State of the Art in Food Supply Chains

Current environment is fragmented across:

- Seed manufacturers
- Producers: Farmers and farm cooperatives
- Packaging and preprocessing enterprises
- Transportation and warehousing companies
- Processing companies
- Retailers
- Other enterprises

There have also been efforts at vertically integrating these entities

Seed Producers

- Companies such as Bayer/Monsanto, Dow Agro, Syngenta, DuPont, BASF, KWS SAAT, Canterra, AgreLiant, Land O Lakes, and Sakata commonly use precision gene engineering for optimizing seeds.

- Genetic motifications are primarily used for specific phenotype (nutrition, drought resistance, pesticide resistance).

- The same techniques can be easily used for intrinsic or extrinsic barcodes.

- Genomic variants have been used in patents, litigation, and intellectual property protection (an alternate use of traceback) [Monsanto vs. Brazilian Farmers Union]

Major Retailers

- Four retailers (Walmart, Kroger, Albertsons, and Costco/ Ahold) control over 40% of the food market share.

- These retailers have used their market share to capture significant fraction of the value in the food chain by strongly integrating them vertically, minimizing transparency and accountability, and due-diligence.

- Several recent studies (https://www.oxfamamerica.org/static/media/files/US_Supermarket_Supply_Chains_End_the_Human_Suffering_Behind_our_Food_report.pdf) have highlighted the desperate need for open markets, transparency, and fair practices. These are precisely our motivations for building an open market.

Producer-Distributor Conglomerates

- Companies such as Cargill and ADM connect producers and users of grains and oilseeds through origination, trading, processing, and distribution. They also provide a range of farmer services (crop input, field management, yield and profit maximization, and risk management). ADM, for example, operates 270 food processing plants and 420 crop procurement facilities.

- These processes are highly optimized internally, however, there is little data visibility across boundaries of these systems, and little ability to solve the problems of optimization, incentives, and end-to-end phenotyping.

Supply Chain Services Companies

- General supply chain optimization has a long history in research and practice. Food supply chains, though, have specific considerations, such as compliance, safe handling, certification.

- A number of companies provide services in this space (Penske Logistics, Baker Tilly, along with global players such as Accenture and BCG).

- These companies provide various services, ranging from training, compliance, instrumentation, transaction markups, audits, and scaling. These are provided on a per-vendor basis.

Traceability Solutions for Supply Chains

- IBM Food Trust is a blockchain based network for supporting food supply chains. This is a relatively simple blockchain implementation with minimal support for privacy, cross party validation, and expressing intra-party logic for optimization and audit.

- Bext360 is a startup that provides a third-party blockchain solution for food supply chains. Once again, beyond a simple ledger, this solution provides no services that are needed to implement a realizable cross-vendor solution.

- Higher level services atop blockchain ledgers are provided by companies such as TransparentPath.

- All of these solutions work as vertically integrated solutions (see also IBM-Walmart), or as single vendor solutions. These solutions cannot support an open market with necessary support for privacy and constrained APIs.

- We strongly believe that an open market is a critical aspect of scalable, secure, optimized food supply chains.