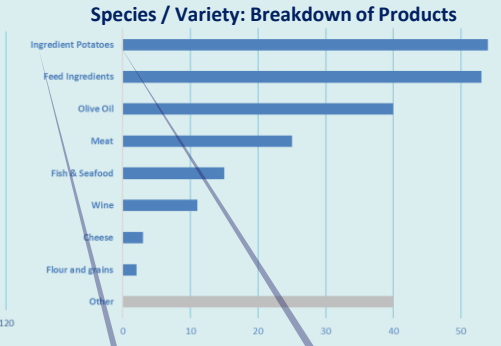


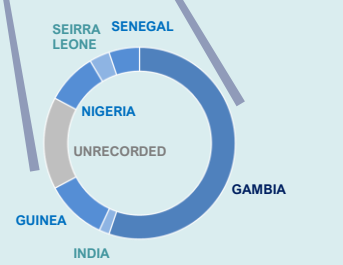
South Africa:
(selected as an example)
Breakdown of Products

Adulteration: Breakdown of Products

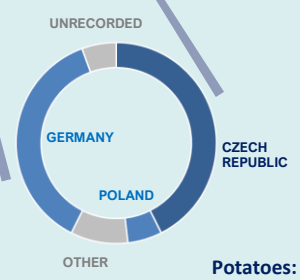


Species / Variety: Breakdown of Products





Adulterated Palm Oil: Origin



Potatoes: Origin

Conclusions

Food fraud is no different to any other fraud. It is not all horsemeat. Simple documentation forgeries prevail. Forged use-by dates, certificates of analysis and health certificates.

Although "usual suspects" such as spices and olive oil do appear, most reported adulteration and varietal substitutions relate to much lower profile ingredient commodities. Particularly animal feed ingredients (primarily from Russia), palm oil (primarily from Gambia) and ingredient potatoes (primarily from Germany and the Czech Republic).

Taking the cynical interpretation, then honey and processed coconut would be added to this list.

Issues that are difficult to detect by analytical testing or by inspection, such as falsely labelled Organic Certification, are notable by their absence. A reminder that relying on historic data-mining for risk assessment has limitations, and cannot be used in isolation.

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The small print: notes on methodology. No country with under 20 total incidents is included in the percentage breakdown. "Cynical" interpretation includes all undeclared colours; "charitable" only includes those in relatively unprocessed ingredients where the colour imparts an obvious price premium *e.g.* yellow in turmeric, red in palm oil, green in pistachio paste. Milk protein in coconut milk was included in "charitable" but not "cynical", as was honey specification failure such as HMF or enzyme activity. Multiple issues in the same sample are each counted in their own right.