The world is changing …

SO ARE WE
Current Challenges

Current systems do not provide enough nutritious food to feed the world’s population in an environmentally sustainable way.

There are about 800 million undernourished people, 2 billion people are considered micronutrient-deficient and an additional 2 billion are overweight or obese.

Current food production, transport and processing along with their waste streams are placing enormous pressure on environmental resources.
Who Feeds the World in a Pandemic?

Credit: https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6
COVID-19 Food Crisis?

Lockdowns have led to decrease in demand for durable goods and discretionary services, but not food.

COVID-19 is amplifying the risk of a worldwide food-price spike, which would trigger crises in many developing countries.

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20 April 2020

2020 - Global Report on Food Crises

Publication type: Reports

Topics: Food security analysis (VAM)

The 2020 edition of The Global Report on Food Crises describes the scale of acute hunger in the world. It provides an analysis of the drivers that are contributing to food crises across the globe, and examines how the COVID-19 pandemic might contribute to their perpetuation or deterioration. The report is produced by the Global Network against Food Crises, an international alliance working to address the root causes of extreme hunger.

Download "Global Report on Food Crises 2020"

- PDF | 7.09 MB

COVID-19 will have significant impact in world economies.

In the USA, 44 to 57 million jobs are vulnerable in the short term.

Impact more muted in (primary) agriculture sector.

Forty-six percent of those vulnerable jobs are in the food service, customer service, and sales.
COVID-19 Food Trends

COVID-19 is changing how people eat, shop and think about food

New product development and packaging

Stress and disruption of food supply chains
Food Value Chains

Food processing involves various activities; most labour intense

`Social Distancing` in the Food Plant?
The Future of Food

Watch out for what happens in USA, China, India and Nigeria.

Industrial Revolution

In the latter half of the 18th century, industrial revolution transformed largely rural, agrarian societies in Europe and America into industrialized, urban ones.

1IR - mechanization, growth of industries
2IR - mass production, expansion of electricity, petroleum and steel
3IR - digitisation of manufacturing processes

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New Industrial Revolution in the Food Sector

Radical innovations are required in the food sector to feed the growing population

4IR technologies such as artificial intelligence and computer vision robotics will be the tools for dealing with future demand for sustainable food supply.
Artificial intelligence (AI) is concerned with building smart machines capable of performing tasks that typically require human intelligence.

It combines a number of methods and phenomena, among which two major concepts called Neural Networks and Deep Learning are responsible for AI to attain such an outstanding advancement.

Components of AI

- Machine Learning
  - e.g. Deep Learning
- Speech Recognition
  - e.g. Speech to text
- Computer Vision
  - e.g. Image recognition
- Natural Language Processing
  - e.g. Language translation
- Robotics
Computer Vision

Computer vision deals with mimicking human visual system. It is widely used in pattern recognition, machine learning, computer graphics, 3D reconstructions, virtual reality, and augmented reality. Techniques such as line detection, feature extractions, segmentations, feature matching and tracking are widely common.

AI in Healthcare
(Robotics, Computer vision, Machine learning)

- Robot-assisted Surgery
- Drug discovery
- Virtual Medical Assistant
- Data analytics and decision making
THE BIRTH OF AUTONOMOUS VEHICLES  (Computer vision, machine learning)

AI IN AGRICULTURE  (Robotics, Computer vision, Machine learning)

- Pest and disease detection and control
- Robotic harvesting and weed control
- Crop and soil health monitoring
- Yield monitoring and optimization
- Drones and Computer Vision for crop analysis & monitoring of farm animals
Process automation to improve hygiene, improve sorting, detect anomaly, improve food quality to meet ever growing consumer demands.

AI in Processing

(Robotics, Computer vision, Machine learning)

AI in Logistics and Supply Chain Management
Crispiness and Crunchiness of food materials

Food Quality by AI

Kakani et al. 2020. JAFR 2: 100033
Diet and Nutrition by AI

Dietary intake and Nutritional benefits assessment

Food Classification by AI
Looking into eggs

Leveraging AI in Food Safety Compliance
Leveraging AI in other compliances

Other applications of AI

- Recipe prediction from food images
- Packaging Recommendation System
- New food product development
- AI-driven monitoring and cleansing system for food processing equipment
- Food waste reduction and supply chain optimization
AI driven
Computer vision driven

Adapted from Kakani et al. 2020. JAFR 2: 100033

AI adoption across the value chain

1 The WEF Digitalization Index is a GPA weighted average of Europe and United States. See Appendix B for full list of metrics and exploration of methodology.
Creating value by AI

Impact of AI on the food industry

<table>
<thead>
<tr>
<th>Impact of AI on the Food Industry</th>
<th>Image Description</th>
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<tbody>
<tr>
<td>Retail</td>
<td>Machine learning, AI, and IoT</td>
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<tr>
<td>Flexibility</td>
<td>Advanced analytics, AI, and IoT</td>
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<td>Manufacturing</td>
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<tr>
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**Impact of AI on the food industry**

- **Changing the shape of demand**
  - Big data and advanced analytics for insurance
  - Blockchain traceability
  - Precision agriculture

- **Promoting value chain linkages**
  - Alternative proteins
  - Food sensing technologies for food safety, quality, and traceability

- **Creating effective production systems**
  - Nutrigenetics for personalized nutrition
  - Mobile service delivery
  - Off-grid renewable energy generation for access to electricity
Bottlenecks to AI Adoption in Food Processing

- Lack of quality and adequate data
- Lack of technical expertise, technology and research
- High cost of bandwidth and computing resources
- Low awareness of AI capabilities in food processing
- Problems with integration of AI into existing system of operation

Enhancing AI in Nigerian Food Processing Sector

1. Contribute to development of AI capacity among young food processing professionals
2. Partner with local and foreign AI organizations to facilitate development of AI enabled food processing technologies in Nigeria
3. Partner with universities and research institutes to facilitate AI-driven researches in food processing in Nigeria
4. Seek buy-in of relevant government stakeholders to setup National AI Strategy that will impact food processing industry
5. Organize nationwide AI competition geared towards solving food processing problems using AI
Concluding Comments

There are already many uses of AI and machine learning in the food industry. Some of the world’s leading startups and enterprises are already using machine learning and deep learning in their operations.

Concluding Comments

The food industry has historically benefitted from technology.

The future is automated.

The next generation of food processors will rely heavily on emerging technologies such as AI in order to be competitive.
Concluding Comments

There is great opportunities for `smaller players` and developing countries to compete effectively with `big players`.
The time is now to take action for the future.

THANK YOU

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