

Traceability to Food Application in the Food Supply Chain

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Finish in Five
 Research



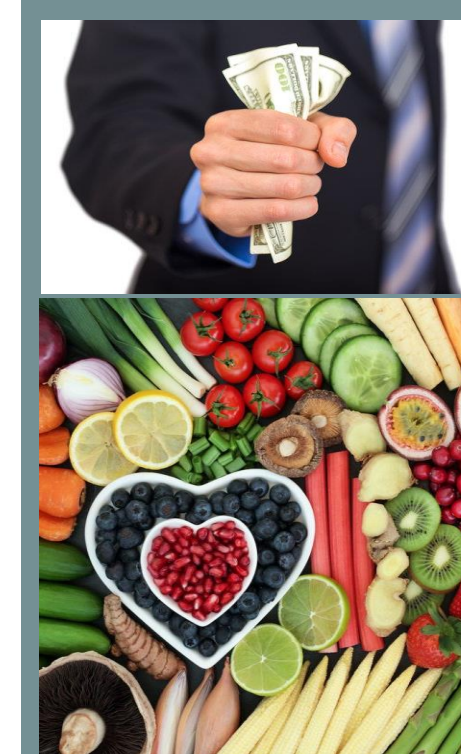
Abstract

1. During food processing there are several conditions and practices that are to be used to preserve the quality of food to prevent major contamination and food-borne illnesses. When food is not kept clean, separated between raw and cooked, cooked thoroughly, kept at safe temperatures, and handled with safe water and raw materials then the foods tend to run the risk of being contaminated, leading to food borne illnesses that can get people either sick or even cause death.
2. Common food viruses can get in our systems simply because of unclean establishments. It is important to have technological development to trace food back to where it was contaminated especially with the increase of contamination.
3. Fresno State is in a food dense industry therefore it is important for students to understand the technology surrounding the growing industry to later improve it.
4. My research approach was to use the Fresno State Research Database to find out more about the technology being used to trace foods through the supply chain.
5. There needs to be more traceability systems in place to implement safer food practices given there is not enough technology and trace systems being used to keep all people safe.

Statistics and Facts on Food Traceability

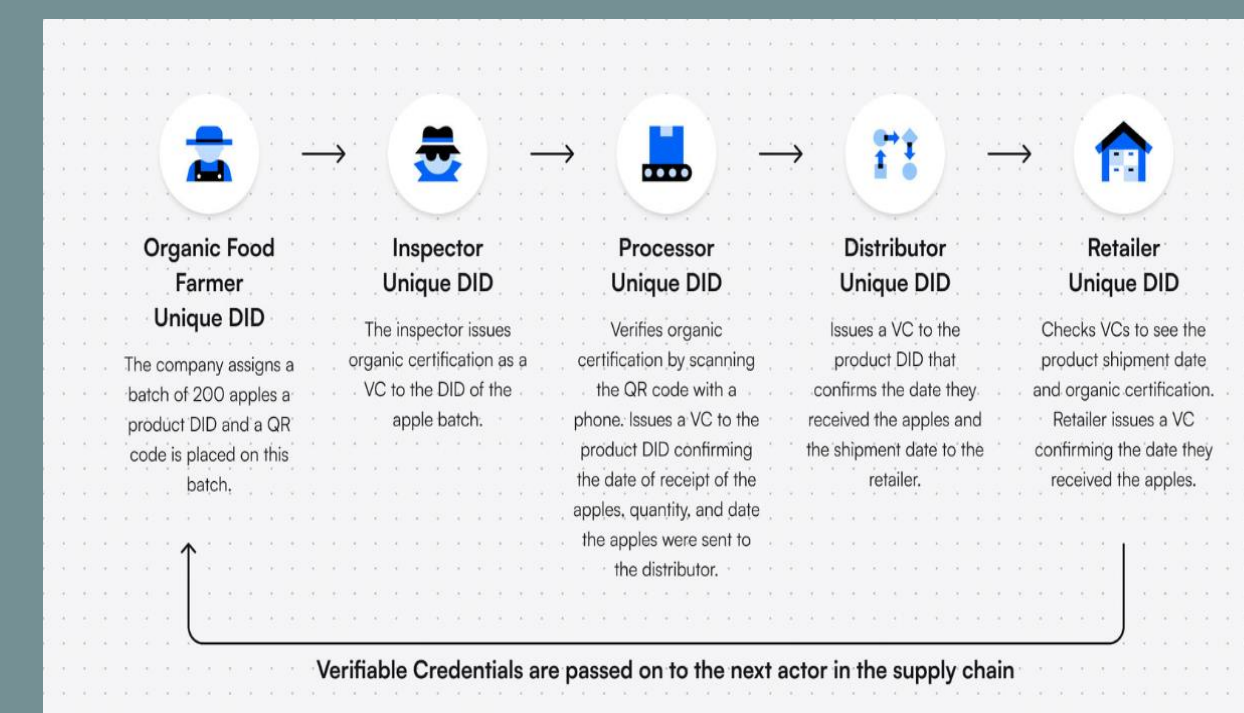
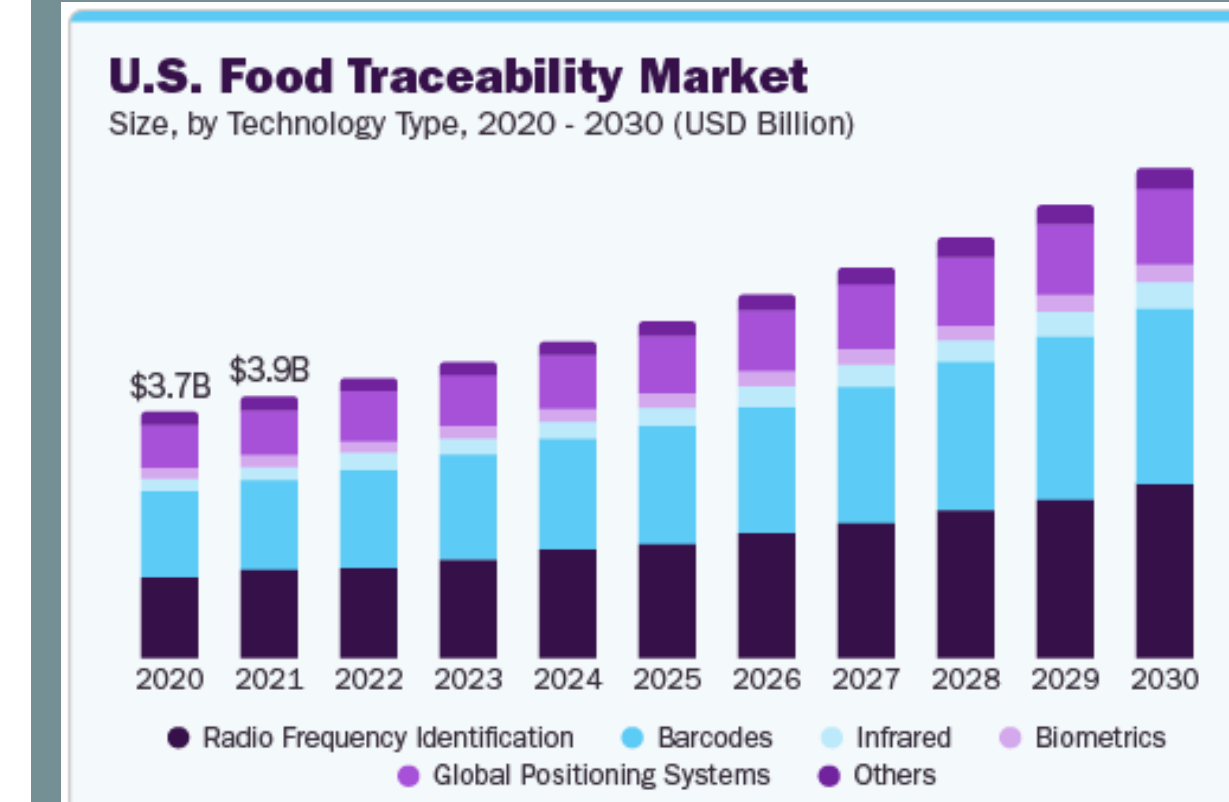
Benefits

- To assess the traceability of selected food products.
- To know how much food facilities maintain information required by the Food and Drug Administration (FDA) in a food emergency.
- Limiting the growing misrepresentation of what is healthy foods with labeling.
 - The growing demand for higher quality foods, the desire for new experiences associated with delicacy products.
 - The booming of e-commerce, further create opportunities for food fraud."
 - Growth of more authentic food. Authentic food is a food product where there is a match between the actual food product characteristics and the corresponding food product claims; when the food product is what the claim says that it is.
 - Food Safety Modernization Act- Established in 2011 to empower the FDA to enhance public health by enforcing the food safety system through new regulatory actions.



Challenges / Issues

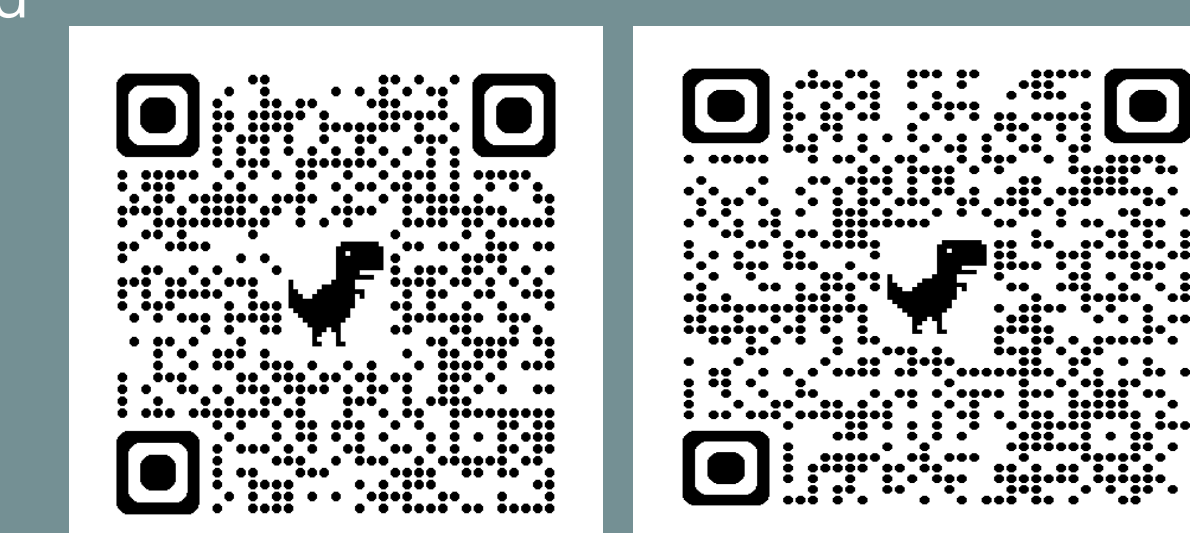
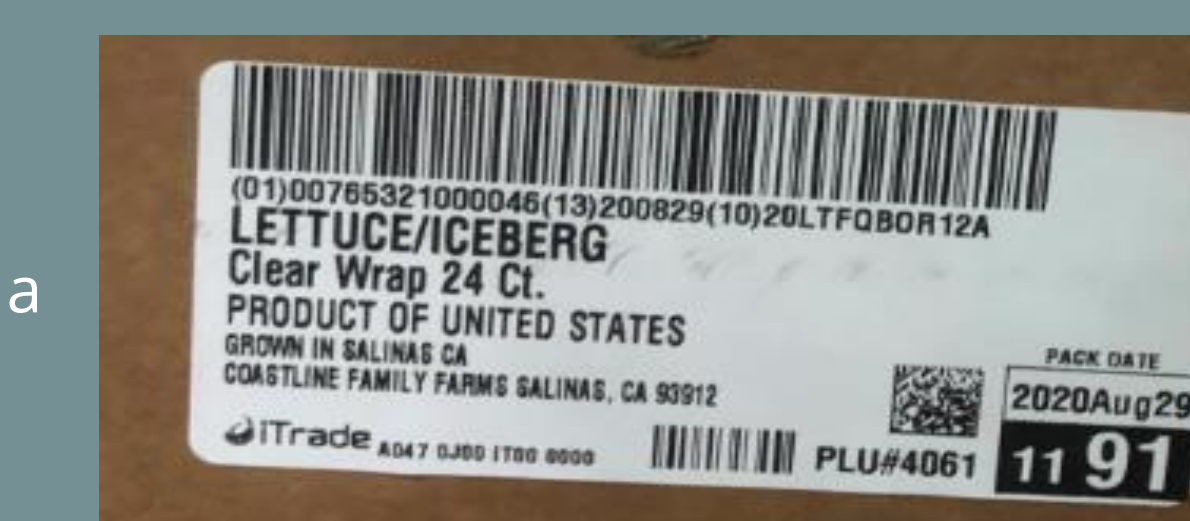
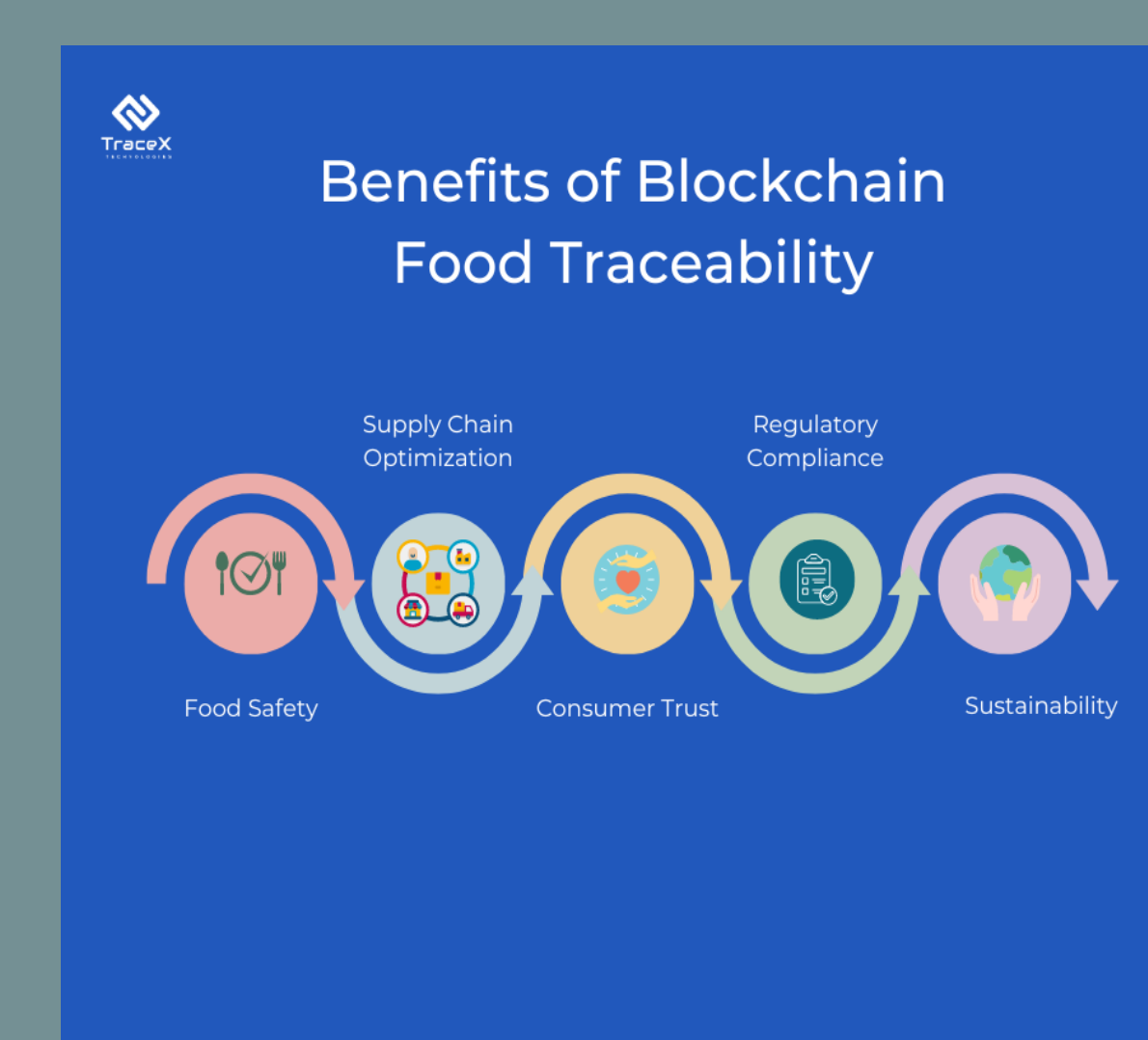
- Companies rather pack more product that isn't top quality to reach retail demand.
- A study was done on the traceability of 40 selected food products and was done through structured interviews with the managers at the food facilities that handled the 40 selected food products.
 - Only 5 of the 40 products were traced through each stage of the food supply chain. For 31 of the 40 products the researchers were only able to find which facilities likely handled them.
 - For the remaining 4 products they were not able to figure out anything through the facilities.
- Fifty-nine percent of the food facilities did not meet FDA's requirements to maintain records about their sources, recipients, and transporters.
- Issues that prevented further tracing...
 - Processors, packers, and manufacturers do not always maintain lot-specific information, as required.
 - Other types of facilities do not maintain lot-specific information because it is not required.
 - Retailers receiving products not labeled with lot-specific information.
 - The mixing of products from many farms.
- Fraud in animal origin products is very common.
- Mislabeling, misinforming of geographical or botanical origin, species substitution, discrepancies in the production method and farming or breeding technique, addition of non-declared substances, as well as fraudulent treatments and non-declaration of processes, such as previous freezing irradiation, and microwave heating.



Technologies

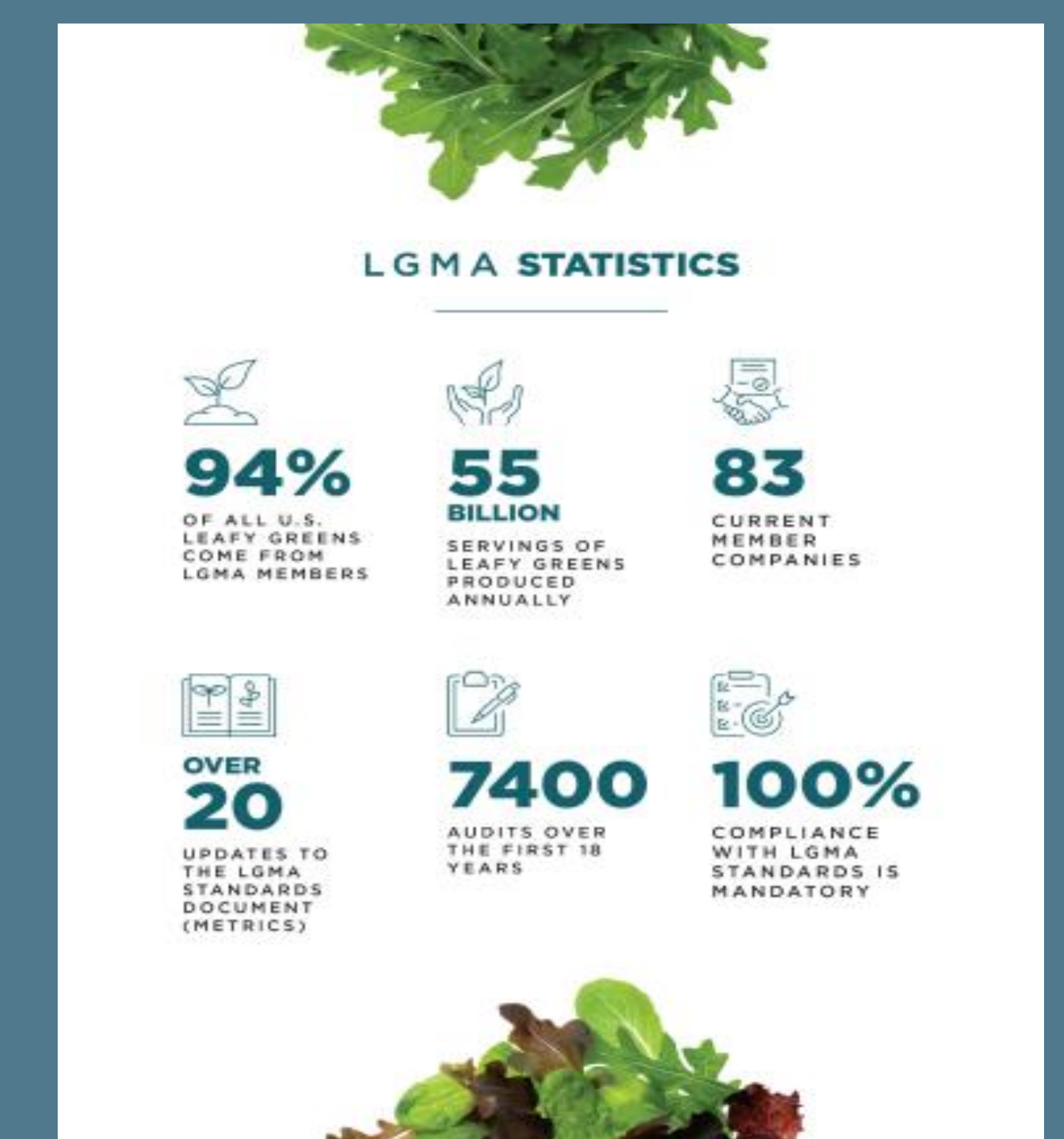


- Blockchain- built around a distributed ledger that contains data on all food supply chain transactions and events. The ledger is formed by timestamped and encrypted data blocks linked in chronological order.
- DNA analysis and MS Methods are used to check fish for species fraud
- Using the processes of NIR spectroscopy and PLS-DA in studies inspectors have been able to find low and high adulterated meats. Sometimes beyond 20% and sometimes below 20%.
- Beef is adulterated with mainly pork and secondly with poultry. This has been proven through spectroscopy to detect this kind of adulteration.
- Beside spectroscopic methods, the traditional ones (e.g., PCR) are still widely used in this field of quality control. For example, Hou et al. used a PCR method to detect different adulterants (duck, chicken, and goose) in pork, beef, and mutton.
- DNA barcoding and ELISA are both methods used to check for adulterer meat.
- All approaches have advantages and disadvantages.
- There are studies done to get Detection of the Geographical origin and Production Method
- Despite the tools mentioned above providing noteworthy outcomes, they are time-consuming, destructive, relatively expensive, and require complex sample preparation.
- From 2000-2010, a lot of effort has been put into developing fast and non-destructive spectroscopy-based approaches to achieve traceability efforts.
- A Traceability Lot Code (TLC) is a descriptor, often alphanumeric, used to uniquely identify a traceability lot within the records of the firm that assigned the traceability lot code. Food industry workgroups recommend the use of a Global Trade Item Number (GTIN), plus the product lot code to create a unique and traceable TLC.
- Record keeping requirements include, traceability records must be maintained, legible, and stored for 24 months, with a requirement to provide them to the FDA within 24 hours.
- Traceability plan- includes record keeping procedures, methods of identifying FTL items, the assignment of traceability lot codes, a designated point of contact for inquiries about the plan and for those growing or raising listed foods, and a farm map displaying growing areas.



Results/ Conclusion

1. The FDA should find new approaches to make food safety more enforced. The FDA should consider requiring facilities to use information technologies to help recordkeeping. A good source would be interoperable recordkeeping systems. Interoperable recordkeeping systems would help by allowing for information to be exchanged between facilities in the food supply chain.
2. The FDA should also try to find statutory authority to all processors, packers, and manufacturers to create and maintain lot-specific information for food products. Next another goal the FDA should be looking to extend is the requirements regarding lot specific information to other types of facilities such as distribution centers, storage facilities, and retailers to be able to accurately trace food products.
3. Conduct mock recalls once systems are in use.
4. There should be more marketing agreements such as LGMA's.



Introduction

What is the FDA?
 The Food and Drug Administration is responsible for finding the source of the contamination and helping to remove the food products from the food supply chain. FDA is responsible for ensuring the safety of almost all food products sold in the United States, except meat, poultry, and some egg products, which are regulated by the U.S. Department of Agriculture. The Federal Food, Drug, and Cosmetic Act gives FDA the authority to regulate food safety. In 2004 the FDA made regulations that enforce all places in the United States to keep records of any place that is a source or recipient of the food products
 What is the Food Supply Chain?
 The food supply chain, is a network of processes that describe how food moves from the farm to the store shelves to the average consumer. It includes different parts, such as production, processing, distribution, consumption, and disposal.



Acknowledgements

This work was supported by the U.S. Department of Education through the Title V Promoting Postbaccalaureate Opportunities for Hispanic Americans grant. Additionally, I would like to acknowledge the invaluable assistance of Fresno State's Industrial Technology Department and express my gratitude to Dr. Arun Nambiar for his essential contributions to this project.