KeSEBAE NEWS

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AI in Agriculture

By Lincon Muriuki

KeSEBAE Conference 2025 Opening Ceremony

Artificial Intelligence (AI) is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the simplest to those that are even more complex. The goals of artificial intelligence include learning, reasoning, and perception. The agriculture industry is turning to AI technologies to help yield healthier crops, control pests, monitor soil and growing conditions, organize data for farmers, help with workload, and improve a wide range of agriculture-related tasks in the entire food supply chain. This technology has protected the crop yield from various factors like the climate changes, population growth, employment issues and the food security problems. This technology has enhanced crop production and improved real-time monitoring, harvesting, processing and marketing. Artificial Intelligence in agriculture has brought an agriculture revolution. Artificial intelligence technologies are a key ingredient in improving crop yields and sustainability as farmers face the challenge of feeding a growing population. Automation and artificial intelligence are helping relieve the effects of an aging agricultural workforce and a shrinking supply of field workers looking for less strenuous work.

DEAR READER

Welcome to KeSEBAE Newsletter.

A monthly Newsletter touching on topical issues affecting our environment.

KeSEBAE NEWS is a Newsletter of the Kenya Society of Environmental, Biological and Agricultural Engineers (KeSEBAE)

Inside this Issue!

Self-driving agricultural machinery and autonomous drones mean farmers can spend less time watching the path in front of them and more time focusing on the path ahead to more sustainable harvests and profits. Data mining and predictive analytics will become common tools of the trade, enabling farmers to make better decisions, maximize resources and optimize yields.

*Figure **Error! No text of specified style in document.**.1: Artificial Intelligence is Reinventing in Agricultural Sector. Source: https://www.tekshapers.com/blog/How-Artificial-Intelligence-is-Reinventing-in-Agricultural-Sector*

The major factors driving the growth of the AI in agriculture industry include:

- The growing demand for agricultural production owing to the increasing population
- Rising adoption of information management systems and new advanced technologies for improving crop productivity
- Increasing crop productivity by implementing deep learning techniques
- Growing initiatives by worldwide governments supporting the adoption of modern agricultural techniques.

1.0 AI in Agricultural Transformation

- **AI helping analyze farm data**

Farms produce hundreds of thousands of data points on the ground daily. With the help of AI, farmers analyze a variety of things in real time such as weather conditions, temperature, water usage or soil conditions collected from their farm to better inform their decisions. For example, AI technologies help farmers optimize planning to generate more bountiful yields by determining crop choices, the best hybrid seed choices and resource utilization.

- **AI systems are also helping to improve harvest quality and accuracy -- what is known as precision agriculture**

Precision agriculture uses AI technology to aid in detecting diseases in plants, pests, and poor plant nutrition on farms. AI sensors can detect and target weeds and then decide which herbicides to apply within the right buffer zone. This helps to prevent over application of herbicides and excessive toxins that find their way in our food.

- **AI is used to create seasonal forecasting models to improve agricultural accuracy and increase productivity**

These models are able to predict upcoming weather patterns months ahead to assist decisions of farmers. Seasonal forecasting is particularly valuable for small farms in developing countries as their data and knowledge can be limited. Keeping these small farms operational and growing bountiful yields is important as these small farms produce 70% of the world's crops.

- **AI to the sky to monitor the farm**

Computer vision and deep learning algorithms process data captured from drones flying over their fields. From drones, AI enabled cameras can capture images of the entire farm and analyze the images in near-real time to identify problem areas and potential improvements. Unmanned drones are able to cover far more land in much less time than humans on foot allowing for large farms to be monitored more frequently.

- **AI tackles the labor challenge**

With less people entering the farming profession, most farms are facing the challenge of a workforce shortage. One solution to help with this shortage of workers is AI agriculture bots. These bots augment the human labor workforce and are used in various forms. These bots can harvest crops at a higher volume and faster pace than human laborers, more accurately identify and eliminate weeds, and reduce costs for farms by having a round the clock labor force.

- **Efficiency in farming with the use of AI**

Through the use of AI and cognitive technologies farms across the world are able to run more efficiently, with less workers than before while still meeting the world's food needs. There is no more fundamental need than the need of food, and this will never go away.
The use of AI allows farms of all sizes to operate and function keeping our world fed. Through the use of agricultural AI and cognitive technologies, farms across the world are able to run more efficiently to produce the fundamental staples of our dietary lifestyles.[1]

2.0 AI in Agriculture
2.1 AI and Robotics in Agriculture

Robots, Artificial Intelligence and machine learning are helping facilitate new, more sustainable agricultural methods that take farming inside and to new heights to conserve resources, minimize chemicals and shorten time to market. With more sustainable, fresher options from traditional growers, greenhouses and vertical farmers, the world's population should be able to eat better, cleaner, smarter and more affordably. Agricultural robots automate slow, repetitive and dull tasks for farmers, allowing them to focus more on improving overall production yields.

2.1.1 AI in Agricultural Robotics [2]
2.1.1.1 Vision Robotics Lettuce Thinner

The AI-powered robots can tackle a host of products include a vineyard pruner that images vines and uses a robotic arm to thin plants, as well as an automated lettuce thinner.

Reference Video: https://youtu.be/kU4X8WbyloM and https://youtu.be/ZuLsNW3jzu0

Figure 2.2 Vision Robotics Lettuce Thinner Source: https://www.visionrobotics.com/copy-of-about

2.1.1.2 Agrobot E-Series

Agrobot E-series has twenty-four robotic arms working wirelessly and an advanced AI system. The E-series picks strawberries really fast and identifies the ripeness of a strawberry in the field.

Reference Video: https://youtu.be/SmOkhVu6oUI

Figure 2.3: Agrobot E-Series. Source: https://www.foodandfarmingtechnology.com/news/harvesting-technology/berry-picking-at-its-best-with-agrobot-technology.html

2.1.1.3 Blue River LettuceBot2

These robots are the perfect tools for farmers and their lettuce crops. With its imaging system, the LettuceBot2 attaches itself to a tractor to thin out lettuce fields as well as prevent herbicide-resistant weeds. Again, because of this robot's ability to be precise, it uses 90% less herbicide on crops.

Reference Video: https://youtu.be/XH-EFtTa6IU

[1] **Kathleen Walch, (2019).** How AI Is Transforming Agriculture. https://www.forbes.com/sites/cognitiveworld/2019/07/05/how-ai-is-transforming-agriculture/?sh=5f44a6094ad1

[2] **Baiju NT, (2019).** Top 14 agricultural robots for harvesting and nursery. https://roboticsbiz.com/top-14-agricultural-robots-for-harvesting-and-nursery/

Figure 2.4: Blue River LettuceBot2. (Credit: Blue River Technology).

2.1.1.4 Energid Citrus Picking System

The Energid Citrus Picking Systems are fast and efficient harvesting systems. The systems can pick a fruit every 2 to 3 seconds.

Reference Video: https://youtu.be/Gf60au-U318

Figure 2.5: Energid Citrus Picking Systems. Source:https://www.energid.com/industries/agricultural-robotics.

2.1.1.5 RoBoPlant

This robot has both semi and fully automatic machinery for greenhouse management or protected horticulture. The artificially intelligent robot is able to take flats of peat seedlings to separate them and plant them in optimal patterns.

Figure 2.6: RoBoPlant. Source: https://www.iso-group.nl/en/machines/roboplant

2.1.1.6 Harvest Automation HV-100

It takes lots of cool technology to allow the HV-100 to see things in its environment and to find its way around to move all those pots. The robot navigates via two principle systems: a distance-measuring laser called a Lidar and infrared sensors that can read a reflective reference tape.

Reference Video: https://youtu.be/S0pQpgrSoDE

Figure 2.6: Harvest Automation HV-100. Source:https://www.greenhousegrower.com/technology/harvest-automation-robot-helps-you-move-plants-without-people/#Tinsel/130782/1

2.1.1.7 Robotic Vacuum Apple Picker – Abundant Robotics

AR startup uses vacuum to select apples from trees. The robot uses algorithms to identify and locate apples in the tree. The robot is designed to accurately harvest and store apples. The collection is made through a flexible hose and storage is made in the same big boxes that human workers use.

Reference video: https://youtu.be/TBcWZcjXr-I

*Figure 2.7: Robotic Vacuum Apple Picker – Abundant Robotics*https://techgenez.com/apple-picking-robots-are-finally-here/.

2.1.1.8 Harvey – Capsicum Harvester

The robot combines, Artificial Intelligence, robotic vision and automation. The camera system and harvesting tool are mounted at a standard robotic (arm) manipulator end. Combining robotic-vision techniques and crop manipulation tools are key factors in harvesting these crops.

Reference Video: https://youtu.be/qKTrWf1tYew

Figure 2.8: Harvey – Capsicum Harvester. Source: https://research.qut.edu.au/future-farming/projects/harvey-the-robotic-capsicum-sweet-pepper-harvester/.

2.1.1.9 Sweeper – Pepper Picking Robot

Sweeper is built to pick ripe peppers in a greenhouse. The weeper uses a camera that recognizes a pepper's color. Computer vision then helps the robot decide whether to pick the fruit. If so, Sweeper uses a small razor to cut the stem before catching the fruit in its "claws" and dropping it in a basket below.

Reference Video: https://youtu.be/5chk9Sory88

Figure 2.9: Sweeper – Pepper Picking Robot. https://www.agritechtomorrow.com/story/2018/09/pepper-picking-robot-demonstrates-its-skills-in-greenhouse-labour-automation/11020/

2.1.1.10 Green Robot Cotton Harvester V 02

The robot is programmed for typical cotton topography. For maximum motion range, the robot uses six degrees of freedom to reach the cotton plant from the side. Using path-planning algorithms, the arm is guided to the cotton. The robot creates the plant's 3D model and, using a vacuum tube, the machine sucks the cotton in a more time-efficient manner.

Reference Video: https://youtu.be/qwEGGR5b4C4

Figure 2.10. Green Robot Cotton Harvester V 02. Credit: Green Robot Machinery.

2.1.1.11 FFRobotics

FFRobotics is a robot that collects 10,000 apples an hour. FFRobotics machine has a three-fingered grip that can grab and twist fruit from a branch and has at least twelve robotic arms. FFrobot uses advanced algorithms and algorithms to pick tree fruits. Image processing algorithms can detect fruits damaged, diseased, or unripe. The grasping hand can be easily modified to pick different fruit types. This makes the robot available for various harvest seasons.

Reference Video: https://youtu.be/N3_uKSM9Rf8

Figure 2.10: FFRobotics. Source: https://www.ffrobotics.com/

2.1.1.12 GRoW

MetoMotion's GRoW is described as 'a multipurpose robotic intensive system for labor-intensive tasks in greenhouses with the ability to harvest tomatoes.

Reference Video: https://youtu.be/7W1Fk6lQdQY

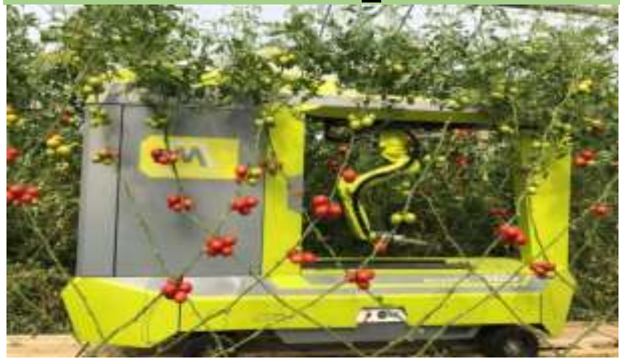

Figure 2.11: MetoMotion's Greenhouse Robotic Worker (GRoW) Harvesting Tomatoes in a Greenhouse. Source: https://www.trendlines.com/company/metomotion/

2.1.1.13 Dogtooth – Harvesting Soft Fruits

Dogtooth Technologies designed a robotic arm capable of harvesting sensitive fruits like strawberries. Using machine vision and motion planning algorithms, the robot recognizes and locates the ripe fruit to be picked.

The robot needs learning algorithms to harvest with fewer errors. Several cameras capture the fruit images for a detailed view of the crops. The GPS system mounted on the robot platform helps precise plant and fruit production. Thus, the farmer can identify the most productive area and low-yield area.

Reference Video: https://youtu.be/kX0yo0KT2jU

Figure 2.12. Dogtooth – Harvesting Soft Fruits. Source: https://www.bbc.com/news/business-43816207

2.1.1.14 Agrobot SW6010

Agrobot SW6010 is a tractor-like robot. This machine uses sensors and robotic arms to detect and pick ripe berries with alarming speed and efficiency. Sensors on the robotic arms can actually tell which berries are ripe and not based on the unpicked berry's shape and size. It packs them in boxes!

Reference Video: https://youtu.be/M3SGScaShhw

Figure 2.13. Agrobot SW6010.

2.1.1.15 Cucumber Harvester

Cucumber Harvester is a smart robot that can spot and pick ripe cucumbers on the vine. The robot detects individual cucumbers, assesses maturity and harvests ripe cucumbers.

Reference Video: https://youtu.be/EiQG4zhMHLM

Figure 2.14: Cucumber harvesting robot. Source: http://vogel-engineering.com/index.php?id=275&CUCUMBER-HARVESTER.

2.1.1.16 Avo - Weeding Robot

The Avo – Weeding Robot is an autonomous machine for a more ecological and economical weeding of row crops, meadows and intercropping cultures.

Reference Video: https://youtu.be/5vvQqqc1zHM

Figure 2.15: Avo - Weeding Robot. Source: https://www.ecorobotix.com/en/

2.1.1.17 Ecorobotix

Powered by the sun, this lightweight GPS, fully autonomous drone has the ability to use its solar power to run all day. The robot uses its complex camera system to target and spray weeds. Because of its very precise arms, the robot uses **90%** less herbicide, making it **30%** cheaper than traditional treatments. A fleet of these robots could easily replace human farm labor down the road.

Reference Video: https://youtu.be/IKZfjtPquzs

Figure 2.16: Ecorobotix.
Source: https://www.ecorobotix.com/en/.

2.1.1.18 Potting-Robot

The potting-robot picks up a couple of pots and to put them down in another place, for example, from a conveyor belt to a mobile pot container. With the potting-robot it is possible to pick up a complete line of pots and to put them down in another place, for instance from the conveyor belt of a potting machine to a mobile pot container.

Reference Video: https://youtu.be/PkqeR7mrzzU

Figure 2.17: Potting Robot. Source: https://www.hetoagrotechnics.com/potting-robot/info/

2.1.1.19 Rubion Bot

The Rubion bot uses a special vision system to detect when a berry is ripe and then plucks it with a soft 3D-printed hand. The strawberry picking robot Rubion finds its way through the crop, picking berries like the ideal human picker, without bruising the strawberries. The robotic system allows for sorting, advanced crop monitoring and precision farming. The robotic arm picks the berries and places it in the punnet in one smooth movement, with the chosen weight in every punnet.

Reference Video:
https://www.youtube.com/watch?v=OyA9XnW6BV

Figure ***Error! No text of specified style in document.****-18: Rubion Bot. Source: http://octinion.com/products/agricultural-robotics/rubion.*

2.1.1.20 FarmWise's Weeding Robots

A California-based team trained machine-learning camera using millions of images so that the robot can differentiate between crop and weed. The robot is trained to spot the center of each crop so it doesn't disturb its growth when it goes in to snag a weed. FarmWise's weeding robots combines multiple domains of expertise such as machine learning, robotics and mechanical engineering.

Reference Video: https://youtu.be/zYurqd7yUYs

Figure ***Error! No text of specified style in document.****-19. FarmWise's Weeding Robots. Source:*

https://roboticsandautomationnews.com/2019/01/07/farmwise-launches-autonomous-weeding-robot/20383/

2.1.1.21 UR5 Robot

UR5 Robot improves the milking process by spraying disinfectant on the cows' udders in preparation for milking.


Figure 2.20: UR5 Robot.

2.1.1.22 TerraSentia

Combined with other on-board technology systems, TerraSentia collects data on traits for plant health, physiology, and stress response. The bot measures young plant health, corn ear height, soybean pods, plant biomass mas well as detect and identify diseases and abiotic stresses, according to the site. So far, it's been deployed in corn, soybean, wheat, sorghum, vegetable crops, orchards, and vineyards.

Reference Video: https://youtu.be/Dc63XGDj2SU


Figure 2.21: TerraSentia.

Source: *https://www.agriculture.com/news/technology/terrasentia-robot-automates-the-labor-intense-process-of-collecting-data-to-improve*

2.2 AI in Crop and Soil Health Monitoring[3]

2.2.1 Plantix

Plantix identifies potential defects and nutrient deficiencies in soil. Analysis is conducted by software algorithms which correlate particular foliage patterns with certain soil defects, plant pests and diseases. The image recognition app identifies possible defects through images captured by the user's smartphone camera. Users are then provided with soil restoration techniques, tips and other possible solutions.

Reference Video: https://youtu.be/0tQ__k3G17g


Figure 2.22: Plantix - The fungus-fighting plant app. Source: https://www.dw.com/en/the-fungus-fighting-plant-app/a-37442349

2.2.2 Machine Learning for Diagnosing Soil Defects

Trace Genomics, provides soil analysis services to farmers. It uses high-throughput DNA sequencing, artificial intelligence, and a growing database of known and previously unknowable microbial species living in agricultural soils to identify and profile the soil microbiome, interpreting key soil health and disease risk indicators for every soil sample.

By understanding how soil microbes affect crop production, Trace Genomics' microbiome test delivers actionable insights to growers. These insights include how to achieve more efficient nutrient use, how to reduce input costs, how to reduce crop disease risk, and which seeds, rotations or biological agents will work best for their soils.

[3] Daniel Faggella, (2020). AI in Agriculture – Present Applications and Impact. https://emerj.com/ai-sector-overviews/ai-agriculture-present-applications-impact/

Trace Genomics' tests can also effectively gauge soil health, carbon sequestration, and sustainable agricultural production.

Figure 2.23: Trace Genomics - AI-enabled diagnostic tool, scalable soil microbiome test. Source: https://www.microbiometimes.com/

2.3 AI in Predictive Agriculture [3]

2.3.1 Transforming Weather Forecast with AI

Weather tracking and forecasting are important applications of AI in agriculture as it facilitates gathering up-to-date information of prevailing weather conditions such as temperature, rain, wind speed and direction, and solar radiation. According to a research study, 90% of crop losses are due to weather events and 25% of these losses could be prevented by using predictive weather modelling.

Various kinds of devices including handheld instruments, sensors, GPS and on-field weather stations are used for the application of weather tracking to get real-time information. The availability of real-time information helps farmers in making various decisions such as timely sowing of crops, weed detection, and pre-harvesting analysis of crops.

2.3.1.1 Satellites for Weather Prediction and Crop Sustainability

aWhere, a Colorado based company uses machine learning algorithms in connection with satellites to predict weather, analyze crop sustainability and evaluate farms for the presence of diseases and pests. Daily weather predictions, are customized based on the needs and range from hyperlocal to global.

Reference Video: https://youtu.be/IcY3mURehec

2.3.2

2.3.3 Satellites for Monitoring Crop Health and Sustainability

FarmShots focuses on analyzing agricultural data derived from images captured by satellites and drones. Specifically, it aims to "detect diseases, pests, and poor plant nutrition on farms."
The software informs the users exactly where fertilizer is needed and can reduce the amount of fertilizer used by nearly 40 percent.

Reference Video: https://youtu.be/wu9-m16V_bA

Figure 2.24: Identifying Field Issues with FarmShots Technology. Source: https://www.syngenta-us.com/thrive/news/farmshots-technology.html

2.4 Artificial Intelligence in Precision Agriculture [3]

One of the immense advantages of artificial intelligence in agriculture is precise operations. High-quality thermal imagery through powerful lenses from above through drones gives brief information on the field.

Thermal images are used as an analytical tool for field conditions. These thermal images display the information of various field problems. The information in the thermal images can point out various problems for example area of the field is having soil, nutrients and irrigation problems.

Usually, fields are treated uniformly in terms of irrigation, fertilizer applications and soil management practices. AI Thermal images are now a more innovative approach to field management. It points out different areas of the field with different problems that need variable control.

Figure 2.25: AI application in Precision Agriculture. Source: https://eos.com/blog/precision-agriculture-from-concept-to-practice/

2.5 AI Drones in Agriculture

Drones are equipped with powerful cameras that fly above the field and can detect different problems in the field. Agricultural drones can detect diseased plants in the field and those areas in the field having a problem or pest attack. The drones can be mounted with different AI devices and sensors that can gather important data for farmers to analyze their farming. It enables the farmer to know about the production and outcome of the crops.

Artificial intelligence on agriculture drones has proved to be helpful in mapping and management of fields. They can be used to broadcast seeds and spray a particular area of the field if remodeled.

Figure 2.26: Use of drones in precision farming. Source: https://www.farmmanagement.pro/5-practical-uses-for-drones-in-precision-farming/

2.6 AI Chatbots for Agriculture Solutions

One of the many benefits of artificial intelligence in agriculture is that it helps farmers to get an instant response.

Agricultural chatbots are developed on mobile apps that instantly answer the oral questions asked by farmers. The chatbots answer questions ranging from commodity prices in the market, news about farming, weather conditions etc.

These chatbots direct them to the company's database and provide timely analyzed information. Moreover, chatbots can connect the farmers to different agricultural extensions and call centers established by governments or private firms. These firms assist them in concerning a problem or provide guidelines in different scenarios.

2.7 AI and Food Safety

AI and machine vision are playing a key role in the world of food safety and quality assurance. AI makes it possible for computers to learn from experience, analyze data from both inputs and outputs, and perform most human tasks with an enhanced degree of precision and efficiency.

Robots are also sterile. That's a huge benefit. It's hard to overestimate how much AI solutions can help stem the rising tide of foodborne illness. Robots could radically reduce the risk of food recalls, since they can eliminate the opportunity for human workers to unwittingly transfer diseases through manual food handling. In addition, they are easy to clean.

Food companies and regulatory agencies should take advantage of the following two promising technologies:

2.7.1 Electric Noses

These electronic chemical sensors can recognize odors using the same principle as the physiology of smell. By identifying aromas in raw materials that match a coded sensory fingerprint in a pathogen database, electronic noses have great potential to improve quality control during food processing and packaging.

2.7.2 Next Generation Sequencing

NGS is playing an increasingly critical role in the evolution of laboratory processes and may soon

replace traditional DNA methods of food safety testing. By automating workflows, critical processes such as data capture and preparation of lab samples is becoming faster and more accurate. NGS tools will ultimately allow organizations such as the CDC, the FDA, etc. to better identify trends and threats to prevent foodborne illness outbreaks from occurring.

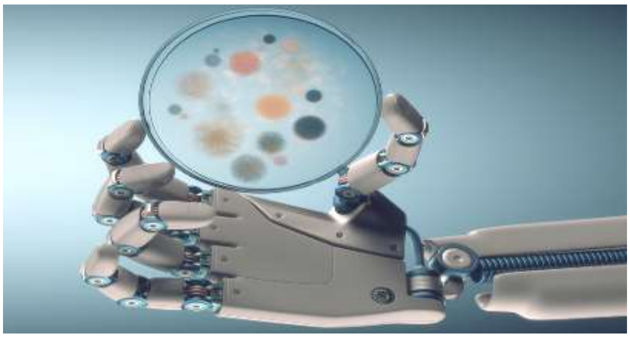

Figure 2.27: Next Generation Sequencing. Source: https://www.foodsafetynews.com/2017/12/lab-robots-crucial-for-end-to-end-food-safety-data-systems/#.W12UQS2ZM6i

2.8 AI and Agricultural Production Management

Agricultural production is a highly complex supply chain. AI is shifting the way our food is produced, distributed, and consumed. Researchers use AI-powered technologies to provide knowledge and guidance about crop rotation planning, planting times, water and nutrient management, pest management, disease control, optimal harvesting, food marketing, product distribution, food safety, and other agriculture-related tasks in the entire food supply chain.

3.0 Advantage of implementing AI in Agriculture

The use of Artificial intelligence in agriculture helps the farmers to understand the data insights such as temperature, precipitation, wind speed, and solar radiation. The data analysis of historic values, offers a better comparison of the desired outcomes. The best part of implementing AI in agriculture that it won't eliminate the jobs of human farmers rather it will improve their processes.

- AI provides more efficient ways to produce, harvest and sell essential crops.
- AI implementation emphasis on checking defective crops and improving the potential for healthy crop production.
- The growth in Artificial Intelligence technology has strengthened agro-based businesses to run more efficiently.
- AI is being used in applications such as automated machine adjustments for weather forecasting and disease or pest identification.
- Artificial intelligence can improve crop management practices thus, helping many tech businesses invest in algorithms that are becoming useful in agriculture.
- AI solutions have the potential to solve the challenges farmers face such as climate variation, an infestation of pests and weeds that reduces yields.

4.0 Concluding Thoughts

AI-driven technologies are emerging to help improve efficiency and to address challenges facing the agriculture industry including, crop yield, soil health and herbicide-resistance. Agricultural robots are becoming highly valued application of AI in the agriculture sector.

The future only depends on how much adopts the techniques of machine learning. A large number of applications are available in the market and some application is still in progress but still, the industry is underprivileged.

The amount of data that is captured by the smart machines like drones and satellite is giving the agriculture industry new capacity to recognize opportunities and predict the changes. The predictions are made that in the coming years satellite machine vision applications will become more common in the agriculture industry.

It is also important that farmers are provided with the training to revolutionize the latest technology and continue to improve. This will prove the importance of machinery over the long trail.

KeSEBAE CONFERENCE 2025

The 2025 KeSEBAE Conference, themed ***Engineering Climate Change***, was convened at the Chandaria Auditorium in the University of Nairobi Towers from 23 to 24 April 2025, with both in-person and virtual participation.

Arrival and Registration at Chandaria Entrance

Arrival of the Chief Guest in Company of Eng. Ezekiel Oranga and Stephen Ondieki

Opening Ceremony in Session, Attendees Sang the National Anthem

In his opening remarks, Hamisi Williams, Deputy Country Representative and Head of Programmes at FAO Kenya, noted that the Engineering Climate Change initiative aligns with Kenya Vision 2030 and Sustainable Development Goal 2: Zero Hunger, core to FAO's mandate, and affirmed that FAO was well placed to contribute. He highlighted FAO's role in the upcoming United Nations Food Systems Summit +4 Stocktake, scheduled for 27–29 July 2025 in Addis Ababa, Ethiopia, a four-year review of the inaugural 2021 Summit designed to assess progress, strengthen accountability and mobilize investments for agrifood-system transformation. Emphasizing the need to produce more with less, he advocated harnessing advanced technologies such as precision irrigation and digital extension services, and urged KeSEBAE to raise its profile by implementing practical engineering solutions, praising its diverse, multidisciplinary membership for providing the expertise needed to turn ambition into action.

KeSEBAE President, Eng. Prof. Lawrence Gumbe with Chief Guest, Hamisi Williams

Eng. Prof. Lawrence Gumbe The President, KeSEBAE, underscores KeSEBAE's mandate to advance engineering in environmental, biological and agricultural sectors through original research, professional collaboration and high standards of practice. He reminded delegates that Kenya Vision 2030 and global Sustainable Development Goals demand engineer-led national planning at both national and county levels and called on government to integrate engineers into policy-making processes. Tracing the profession's evolution from Roman aqueducts and 19th-century fortifications to today's precision irrigation, smart farming and urban-infrastructure solutions, he highlighted emerging frontiers; agricultural robotics, IoT-driven vertical farming, pollution-free technologies, resilient cities, circular-economy waste management, advanced bioprocessing and biomedical innovations. He affirmed that KeSEBAE's diverse, multidisciplinary membership is uniquely positioned to translate these opportunities into climate-smart, food-secure, resource-efficient realities.

KeSEBAE President Delivering His Speech

Eng. Prof. Ayub Gitau Represented UoN VC

Eng. Anthony Okere Represented Chairperson, EBK

Eng. Shammah Kiteme, President, IEK

Prof. Thomas Ochuku – Director of Research and Enterprise, UoN

Eng. Jonah Kebeney – Represented, Principal Secretary, State Department of Agriculture

Other Distinguished Guests:

1. **Eng. Prof. Douglas Shitanda**, Vice Chancellor, South Eastern Kenya University
2. **Prof. Daniel Mugendi Njiru**, Vice Chancellor, University of Embu
3. **Prof. Elijah M. Ateka**, Deputy Vice Chancellor, Academic Affairs, Jaramogi Oginga Odinga University of Science and Technology.
4. **Dr. Ayub Macharia**, Director, Environmental Education, Information and Public Participation, NEMA
5. **Mr. Alex Mugambi**, Chair, Environment Institute of Kenya
6. **Eng. Charles Muasya**, CEO, National Irrigation Authority

Our key partner, the University of Nairobi, guided attendees through every facet of the new Engineering and Science Complex:

i. **Mr. Brian Ouma, Chief Operations Officer, UoN** – Overview remarks on the Engineering and Science Complex

ii. **Ms. Beatrice Ndaisi** – Detailed presentation on the proposed complex and Industry–academia linkage pillar

iii. **Arch. Jarrett Onyango Odwallo** – Architectural design of the Engineering and Science Complex

Brian Ouma

Arch. Jarrett Onyango Odwallo

Beatrice Ndaisi

Prof. Marc Zolver

Presenters

Eng. Prof. Hameer Sameer (Right) and Eng. Dr. Joseph Sang

Eng. Prof. Moses Marenya

Dr. Justine Nyaga

Eng. Kennedy Okuku

Twenty-Four (25) Papers were Presented:

1. **Dr. Hezron Mogaka and Dr. Justin Nyaga**: Role of Precision Agriculture on Climate Change Adaptation in Africa.
2. **Eng. Serede Jairus; Mbugua Harun; Oscar Mutiga**: Potential Improvements in Rice Crop Production in Kenya Using Remote Sensing and its Implications for Future Water and Land Demand.
3. **Dr. Ayub Macharia, Director, NEMA**: Waste Management in Kenya.
4. **Okuku K., O. (Egerton), Onyando J.O. (Egerton), Okwany R.O. (Egerton) & Kiptum C.C. (UoE)**: Rainfall Onset Variability and Cumulative Precipitation Analysis for Optimizing Sorghum Cultivation
5. **Eng. Prof. Sameer Hameer**: Air Transport in Africa.
6. **Eng. Prof. Moses Marenya**: Rethinking the Engineering Profession in Kenya: What Can Kenya Borrow from South Africa?
7. **Eng. Amos Kiptanui**: Machinery for Agroprocessing and Value Addition.
8. **Prof. Nyaanga et al**: Status of Solar Powered Irrigation Systems in Kenya.
9. **John P. O. Obiero, Vide Adedayo, Alice Rutto, Allois Luvai Kioko,**

Raphael Wanjogu: Simulating Climate Change Impact on Irrigated Agriculture for Development of Adaptation Measures in River Basins in Kenya (Nyando) and Nigeria (ASA).

10. **Hellen Jerotich Sang**: Optimization of SDI System Variables for Watermelon Crop Water Productivity in ASALs
11. **Kennedy Okuku, Japheth Onyando, Romulus Okwany, Clement Kiptum**: Shifting Weather Patterns and their Influence on Sorghum Yield and Water Use Efficiency
12. **Irine Jeptum, James Messo Raude, Jeremiah Kiptala and Charles Cheruiyot**: Application of HEC-HMS for Flow Simulations for Perkerra River Catchment in Kenya.
13. **Javan Joshua Ayieko**: Design of a Tractor Mounted Sugarcane Planter Integrating a Fertilizer Application Mechanism.
14. **Emmy A. Wanjohi**: Social Dynamics in Project Management – The Case of DRSLP.
15. **Eng. Ezekiel Oranga**: An Assessment of Agricultural Machinery in Kenya.
16. Prof Edward Ontita, Director, Center for Land Acquisition and Resettlement Studies (CELARS): At the Interface of Engineering and Social Sciences
17. **Eng. Dr. Elisha Aketch**: Engineering Accessibility in Nairobi City by Road Transport Infrastructure in the Face of Climate Change Dilemmas.
18. **Raude, James Messo; Ndolo, Monica Mwikali and Matheka, Rosemary Mwende**: Surface Water Bodies Threat from Antibiotic Resistance Genes-an Emerging Trend.
19. **Eng. Dr. Joseph Sang**: Sedimentation Assessment and Bathymetric Survey in Reservoirs and Natural Lakes: A progress of 10 Years Application of Bathymetric Survey System in Kenya.
20. **Eng. Claudia Bess**: Green Hydrogen.
21. **Jacob Simwero, Dr. Patrick Ajwang and Dr. Fundi Sanewu**: Barriers to the Adoption of Sustainable Construction Practices in Kenya.
22. **Steve Ayal**: Agricultural Mechanization for Climate Change.
23. **Eng. Shiribwa Mwamzali**: How Energy Efficiency Can Lessen the Gravity of Climate Change.
24. **Dr Ali Adan Ali**: Engineering Climate Change Solutions through a Data- Driven Perspective.
25. **Ebenezer Nyambura**: Reuse of Plastic Materials in Production of New Products for Light Industry and Conservation of a Green Environment in Kenya.

Honorary Secretary, KeSEBAE, Moderating the Conference

Stephen Ondieki, Chairman, Department of Environmental and Biosystems Engineering Making a Speech

Industrial Visits

KeSEBAE organized visits to two companies on 25 April 2025:

i. TECSOLS Ltd
ii. New Kenya Co-operative Creameries

The Team at New KCC led by Eng. Ezekiel Oranga and Stephen Ondieki

Dr. Musa Njue (Right) Owner of Tecsols Ltd with Eng. Shiribwa Mwamzali Briefing the Visitors

KeSEBAE Team at Tecsols Ltd in Nakuru

During the Conference the KeSEBAE Strategic Plan 2025-2030 was successfully launched on 24 April 2025 by Eng. Jane Mutilili, President of ACEK, during the conference closing ceremony.

One hundred (100) guests including students attended KeSEBAE Cocktail party at United Kenya Club on 23 April 2025 in the evening.

Five exhibitors showcased various technologies and services.

Booths for Ministry of Agriculture (Left) for AFICAT and EBARA Pumps (Right)

They Included:

1. New Kenya Co-operative Creameries
2. Africa Field Innovation Center for Agricultural Technology
3. EBARA Pumps
4. ICEALION Insurance
5. Ministry of Agriculture and Livestock Development

Group Photo of Chief Guests and Distinguished Guests

Group Photo of Attendees on 23 April 2025

The conference drew to a close on a high note with KeSEBAE's Annual General Meeting, where members not only reflected on a landmark ***Engineering Climate Change*** gathering but also charted bold new directions for the Society; underscoring a shared commitment to innovation, collaboration and sustainable impact in the year ahead.

One of AGM agenda was the change of KeSEBAE's governance framework to fit the industry standards.

i. Rebranding of leadership titles: The "Chairperson" becomes President, the "Vice Chairperson" becomes Vice President, the "Secretary" is now Honorary Secretary, the "Treasurer" is Honorary Treasurer, and the assistant roles are recast
ii. as Honorary Vice Secretary and Honorary Vice Treasurer.
iii. Establishment of a formal Council: What was formerly the Executive Committee is now the Council, charged with overarching strategy and policy, while a newly constituted Executive Committee—composed of the President, Vice President(s), Honorary Secretary, Honorary Treasurer, Honorary Vice Secretary and Honorary Vice Treasurer—will handle day-to-day operations, including staff recruitment, procurement and financial oversight.
iv. Updated secretariat location

These amendments align KeSEBAE's structure with international best practice, bolster clarity of roles, and streamline decision-making as the Society scales up its impact.

Guests Enjoying Cocktail at United Kenya Club

CALL FOR PAPERS

To the Next Editions of the JEAE

JEAE

Journal of Engineering in Agriculture and the Environment

The Journal of Engineering in Agriculture and the Environment (JEAE) is a Publication of the Kenya Society of Environmental, Biological and Agricultural Engineers (KeSEBAE) through which researchers in the fields of Environment, Agriculture and related fields share research information and findings with their peers from around the globe.

The JEAE Editorial Board wishes to invite interested researchers with complete work in any relevant topic, to submit their papers for publication in the next editions of the Journal.

Manuscripts may be submitted online or via email to:

Chairperson, JEAE Editorial Board via Email: jeae@kesebae.or.ke or Online via: https://kesebae.or.ke/journal/index.php/kesebae/about/submissions

Criteria for Article Selection

Priority in the selection of articles for publication is that the articles:

a. Are written in the English language
b. Are relevant to the application of engineering and technology in agriculture, the environment and biological systems
c. Have not been previously published elsewhere, or, if previously published are supported by a copyright permission
d. Deals with theoretical, practical and adoptable innovations applicable to engineering and technology in agriculture, the environment and biological systems
e. Have a 150 to250 words abstract, preceding the main body of the article
f. The abstract should be followed by the list of 4 to 8 “Key Words”
g. Manuscript should be single-spaced, under 4,000 words (approximately equivalent to 5-6 pages of A4-size paper)
h. Should be submitted in both MS word (2010 or later versions) and pdf formats (i.e., authors submit the abstract and key words in MS Word and pdf after which author uploads the entire manuscript in MS word and pdf)
i. Are supported by authentic sources, references or bibliography

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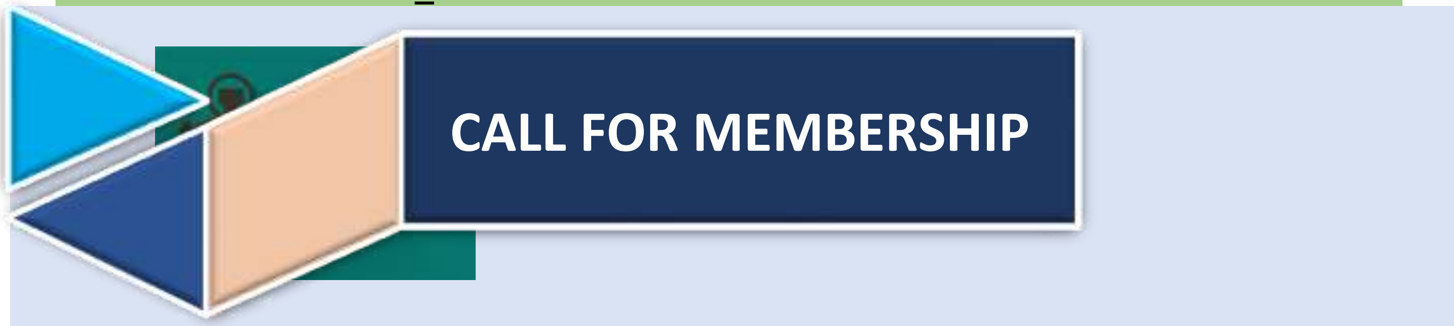
KeSEBAE NEWS Editorial wishes to call for topical articles for publication in future editions of KeSEBAE NEWS.

Please transmit the same via Email: info@kesebae.or.ke

NOTE: A payment will be made to the author of each selected article



Be a KeSEBAE Member:

The annual subscription fees, admission fees and reinstatement fees for members of all grades (except Honorary and Life Members who shall pay no dues or fees) are indicated below: The annual dues are as follows:

Membership Category	Annual Subscription (KES)	Admission Fees (KES)	Reinstatement Fees (KES)
Fellow	5,000	1,000	2,000
Member	2,000	1,000	2,000
Ass. Member	1,000	1,000	2,000
Aff. Member	500	1,000	2,000
Student	300	100	-

Membership Renewal

Members of all grades are requested to renew their **2024 membership as follows.**

Membership Category	*Annual Subscription Fee (KES)*
Fellow	**5,000**
Member	**2,000**
Ass. Member	**1,000**
Aff. Member	**500**
Student Member	**300**

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Account No.	**2038150696**
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