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Crops to Code

The role of data in fostering sustainable agricultural trade and responsible supply chains

Committed to Climate Action

Crops to Code:

The role of data in fostering sustainable agricultural trade and responsible supply chains

International trade underpins the global economy, fostering job creation, economic growth, and diverse goods and services. Embracing efficient, data-driven, and sustainable international trade will be crucial to combat biodiversity loss, address population growth, and tackle the climate crisis. As such, striving for sustainable international trade is not an opportunity, but an imperative.

The development of digital trade and trade data technologies enables policymakers to think beyond traditional customs processes and develop an environmentally-friendly system of international trade. The UK Government is already developing policies to utilise trade data. However, to address the pressing issue of a broken food system that is detrimental to our planet, policymakers must fully embrace the possibilities offered by today's technology. Trade data technologies can be a driving force in shifting trade towards regenerative and sustainable forms of agriculture.

In this briefing, we highlight several of the more important technologies and their applications to showcase the developing data and technology landscape that provides policymakers an opportunity to rethink conventional customs procedures and shape a more sustainable trade system.

Customer journey

Production → Processing and packaging → Shipping and customs → Distribution to end consumer

Goods are grown or sourced by farmers.

Produce is collected and processed into a refined product. This is then packaged and marketed to be sold or distributed to a buyer.

Goods are shipped internationally and undergo stringent border checks.

Goods are distributed to their final seller or user.

Innovation

Technology helps farmers make efficient decisions, thereby saving time and resources. It also improves supply chain visibility and helps determine the sustainable value of a product.

The integration of technology enhances precision, quality control, and worker safety. Innovations for packaging further reduce environmental impact and QR codes provide traceability for consumers.

Cloud-based solutions as well as Distributed Ledger Technologies (DLT) can streamline trade by pre-screening goods and flagging at-risk goods even before inspection.

Technologies enable efficient tracking of a product's journey from farm to consumer, fostering transparency and optimisation in distribution. This reduces the environmental impact and administrative burden in trade and regulatory compliance.

Case studies

Tô No Mapa

The Tô No Mapa mobile app in Brazil empowers local producers by allowing them to map their production territories, enhancing supply chain transparency through real-time data submission to the cloud and promoting sustainability verification.

AB InBev & Fujitsu

AB InBev, in partnership with Fujitsu, implemented a QR code project. Using a blockchain tracking platform that connected 80 farmers to a malthouse in Belgium, enhanced supply chain visibility, optimised operations, and provided full transparency for consumers.

Dun & Bradstreet

Dun & Bradstreet utilise shipping data points to provide traceability and transparency, allowing the mapping of agri-food supply chains. This helps supply chain actors categorise risk and identify areas of concern before and after goods enter the UK.

Stuart

A B2B last-mile delivery platform, minimises emissions by enhancing routing efficiency through advanced dispatcher technology and the integration of low-emission vehicles. Clients can also specifically request low-emission vehicle deliveries – an option that, with the help of technology, could be adopted on an international scale.

Production

Advances in the use of connected devices or Internet of Things (e.g. drones, smart sensors, RFID) as well as geospatial technology (e.g. remote sensing, Lidar, GPS, Geographic Information System) deliver precise real-time data on land use, crop health and environmental conditions. This enables close monitoring of deforestation and agricultural practices while optimising the use of water, fertilisers, and pesticides.

These technologies, combined with access to mobile phones, mean smallholder producers are able to contribute to a more transparent and traceable supply chain. By utilising mobile applications (apps), they can efficiently record and share crucial data points, including production methods, environmental impact, and transportation details.

Decision Support Systems (DSS) have been utilised in India to provide cotton producers, through the Cotton Doc mobile app, with information about soil health, weather conditions and market prices, enabling precision agriculture and yielding improvement predictions while conserving precious resources and reducing waste. Smarter, data-driven decision-making not only delivers economic advantages for the farmer but also environmental benefits for the planet.

Inaccurate or incomplete data hinders supply chain visibility of a product's origin, which is problematic when determining the sustainable value of a good. Data monitoring at production level is therefore key to establishing sustainable supply chains. As technology becomes increasingly accessible, the ability to reliably verify how or where a good was produced grows.

In Brazil, the To No Mapa mobile app is available to local producers, enabling them to map the territory where their production occurs within various biomes. This initiative equips supply chain stakeholders with real-time data and evidence by facilitating the submission of documents or forms through digital platforms via cloud computing, resulting in greater visibility into the product's journey from its origin to the end consumer. This enhanced transparency not only aids in verifying the sustainable practices employed but also promotes accountability and encourages the adoption of eco-friendly measures at every stage of the supply chain.

Earth Observation (EO) technology could also be utilised to foster sustainable land management and support a greener and more resilient agriculture industry. Agtelligence utilises EO imagery to detect and monitor key environmental indicators, providing actionable insights to address environmental challenges. For example, it aids in understanding the impact of changes in land use on river dynamics and water quality. Additionally, it provides valuable insights into flood risks. Initiatives should be supported to make this data easily accessible for farmers, businesses, and financiers to facilitate an informed transition and incentivise verifiable sustainable investments.

The expansion of digital data mapping and traceability at the producer level creates significant opportunities for businesses and policymakers to craft sustainable trade policies. Producers worldwide can now consistently upload data, thereby promoting transparency and sustainability throughout supply chains. This enables trade to address issues such as deforestation and can also be used to eliminate harmful agricultural practices from our faltering food system.

Processing and packaging

The processing and packaging phase of the agricultural supply chain is a critical juncture where using sustainable practices becomes increasingly vital. Technology emerges as a crucial enabler during this stage of trade.

The utilisation of industrial robotics and automation in sorting and processing operations ensures a high level of precision, contributing significantly to quality control and mitigating the potential for food waste. Moreover, robots play a key role in enhancing worker safety, underscoring their multifaceted impact on improving overall efficiency and sustainability within the agricultural trade process.

As products reach the packaging stage, incorporating biotechnology through eco-friendly alternatives, such as biodegradable plastics or reusable materials, becomes instrumental in curbing the environmental footprint associated with packaging waste.

The integration of barcodes or QR codes on packaging is another crucial element in streamlining processes and enhancing visibility within the supply chain. By incorporating barcodes or QR codes on agricultural product packaging, stakeholders in the international trade ecosystem gain access to real-time information about the origin, production methods, and journey of the products.

Case study

In collaboration with Fujitsu, AB InBev embarked on a pilot project involving one million beer packs, each equipped with traceability QR codes. This initiative aimed to fortify AB InBev's supply chain resilience by implementing a Fujitsu-run blockchain-based tracking platform that connects 80 farmers in France with the malthouse and brewery in Belgium.

This solution enabled consumers to easily trace the origin of their beer and learn about the barley's source by scanning a QR code on the pack. The platform not only benefits AB InBev by providing a precise view of the supply chain, optimising resources, and identifying operational frictions, but also facilitates CO2 emission reduction and financial gains through consumers' willingness to pay a premium for local products. For end consumers, the platform fosters awareness of sourcing and valorises local farms.

Shipping and customs

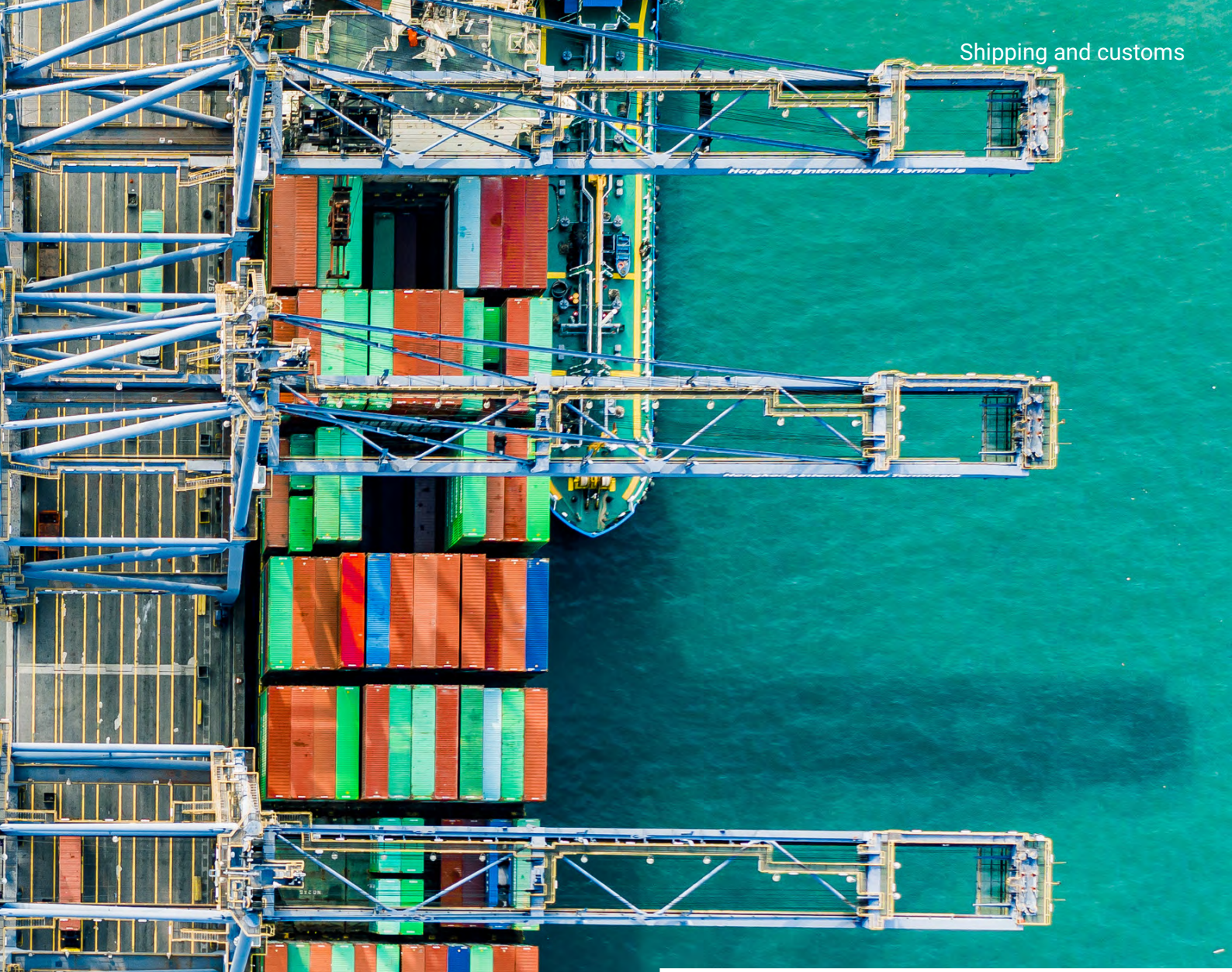
The advancement of technology and a growing emphasis on more responsible practices have prompted governments worldwide to modernise outdated trading laws and enable the use of electronic documents, paving the way for a new era of sustainability in the realm of international commerce. Given that it has previously been estimated that global container shipping generates billions of paper documents every year, this transformation is paramount in fostering a heightened ecological awareness within the realm of trade.

In response to this global shift towards more sustainable trade practices, innovative solutions have emerged to streamline and digitise the entire supply chain. By way of example, a cloud-based software called Exabler offers traders a single digital trade platform through which they can seamlessly exchange data across the entire supply chain. The compilation of this data enables businesses to generate digital trade documents tailored to the specific needs of relevant stakeholders and officials, resulting in significant time and cost savings.

The digitisation of supply chains can also be facilitated by the implementation of Distributed Ledger Technologies (DLT) which allows for the real-time recording, validation, and storage of transparent data in a decentralised database. This data includes evidence in the form of documents, photos, or collection points.

Streamlined data-driven advancements are of paramount importance for the UK, especially as it implements a risk-based border system for food, animal, and plant-origin products. The UK's Target Border Operating Model (TBOM) entails categorising goods entering the UK into different risk levels (low, medium, high), which in turn dictates the extent of checks they will undergo. This approach enables smarter border decisions that factor in essential considerations such as the nature of the traded goods, their country of origin, and even a calculated assessment of the likelihood of any breaches concerning UK safety requirements.

Innovative systems like TBOM possess the capability to swiftly and accurately identify goods or businesses that may be at risk of non-compliance with UK rules. When such risks are identified, customs officials can be alerted, prompting them to conduct thorough inspections and document checks as necessary.



Case study

The Dun & Bradstreet Data Cloud contains datapoints on shipping movements, trends, and risks. These connections provide traceability and transparency, allowing businesses and governments to map agri-food supply chains, from farm to fork. This helps in identifying key players and pinpointing areas of concern, and with the use of Harmonised Shipping Codes, the goods in the container can be exposed, including ports on route to final destinations.

The data also assesses general supply chain risks, encompassing geographical factors, supplier stability, control, ownership, sanctions, and financial risks. From a sustainable supply chain perspective, it highlights the cascading impact of a weak link, underlining the necessity to explore alternative solutions.

Distribution to end customer

The use of data enables the tracking of a product's journey from the farm to the consumer's table.

Technology, besides improving efficiency and transparency, can significantly contribute to quality assurance by monitoring the conditions in which products are stored and transported. Real-time data on environmental factors such as temperature and humidity ensure that products reach consumers under optimal conditions, reducing the risk of spoilage or degradation. This aligns with the growing emphasis on preventing food waste.

As products embark on their journey to consumers, sensors, connected devices and artificial intelligence (AI) can also empower distributors to optimise the transportation process, ensuring minimal environmental footprint resulting from road transit. These gains can be magnified if the distributor's fleet comprises of electric vehicles.

Case study

Stuart, a cutting-edge B2B last-mile tech delivery platform, employs advanced dispatcher technology to minimise emissions per package. By harnessing the power of data, the company enhances routing efficiency, thereby enabling independent couriers on the platform to efficiently pick up multiple packages from a single location and deliver them to nearby destinations. This approach resulted in a 15% reduction in courier emissions in 2022 and its further success is underscored by the strategic introduction of low-emission vehicles associated with a courier's account and comprehensive transition programs for couriers. Stuart's platform has expanded to identify, transition and onboard new, more specific transport types, such as the electric moped XL which boasts the capacity to carry larger and multiple packages simultaneously. Clients can also specifically request low-emission vehicle deliveries – an option that, with the help of technology, could be adopted on an international scale.

Conclusion and recommendations

Data harmonisation provides numerous opportunities — from enabling farmers to better understand the impact of their production and the supply chains they are a part of, to supporting financial institutions to make informed decisions, to verifying claims of sustainable production or distribution.

As we navigate the complexities of a changing world, the adoption of data-driven, technology-enabled solutions stands as a beacon for achieving a more sustainable and resilient international trade environment. The challenge now lies in scaling up these innovations, fostering international cooperation, and ensuring that the benefits of technology in trade are accessible to businesses of all sizes, thereby realising the imperative of sustainable and data-driven trade.

Governments can leverage technology to implement progressive trade policies that address issues beyond customs processing and maintain a level playing field between domestic and global producers or businesses.

One recommendation is to establish a set of core environmental standards for imported agri-food to enter the domestic market. Through utilisation of traceable data gathered throughout the supply chain, the UK can prevent the offshoring of its environmental impact and ensure imports are made to similar standards as domestic producers.

The implementation of such environmental policies for imported goods not only promotes fair competition but also has a positive impact on our trading partners. Preventing the most environmentally damaging producers from benefitting from preferential market access will encourage adoption of greener and more ethical practices to access larger markets. Trade technology has the potential to drive this change.

To facilitate a seamless flow of trade and trade data, the UK should actively pursue data interoperability within global supply chains. The adoption of data interoperability would streamline compliance processes across various trading regimes reducing the administrative burden on businesses and producers. This approach is vital for promoting sustainable global trade flows. The UK could take a leading role in multilateral initiatives at both plurilateral and multilateral levels to develop standardised data practices.

New trade policies and technologies would also require a degree of upskilling. Many businesses, especially smaller ones, may lack the necessary resources or skills to adapt to trade innovations effectively. Governments should therefore invest in training programs to ensure that businesses, from small enterprises to larger corporations, have access to the training required to leverage these tools and should provide clear guidance on the requirements of traders and customs processes.

In addition to scaling up technological innovations globally, it is essential for the Government to recognise the pivotal role of domestic investment in technology to boost sustainable international trade. By fostering a robust technological infrastructure within their borders, governments can not only enhance the efficiency and resilience of their own trade processes but also contribute significantly to the global sustainability agenda. Investing in technology domestically, especially at various stages of trade such as processing, packaging, and delivery, not only positions a country as a leader in technological advancement but also serves as a catalyst for the adoption of sustainable practices on a broader scale. A technologically empowered domestic environment creates a ripple effect, influencing the entire supply chain and encouraging other nations to embrace similar advancements. This strategic investment in technology domestically aligns with the imperative of building a sustainable and data-driven trade ecosystem, positioning the UK at the forefront of the evolving landscape of international commerce.

The integration of trade technology into supply chains holds great promise for advancing sustainability, enhancing trade efficiency, and aligning with environmental goals. Through the use of digital platforms, smart agricultural methods, and well-designed border systems, nations can develop effective trade ecosystems that encourage responsible practices while minimising administrative complexities. Furthermore, the use of technology in trade, particularly when facilitated through solutions such as QR codes or barcodes, enhances consumer awareness and helps people make informed, sustainable purchasing decisions.

Although challenges remain, the establishment of comprehensive guidelines, upskilling initiatives, standardisation of data, and strategic investment in technology can pave the path toward a more sustainable and technologically driven trade environment.

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techUK is the trade association which brings together people, companies and organisations to realise the positive outcomes of what digital technology can achieve. With around 1,000 members (the majority of which are SMEs) across the UK, techUK creates a network for innovation and collaboration across business, government and stakeholders to provide a better future for people, society, the economy and the planet. By providing expertise and insight, we support our members, partners and stakeholders as they prepare the UK for what comes next in a constantly changing world.

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We're WWF, the global environmental charity, and we're bringing our world back to life. With nature in freefall, we're urgently tackling the underlying causes that are driving the decline and we're finding solutions so future generations have a world with thriving habitats and wildlife. It's a huge challenge, but there is hope. We're working globally with governments, companies, communities and others who have the will to act and the power to transform our world. We're using our groundbreaking scientific research, our global influence, and the backing of our many supporters to make sure the natural world's vital signs are recovering by 2030.

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