AGRITECH 4. 0

HACKATHON 2024

FARMING REDEFINED

MINISTRY OF ICT & NATIONAL GUIDANCE
A Knowledge and Productive Society driven by ICT & National Ideology

NITA UGANDA
- Driving the IT Revolution -

CAMTech UGANDA

StartHub

Edition 1

May 2024

AGRI-TECH HACKATHON 2024

THEME

UTILIZING INDUSTRY 4.0 TECHNOLOGIES TO ADDRESS THE CHALLENGES CONFRONTING SUSTAINABLE AGRICULTURE IN UGANDA

3rd - 5th May 2024

National ICT Innovation Hub(NIIH)

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National ICT Innovation Hub

MINISTRY OF ICT & NATIONAL GUIDANCE
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- Driving the IT Revolution -

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Editorial Note

Agriculture remains the backbone of Uganda's economy, supporting livelihoods and ensuring food security. Yet, this vital sector is facing growing challenges—climate change, resource depletion, inefficiencies in production, and limited market access—which threaten its sustainability.

Welcome to this special edition of our AgriTech Hackathon 2024 magazine, where innovation meets agriculture at the intersection of cutting-edge technology and sustainable solutions. This year's hackathon, themed "Utilizing Industry 4.0 Technologies to Address Challenges Confronting Sustainable Agriculture in Uganda," reflects a timely and crucial focus on reshaping the future of Uganda's agricultural sector.

As we enter the Fourth Industrial Revolution, technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), big data analytics, and automation provide unprecedented opportunities to transform agricultural practices and ensure a more sustainable future.

The AgriTech Hackathon 2024, hosted by the Uganda Institute of Information and Communications Technology (UICT) and the National ICT Innovation Hub (NIIH), brought together brilliant minds from across tertiary institutions nationwide to address these pressing agricultural challenges. The event, held from May 3rd to 5th, 2024, in collaboration with Start Hub Africa, CAMTech Uganda, and key partners such as the Ministry of ICT and National Guidance (MoICT), Uganda Communications Commission (UCC), National Information Technology Authority - Uganda (NITA-U), the STI Secretariat, and POLLICY, showcased the potential of Industry 4.0 technologies to revolutionize agriculture.

The hackathon attracted over 250 applications, from which 96 innovators were selected to form 16 teams that tackled critical issues in Soil Health Optimization, Efficient Water Usage, Enhanced Agricultural Inputs, and Supply Chain Optimization. These interdisciplinary teams, mentored by experts from diverse sectors, developed creative solutions aimed at transforming Uganda's agricultural landscape. Their efforts demonstrated the power of collaboration and innovation in addressing the real-world challenges facing Uganda's farmers.

This magazine captures the essence of the AgriTech Hackathon 2024—highlighting the innovative solutions developed, challenges encountered, and the opportunities for future growth. From AI-driven smart farming systems to IoT-enabled real-time monitoring tools, the projects presented here offer a glimpse of how technology can bridge the gap between tradition and modernity, ensuring a sustainable and prosperous agricultural sector.

As you explore the solutions and stories within this edition, we hope you are inspired by the vision and creativity of Uganda's next generation of agri-tech pioneers. The future of sustainable agriculture is bright, and with the continued support, mentorship, and collaboration of stakeholders, the innovations developed here can become game-changers for Uganda's farming communities.

Enjoy reading and stay inspired as we continue to drive the future of agricultural innovation.

UGANDA INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY (UICT)

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Uganda Institute of Information and Communications Technology (UICT) is a Public Tertiary Institution that offers competence-based, practical-oriented training programmes in ICT, Engineering, and Business Management; course examined by the Uganda Business & Technical Examination Board (UBTEB) and Professional and Speialized Short Courses.

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8. ICT in Education Management, Teaching, Learning, and Testing
9. Digital Marketing

For detailed information about the programmes and application, please visit our website at https://www.uict.ac.ug or https://admissions.uict.ac.ug/

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Gastervas and other members of the organising team

> **"Traditional agricultural methods are insufficient to meet the growing demands for food security and economic development, highlighting the necessity of integrating advanced technologies."**

MR. GASTERVAS RUTWARA
Chair, Organising Committee

Message from Chief Organiser

The AgriTech Hackathon 2024 created a dynamic platform for innovation, encouraging participants to devise technological solutions for pressing issues, including Agricultural inputs, supply chain inefficiencies, water management, and soil health.

Alongside technological advancement, the hackathon emphasized enhancing the technical and entrepreneurial skills of participants through mentorship and practical experience with 4IR tools.

The theme underscores the urgent need for transformative solutions in agriculture. With Uganda's economy heavily reliant on agriculture, the sector grapples with numerous challenges, such as low productivity, inefficient supply chains, and environmental sustainability concerns. Traditional agricultural methods are insufficient to meet the growing demands for food security and economic development, highlighting the necessity of integrating advanced technologies.

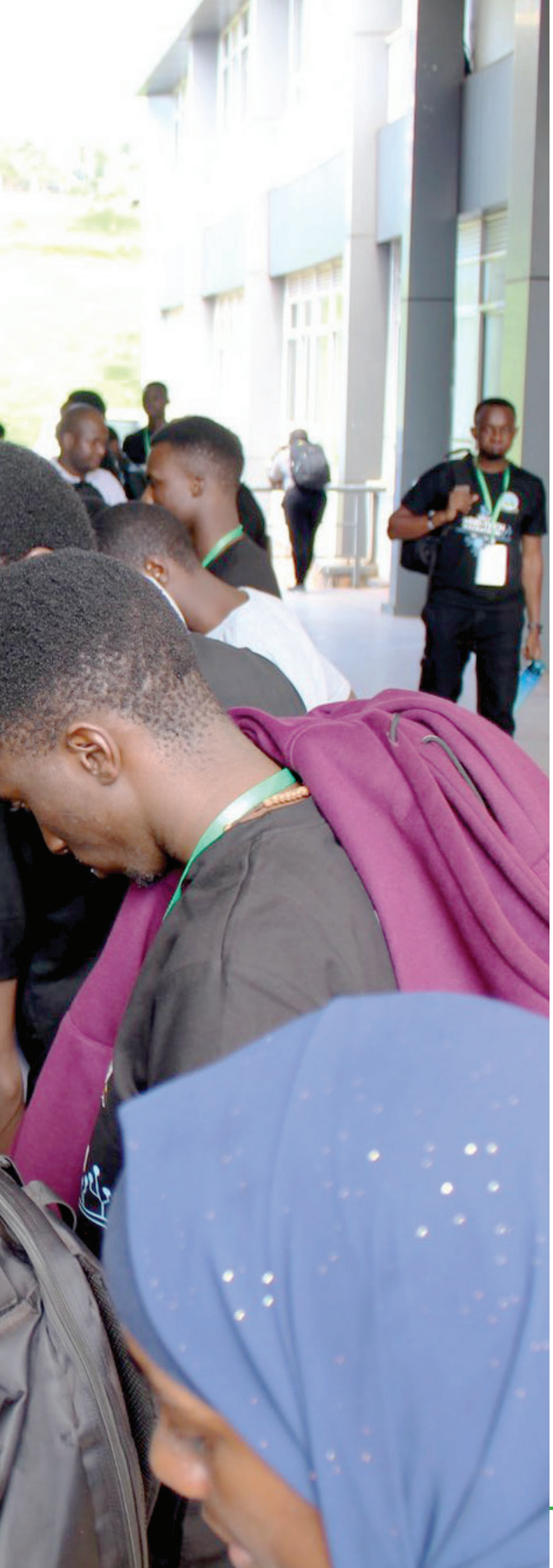
The hackathon showcased various 4IR technologies particularly suited for tackling Uganda's agricultural challenges, including: precision Farming: Utilizing real-time monitoring of soil health, water usage, and crop conditions to enhance yields and optimize resource management, Supply Chain Transparency: Implementing blockchain technology to improve traceability, ensuring that farmers receive fair prices while minimizing inefficiencies, data-Driven Insights: Leveraging AI and data

analytics to predict trends, optimize farming practices, and address climate-related risks.

The innovative projects that emerged as winners from the Agritech hackathon are being rolled out through a structured, multi-phase approach. This process includes collaboration with industry partners to refine prototypes into minimum viable products (MVPs) for pilot testing in selected farming communities. Feedback from these pilot programs will be critical for tailoring the technologies to Uganda's specific agricultural conditions. Furthermore, partnerships with government agencies, agricultural cooperatives, and private sector entities will provide essential support for scaling these projects. Capacity-building programs will play a vital role in training farmers and stakeholders on effectively utilizing new technologies, ensuring their long-term adoption.

Despite its noble goals, organizing the hackathon presented significant challenges. Engaging a diverse array of stakeholders—from traditional farmers to technology experts—required bridging the knowledge gap between conventional agricultural practices and advanced technologies. Additionally, resource constraints, particularly in funding and access to an enabling technological infrastructure, posed hurdles.

In summary, the AgriTech Hackathon 2024 marks a pivotal step towards modernizing Uganda's agricultural sector. By harnessing the potential of Industry 4.0 technologies, the event aspires to foster a more sustainable, efficient, profitable agricultural landscape and ultimately contribute to Uganda's economic development and food security.



Objectives and Goals

The AgriTech Hackathon 2024 is part of the strategic interventions to spur innovative applied research and solution development at the UICT & NIIH and was conceived with the primary goal of harnessing the potential of Fourth Industrial Revolution (4IR) technologies to solve pressing challenges in Uganda's agricultural sector.

The specific objectives were to:

- Foster Innovation by developing innovative technological solutions that address critical issues in agriculture, such as supply chain inefficiencies, water management, soil health, and accessibility of quality agricultural inputs.
- Build capacity by strengthening participants' and staff's technical and entrepreneurial capacities through exposure to cutting-edge technology and industry expert mentoring.
- Create an environment that fosters collaboration, networking, and knowledge sharing among technologists, agriculturists, academics, and industry professionals.
- Create an innovation pipeline for commercializable products and services by encouraging participants to think entrepreneurially and providing mentorship and resources to help transform unique ideas into viable businesses.
- Accelerate Time to Market: Hackathons' intense, time-bound nature promotes rapid prototyping and development of impactful and scalable solutions.

Supply Theme

Group	Name	Description
Group 1	Cattle Connect Hub	An application that provides linkage between the farmers that have cattle and the market to improve easy access to buy cattle
Group 2	Agro-access	Addressing the challenge of lack of ready market post-harvest by integrating educational resources, transportation coordination, direct sales points, and market connections
Group 3	Pest-Safe Uganda	Distribute organic pesticides using an AI to detect the disease and recommend needed pesticide
Group 4	Yield-Xpress	Getting the right transporters to move yield for farmers - Creation of a digital platform that enables farmers to transport and import online

Soil Theme

Group	Name	Description
Group 5	Soil-Tech systems	Soiltech is an innovative tool that provides Ugandan farmers with real-time accurate and actionable insights into their soil conditions. It also provides customized crop recommendations that maximize yields, and profitability, and promote sustainable farming practices.
Group 6	Eco-Terra	A portable device that measures the pH states (alkaline, neutral, and acidic) of soil and provides best farming practices and recommendations on the ideal crops to grow while providing insights on the best soil nutrients to apply for that particular crop to yield.
Group 7	Nutri soil innovators	IoT device gets real-time soil parameter values from the sensors and the system can use them and compare them with the preset critical values and provide appropriate recommendations.
Group 8	Farm-Info	Using AI/ML to enable farmers to know about their soil quality/fertility, and best agriculture practices and determine how that influences crop yield. And then be able to provide real-time recommendations to the farmers based on soil fertility.

Input Theme

Group	Name	Description
Group 9	Farm link	A USSD-based system to link farmers to genuine suppliers of quality Agro-inputs
Group 10	Legit	Application that scans a QR code on the authentic products from the laboratory-tested inputs.
Group 11	I-Scan	Mobile Application that verifies and authenticates agricultural input leveraging holographic QR code system with assisted AI
Group 12	Agri-grow	Digital platform with sophisticated handheld devices, known as Agri-kit, designed to authenticate agricultural inputs and combat counterfeiting in Uganda. The Agri-grow platform serves as a secure marketplace for verified fertilizers, pesticides, and seeds, ensuring farmers access to genuine products. This access significantly enhances the quality of agricultural inputs, directly impacting the quality and quantity of farmers' yields.

Water Theme

Group	Name	Description
Group 13	Aqua-Guide	Use of machine learning to predict future rainfall patterns and Large language models based on Aquacrop to optimize water usage in production to guide farmers on when and how much to irrigate their crops.
Group 14	Aqua-Sense	Optimizes irrigation efficiency by integrating IoT sensors for real-time monitoring of soil moisture, temperature, and weather conditions. Through cloud-based data analytics, we automate irrigation schedules to match crop water needs precisely. Additionally, we leverage open APIs like Open Weather Map and Google Maps to provide accurate weather forecasts and location-based insights, empowering farmers to make informed decisions for sustainable agriculture practices.
Group 15	Tech Farmers	Drop grow is an application that is aiming at providing reliable rainfall updates and recommending the crops that can be planted and sustained in a specific period and region
Group 16	165 Smart Flow	It is a two-way switching system that activates irrigation by detecting the soil's moisture level, as well as through an SMS.


AGRI-TECH
HACKATHON 2024
PANELLIST

> **"The Agritech Hackathon is more than just a competition; it is a platform for creativity, innovation, and problem-solving."**

DR. IRENE NAKIYIMBA
The Deputy Principal, UICT

Revolutionizing Uganda's Agriculture

This gathering brings together a diverse group of participants, including students, entrepreneurship experts, farmers, and technologists, each contributing a wealth of knowledge and experience to drive creativity and ensure success.

Honorable Minister of State for ICT, Hon. Joyce Ssebugwawo, distinguished guests, ladies and gentlemen, good morning, and a warm welcome to the United Institute of ICT. It is with great pleasure and excitement that I stand before you today to officially kick off our highly anticipated Agritech Hackathon. This event marks a significant milestone in our mission to leverage technology to revolutionize Uganda's agriculture sector.

As we gather here, we recognize the immense potential of agriculture in driving economic growth, ensuring food security, and improving livelihoods across Uganda. However, we are also mindful of the challenges that our farmers face, including limited access to marketing information, financial services, and unsustainable farming practices. The Agritech Hackathon is not just a competition; it is a platform for creativity, innovation, and problem-solving. Over the next few days, you will have the opportunity to collaborate with your teams, brainstorm ideas, and develop solutions with the potential to transform agriculture in Uganda.

On behalf of the management, we are delighted to see such a diverse group of participants here today. From students and entrepreneurship experts to farmers and technologists, this gathering reflects a wealth of knowledge and experience that will fuel creativity and drive success. I would like to thank each of you for honoring our invitation. It is this diversity of backgrounds, expertise, and perspectives that will be key to the success of this event.

Throughout the Hackathon, I encourage you to think big and bold. Challenge the status quo and let your imaginations soar as you explore innovative ways to improve agricultural productivity, enhance market access, and promote sustainable farming practices.

I extend my heartfelt gratitude to our partners and sponsors for their generous support in organizing this event, as well as to the organizing committee and volunteers for their hard work and dedication. Your commitment to advancing agriculture through technology is truly commendable.

As we embark on this exciting journey, let us keep in mind the farmers and rural communities whose lives and livelihoods depend on the success of our efforts. Our goal should be to develop solutions that are practical, scalable, and impactful, empowering farmers to thrive in an ever-changing world.

In conclusion, I wish you all the best of luck in this event. May your ideas be bold, your collaborations be fruitful, and your innovations transformative.

Thank you for your attention, and for God and my country.

> **"Picture smart sensors across farmlands, gathering critical data on crop health, water usage, and pest infestations, empowering farmers to make precise, data-driven decisions."**

DR. FREDRICK E. KITOOGO
The Principal - UICT

Exploring the Intersection Between Technology and Agriculture

This hackathon symbolizes our dedication to innovation and sustainable development in the era of Industry 4.0, now aptly termed Agriculture 4.0. We are called to revolutionize agriculture through technology, leveraging digital advancements to transform traditional practices.

Hon. Joyce Ssebugwawo Owekitibwa, Minister of State for ICT; distinguished secretaries from the Ministry of ICT & National Guidance and MAAIF; esteemed executive directors and staff of UCC; chairperson and members of the UICT Governing Council; members of the UICT Academic Board; management and staff of UICT; valued development and private sector partners; public officials; our judges and mentors; ethical hackers; students; alumni; invited guests; and all those joining us online through the Institute's and other digital platforms—ladies and gentlemen, I am honored to welcome you to the inaugural Agritech Hackathon, hosted by UICT and the National ICT Innovation Hub.

We are privileged to have you with us today, both physically and virtually, as we celebrate innovation and collaboration in the intersection of agriculture and technology. I extend my heartfelt gratitude to the Almighty for enabling us to witness and participate in this milestone event.

Hon. Joyce Ssebugwawo, our esteemed Chief Guest, I sincerely thank you for taking time from your busy schedule to grace this occasion. Your unwavering guidance on governance and wise counsel on related matters are deeply appreciated.

Allow me to share a brief history of UICT. Since November 2007, the Institute has proudly operated under the Ministry of ICT & National Guidance, and we are immensely grateful for the continued support from the Ministry. Additionally, under Section 5(w) of the Uganda Communications Act, 2013, the Uganda Communications Commission (UCC) is mandated to operate and manage this Institute, which it has done with diligence.

Today marks a pivotal moment as we explore the intersection of technology and agriculture—two fundamental pillars shaping our future. This hackathon represents our dedication to innovation and sustainable development in the era of Industry 4.0, now called Agriculture 4.0. We are called to revolutionize agriculture through technology, leveraging digital advancements to transform traditional practices. The convergence of cutting-edge technologies and agriculture is paving the way for a sustainable future.

Industry 4.0 presents unprecedented opportunities to revolutionize sustainable agriculture in Uganda. While challenges such as climate change-induced weather fluctuations, supply chain inefficiencies, resource constraints, and limited access to modern farming techniques persist, they fuel our determination to innovate. By leveraging Industry 4.0 technologies—such as artificial intelligence, the Internet of Things (IoT), big data analytics, and blockchain—we can address these challenges. These tools offer transformative solutions to enhance efficiency, promote sustainability, and evolve agriculture in Uganda. Through strategic integration, we can overcome adversity and redefine the future of farming.

Imagine a future where smallholder farmers can access real-time weather forecasts, soil quality insights, and market prices through their smartphones or digital devices. Picture smart sensors across farmlands, gathering critical data on crop health, water usage, and pest infestations, empowering farmers to make precise, data-driven decisions. Envision a supply chain powered by blockchain, ensuring transparency and fair compensation for all stakeholders. This future is within our reach. As educators and mentors, we must equip students with the knowledge, skills, and mindset needed to thrive in this digital age. Through interdisciplinary learning, hands-on experimentation, and industry partnerships, we can nurture a generation of agricultural innovators ready to lead the way to a sustainable and prosperous future. Collaboration is key, and together, we can turn this vision into reality.

We are committed to partnering with government agencies, private sector entities, civil society organizations, and local communities to scale impactful solutions to the challenges of sustainable agriculture. Collaboration remains central to creating meaningful change.

At UICT, we play a critical role in driving innovation and skilling opportunities. Our diverse training, skilling, and certification programs equip learners with cutting-edge expertise. Through collaborations with renowned international partners, we offer an extensive range of long- and short-term courses, including certifications in Data Science, Management, Analytics, and Software Engineering for Modern Applications. Our programs also include e-Government and Digital Transformation, Mixed Reality for STEM education, and applications of Machine Learning and Artificial Intelligence in sectors such as Agriculture, Healthcare, Education, Finance, Tourism, and Oil & Gas.

We are advancing digital literacy initiatives like the Parish Development Model and Digital Skills for Employability. Our offerings include IT Service Management, ICT certification for practitioners, ICT for non-ICT professionals, ICT in Education Management, and Digital Marketing. These programs are customized to meet stakeholder needs and enhance the adoption of digital technologies in agriculture and other key sectors. Together, these efforts are driving transformative innovation across Uganda's primary sectors.

UICT is also proud to manage innovative spaces like the National ICT Innovation Hub (NIIH) on behalf of the Ministry of ICT and the Government of Uganda. These hubs are central to advancing technological innovation and fostering collaboration. In addition, UICT is establishing a regional Mixed Reality Centre to revolutionize STEM education. This facility, already under development at our main teaching block, will serve a wide range of users across sectors, providing a hub for innovation and learning.

With government funding and support from development partners, we are integrating these technologies into our teaching. In collaboration with the Ministry of Education and Sports, we plan to use this platform for teaching secondary school science subjects, aligned with the revised curriculum. Additionally, through the Ministry of ICT, we aim to work with the Ministry of Agriculture to extend STEM applications and equip users with the digital skills necessary to optimize agricultural practices.

At the National ICT Innovation Hub, we engage not only our students but also collaborate with various stakeholders to develop solutions with local impact. As the hackathon progresses, we look forward to seeing some of these innovative solutions come to life.

In conclusion, let us seize the opportunities presented by advanced technologies to transform Uganda's agricultural landscape, empower our farmers, and enhance lives. Through these technologies, we can foster efficient growth that benefits everyone. Together, let's use technology as a catalyst for positive change and a brighter future.

Thank you for your attention and participation. Let's continue striving for excellence, and I wish you all the best in the hackathon.

> **Your solutions should be accessible, user-friendly, impactful, and economically viable, aiming to increase agricultural productivity, enhance access to markets and financial services, and improve data collection for better risk forecasting.**

MR. DEAN MUNENE
Chairperson Governing Council, UICT

Strategies for Integrating Digital Solutions

Agriculture is vital to Uganda's economy, employing most people and contributing significantly to GDP. However, it faces challenges like unsustainable practices, climate change, and limited access to financing and markets. Over these three days, I encourage you to create practical, user-friendly solutions that boost productivity, market access, financial services, and risk forecasting.

Good afternoon to our chief guest, the Minister of State for ICT and National Guidance, Hon. Joyce Ssebugwawo, the undersecretary representing the permanent secretary, the head of technical projects at UCC representing the executive director, the principal, management, and staff of UICT, as well as all the experts and innovators present today.

Agriculture remains one of the most critical sectors in Uganda, employing the majority of our people and contributing significantly to our GDP. However, the sector faces several challenges, including unsustainable farming practices, climate change, limited access to financing, pests and diseases, post-harvest losses, and inadequate infrastructure. The urgency to address these challenges cannot be overstated.

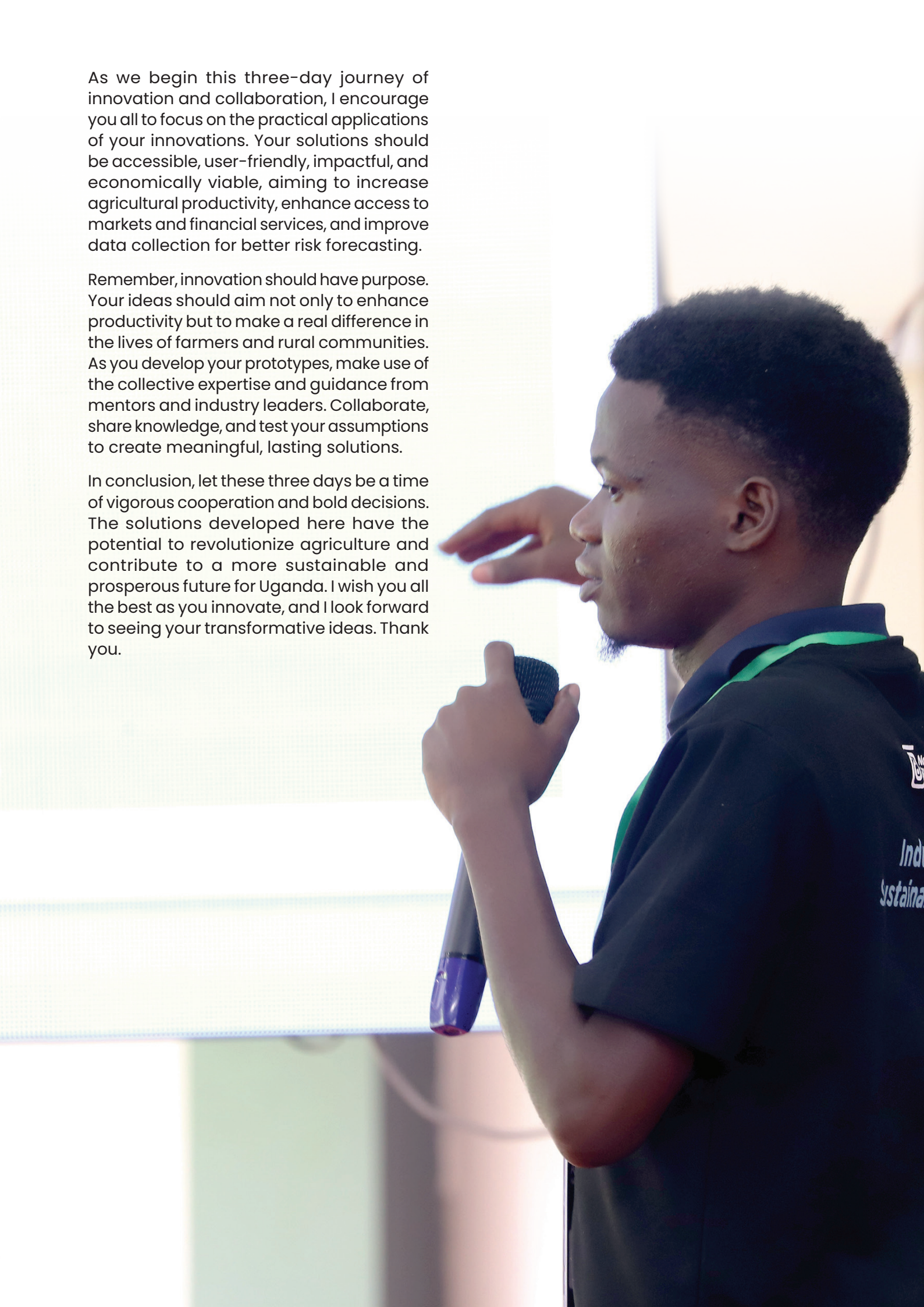
Agriculture currently contributes 24% to Uganda's national GDP, valued at over 30 trillion UGX. Women play a crucial role, contributing more than 75% of farm labor, while youth are also heavily involved, with 45% of smallholder farms led by individuals under 40 years of age. These statistics highlight a tremendous opportunity for impactful innovations to transform the sector.

The digital transformation roadmap provided by the Ministry of ICT & NG outlines strategies for integrating digital solutions across sectors, including agriculture. The roadmap emphasizes scalable solutions that can enhance productivity, improve supply chain efficiency, and promote sustainable farming practices. According to the 2023 Uganda report, 50% of agricultural households face limited access to market information and financial services, significantly impacting productivity. This highlights the need for digital platforms to bridge these gaps, offering timely market updates, weather forecasts, and accessible financial services.

As we begin this three-day journey of innovation and collaboration, I encourage you all to focus on the practical applications of your innovations. Your solutions should be accessible, user-friendly, impactful, and economically viable, aiming to increase agricultural productivity, enhance access to markets and financial services, and improve data collection for better risk forecasting.

Remember, innovation should have purpose. Your ideas should aim not only to enhance productivity but to make a real difference in the lives of farmers and rural communities. As you develop your prototypes, make use of the collective expertise and guidance from mentors and industry leaders. Collaborate, share knowledge, and test your assumptions to create meaningful, lasting solutions.

In conclusion, let these three days be a time of vigorous cooperation and bold decisions. The solutions developed here have the potential to revolutionize agriculture and contribute to a more sustainable and prosperous future for Uganda. I wish you all the best as you innovate, and I look forward to seeing your transformative ideas. Thank you.



> **"The solutions developed here should address practical challenges, create meaningful impacts, and propel Uganda toward a digitally driven, inclusive agricultural future."**

MR. ARNOLD MUJUNI
Representing ED-UCC

The Pivotal Intersection Between Agriculture and Technology

This hackathon is a collective effort to support Uganda's vision of a digitally empowered society and knowledge-based economy. By addressing key challenges, your innovations can increase household incomes, ensure food security, and create a sustainable future, empowering farmers with real-time data, improving market competitiveness, and leveraging technologies like IoT, blockchain, and data analytics.

Hon. Joyce Ssebugwawo, Minister of State for ICT and National Guidance, the undersecretary to the Ministry of ICT & NG, representatives from MAAIF, the UICT Governing Council, principal, management, staff, and all esteemed guests, I warmly welcome you. As we commence this hackathon, themed "Utilizing Industry 4.0 Technologies to Address Challenges Confronting Sustainable Agriculture in Uganda," we spotlight the synergy between agriculture and technology, two pillars of Uganda's development.

Agriculture remains the backbone of Uganda's economy, providing livelihoods, contributing significantly to GDP, and supporting export earnings. However, the sector faces critical challenges, including water scarcity, soil degradation, counterfeit inputs, and supply chain inefficiencies. This hackathon focuses on these pressing issues, aiming to foster sustainable practices that ensure food security, economic stability, and environmental resilience.

The objectives of this event align closely with Uganda's National Development Plan III and the Digital Transformation Roadmap, which emphasize digitalization as a driver of agricultural productivity and commercialization. By integrating technologies like IoT, blockchain, and data analytics, we aim to empower farmers with real-time insights, mitigate environmental challenges, and enhance market competitiveness.

Participants are called to innovate with purpose, considering the socio-economic realities of Ugandan farmers. The solutions developed here should address practical challenges, create meaningful impacts, and propel Uganda toward a digitally driven, inclusive agricultural future.

This hackathon represents a unified effort to achieve Uganda's vision for a knowledge-based, digitally empowered society. By addressing these challenges, we not only secure household incomes and food security but also pave the way for a resilient and prosperous future. I thank you all for your dedication to this cause and invite you to harness the power of innovation for a sustainable agricultural transformation in Uganda. Thank you.

> **"Develop solutions that boost productivity, efficiency, and resilience while promoting sustainability."**

MS. SOPHIA NANTONGO
Representing the Permanent Secretary,
Ministry of ICT and National Guidance

Transforming Uganda into a Modern and Prosperous Society

"Uganda Vision 2040 and the National Development Plan III focus on transforming Uganda into a modern, prosperous society. This hackathon supports key programs—Agro-Industrialization, Digital Transformation, Human Capital Development, and Innovation and Technology Development—aiming to digitalize agriculture, enhance productivity and sustainability, and accelerate the shift to commercial farming."

Good afternoon, distinguished guests, including Hon. Joyce Ssebugwawo, Minister of State for ICT and National Guidance, representatives from the Ministry of Agriculture and Fisheries, the UICT Governing Council, and all protocol observed. My name is Sophia Nwotono, Under-Secretary at the Ministry of ICT and National Guidance. I bring greetings from Dr. Amina Zawedi, the Permanent Secretary, who, alongside our Minister of ICT, is today launching the Muni University Regional Innovation Hub—the fifth such hub in Uganda, alongside hubs at Soroti and Kabale Universities.

It is an honor to welcome you to the Agritech Hackathon, themed "Utilizing Industry 4.0 Technologies to Address Challenges Confronting Sustainable Agriculture in Uganda." This event reflects a critical intersection of innovation and agriculture, aiming to address challenges faced by a sector that remains vital to Uganda's economy. Agriculture supports millions of livelihoods and contributes significantly to GDP, yet it grapples with issues like climate change, outdated practices, and limited market access. Despite these challenges, there lies a tremendous opportunity to harness Industry 4.0 technologies, including AI, IoT, robotics, and big data, to revolutionize every aspect of the agricultural value chain.

The National Development Plan III and Uganda Vision 2040 emphasize transforming the country from a subsistence to a modern, prosperous society. This hackathon aligns with key programs such as Agro-Industrialization, Digital Transformation, Human Capital Development, and Innovation and Technology Development. These initiatives aim to commercialize agriculture, increase ICT access, improve quality of life, and foster innovation. By digitalizing agriculture, we can enhance productivity, sustainability, and the transition to commercial farming.

As we gather here, I urge you to seize this opportunity. Develop solutions that boost productivity, efficiency, and resilience while promoting sustainability. Your creativity can empower farmers with cutting-edge tools to adapt to a rapidly changing environment. The Ministry of ICT is committed to supporting you through access to data, resources, and partnerships, ensuring your innovations make a lasting impact. Together, let us leverage technology to build a thriving, sustainable agricultural sector and secure a brighter future for Uganda. Thank you.

> **"Agriculture, with its high potential to create jobs, is projected to grow from 3.8% to 5.1% by the program's end, reducing youth unemployment from 13.3% to 6.6%."**

HON. JOYCE SSEBUGWAWO OWEKITIBWA,
Minister of State of ICT and National Guidance

Building on our Past Successes

Uganda has made significant strides in agricultural productivity, business infrastructure, and technology growth. However, challenges like limited market access, regulatory hurdles, and infrastructure gaps persist. Addressing these requires innovative solutions aligned with the National Development Plan, which prioritizes industrialization, value addition, and enhancing regional competitiveness.

Distinguished guests, including the Permanent Secretary, the Under-Secretary, the Minister of ICT and National Guidance, the Executive Directors of UCC and NITA-U, the Principal of UICT, members of the Academic Board, government partners, judges, participants, students, press, ladies, and gentlemen, I warmly greet you all.

As we convene for this Agri-tech Hackathon, it is vital to reflect on Uganda's progress over the past decade in agriculture, business, and technology. We have witnessed significant advancements in agricultural productivity, business infrastructure, and a growing technology ecosystem. However, persistent challenges remain,

including limited market access for agricultural products, regulatory gaps, and insufficient technology and infrastructure.

Aligned with the NDPIII, our focus is on industrialization to accelerate economic growth, enhance value addition in agriculture, and improve employment prospects. Agriculture, with its high potential to create jobs, is projected to grow from 3.8% to 5.1% by the program's end, reducing youth unemployment from 13.3% to 6.6%. This hackathon is a testament to our commitment to addressing these challenges while building on past successes. By uniting talent in industry, agriculture, and business, we aim to develop innovative, locally driven solutions for Uganda's sustainable growth.

Collaboration is critical to this effort, and we are proud to partner with the Ministry of Agriculture, Animal Industries, and Fisheries to develop solutions tailored to Uganda's needs. This approach prioritizes homegrown talent and innovation, reducing dependency on external solutions and promoting sustainable development. As we embark on these three days of intensive programming, I urge all participants to harness their creativity and expertise to shape a brighter future for Uganda's agriculture, business, and technology sectors.

I also encourage you hackers to share the knowledge gained here with your communities to amplify the impact of these efforts. Let us commit to spreading the benefits of innovation widely and fostering Uganda's development.

With gratitude to all contributors, I look forward to the outcomes of this hackathon.

For God and my country—thank you.

FEATURED INNOVATIONS

AGRO ACCESS

Digitaly bringing farmers closer to SMEs and Markets.

MPANGA TREVOR
SOFTWARE ENGINEER
TECHNICAL LEAD

OJOK OSCAR BRIAN
PROJE CT MANAGER
PROJECT LEAD

NANZIRI MARIA THERESA
ELECTRICAL ENGINEER
FARMER MANAGER

OCHAN KENNETH
DATA SCIENTIST
DATA ANALYST

WASA EMMY
COMPUTER SCIENTIST
TECHNICAL ASSISTANT

Description

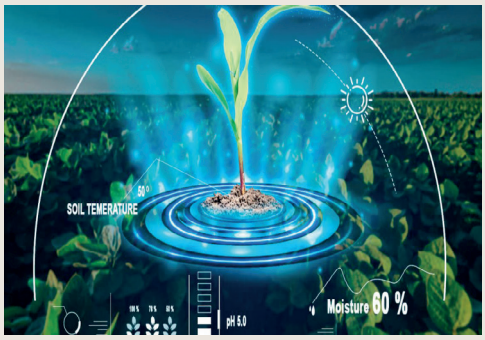
This system aims to improve market access for farmers by providing education, transportation, direct sales, and market connections. The system aims to alleviate th common issue of farmers facing limited market access for their produce after harvest. By integrating various components, the project seeks to create a more efficient and sustainable market system

Impact

The project can increase farmer income, reduce food waste, improve food security, stimulate economic growth and strengthen agricultural value chains. By improving market access and reducing post-harvest losses, farmers can increase their income and improve their livelihoods. Proper post-harvest handling and storage practices can help minimize food waste leading to more efficient use of agricultural resources. By ensuring that farmers have access to markets the project can contribute to food security and by ensuring a steady supply of fresh produce

The system may require significant investments in infrastructure face market fluctuations, need long term sustainability and require collaboration among various stakeholders.

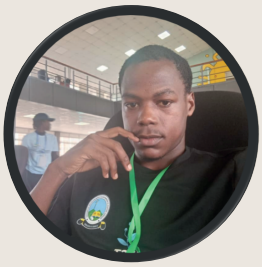
SOILTECH SYSTEM



Kibalama James
Software Developer

Muganga Charles
Robotics, ML Engineer

Abalo Proscovia
Sales professional



Nsubuga Daniel
Agricultural consultant

Description

Soil-tech is an innovative tool that provides Ugandan farmers with real-time accurate and actionable insights into their soil conditions. It also provides customized crop recommendations that maximize yields, profitability, and promote sustainable farming practices. This is a ground breaking agricultural technology tool designed to empower Ugandan farmers with precise and timely information about their soil conditions.

How it works

By leveraging advanced data analytics and sensor technology, the tool provides farmers with accurate and up to date insights into soil moisture, nutrient levels, PH, and other essential parameters. This tailors to planting advice based on specific soil conditions, climate and crop preferences, maximizing yield potential and profitability. The tool will help in guidance on environmentally friendly farming methods such as soil conservation and nutrient management, to promote long term sustainability.

Impact

The system can help by optimizing planting decisions and nutrient management; farmers can achieve higher crop yields and improve their livelihoods. The tool can help farmers reduce input costs by using fertilizers and other resources more efficiently. It also helps by promoting sustainable farming practices, the tool can contribute to the long term health and fertility of Ugandan soils. Increased crop production can help ensure a more secure food supply for the country and the tool can stimulate economic growth by increasing agricultural productivity and creating new job opportunities.

FARM LINK

Team members

Kakooza Vianey
Ssuna Francis
Ssempeebwa Phillip
Okol Mosess
Ochom Emmanuel
Katusiime Serina

Description

The system proposes the development of a USSD based system to connect farmers with reliable suppliers of high quality agricultural inputs. USSD is a simple text based communication technology widely accessible even in areas with limited internet connectivity.

The system helps farmers with a database of pre-screened and verified suppliers of agro-inputs such as fertilizers, seed and pesticides, detailed information about the available products including prices, quality standard and usage instructions. A convinient platform for farmers to place orders directly with suppliers and track the delivery status as well as integraton with mobile money services or other secure payment methods to facilitate transactions.

The implementation of this USSD based system could have a significant impact on the agricultural sector whereby farmers can more easily access genuine and high quality agro-inputs, leading to increasd crop yields and improved productivity. The system can combat theproblem of counterfeit agro-inputs which can harm crops and reduce farmers' income.by streamlining the procurement preocess, farmers can potentially benefit from lower prices and reduced transaction costs. The system can improve the efficiency of the agricultural value chain by reducing the time and effort required for farmers to source inputs.

LEGIT

Description

The system is a mobile application that utilizes QR code technology to verify the authenticity of agro-inputs. The app allows farmers to scan codes printed on agro-input packaging to access product information and verification status. The app connects to a centralized database containing information about genuine products and their corresponding QR codes.

The App helps to obtain detailed information about the product including manufacturer, batch number, and expiration date and laboratory test results. The system helps to report suspected counterfeit products to authorities through the app, helping to combat the issue of fraudulent agro-inputs.

The system has a significant impact on the agricultural sector as it provides a simple and effective way to verify the authenticity of agro-inputs, help reduce the prevalence of counterfeit products, protecting farmers from financial loses and crop damage. The app can increase consumer confidence in the agro-input market by providing transparency and traceability. The system could as well help by reducing the negative impact of counterfeit products, the app could contribute to the economic development of the agricultural sector.

However there are some challenges and considerations to be taken such as, the widespread adoption of the app may require investments in mobile network infrastructure, particularly in rural areas. Developing and maintaining the app and the underlying database requires technical expertise and resources. Farmers will need training and support to effectively use the app and understand its benefits .

By addressing these challenges and leveraging its potential benefits, the QR code-based authentication app can provide a valuable tool for improving the quality and safety of agro-inputs, protecting farmers' interests and promoting sustainable agricultural development.

JJUMBWE NATHAN
BIOMEDICAL LAB TECHNOLOGY
CORDING

MUTONI TRACY ANKUNDA
DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
WORK COMPILING

TUMUHIMBISE DARIUS
TELECOMMUNICATIONS ENGINEER
FINANCE

AGASHA MITCHELLE
AGRICULTURIAL ENGINEERING
AGRICULTURIST

AQUA-GUIDE

Team members

Anselm Namonye

Bwenje Josh

Joel Ikabat

Description

The project proposes the development of a system that combines machine learning and the aqua-crop agricultural simulation model to provide farmers with accurate and timely irrigation guidance. The system would predict future rainfall by employing machine learning algorithms to analyze historical weather data and predict future rainfall patterns.

The system leverages the aqua-crop model to stimulate crop growth, water use and yield under different irrigation scenarios. It also combines rainfall predictions and aqua-crop simulations to determine the optimal irrigation timing and amounts for specific crops and field conditions. The project would as well deliver tailored irrigation recommendations to farmers through SMS, mobile apps or other communication channels.

Impact

By optimizing irrigation, farmers can reduce water wastage and improve water use efficiency. More efficient irrigation can lead to higher crop yields and improved quality of crop yields. Farmers can as well save on water and energy costs by using irrigation more effectively. The system can promote sustainable agriculture by conserving water resources and reducing environmental impact. By providing farmers with information on future rainfall patterns, the system can help them prepare for droughts or excessive rainfall.

Challenges or Considerations

Ensuring that farmers adopt and use the system effectively will require training and support. The system may need to be integrated with other agricultural information systems or government initiatives.

CATTLE CONNECT HUB

Team members

Kyobe Joshua

Hanan Aburahaman

Loyo Moses

Cattle connect manages the cattle and up to the point of sales ensuring higher margins and increased high quality beef production.

Description

Many farmers today face a problem of having many middlemen in the cattle purchase process. This is because of the many government regulations on cattle sale in Uganda and the low levels of education among farmers.

This leads to low production of cattle and yet Uganda has potential to serve the entire beef demand of East Africa. Cattle connect comes in to manage the entire process of raising the cattle and managing them to ensure cattle traceability and meeting cattle regulations set by the government.

Impact

Cattle Connect has the potential to significantly impact the Ugandan cattle industry by:

- Establishing direct connections between cattle farmers and buyers eliminating the need for middlemen.
- Increasing beef production ensuring a stable and sufficient supply of meat for both domestic consumption and export
- improving market access and reducing transaction costs, significantly increase the income of farmers.

165 SMART FLOW

Team members

Barisigara Simon

Sserunjogi Derrick

Alex Ahimbisibwe

Ashaba Martin

Matolano Martin Mugabi

Katende Brian

Baisi Rajab Isabirye

Description

The system proposes the development of a two way switch for irrigation control that combines soil moisture sensing with SMS based activation. The system would automatically activate irrigation pumps or sprinklers when the soil moisture falls below a predetermined threshold.

The system allows for manual control of an irrigation system through SMS commands, providing flexibility and oversight. The system also enables remote monitoring of soil moisture levels and irrigation status via SMS or a mobile App. Farmers will employ soil moisture sensors that will continuously monitor the moisture levels in the fields.

Impacts

The system will help by automatically activating irrigation only when necessary and help conserve water. Consistent and appropriate irrigation can promote healthy crop growth and increase yields. The system can automate irrigation tasks, reducing the need for manual labor and saving time and money. In addition, the system can automate irrigation tasks, minimizing water pollution and conserving natural resources.

ECO-TERRA

Team Members

Collins Mwambazi
Grace Biribawa Muganzi
Florence Namyalo
Jonathan Magomu
Philip Kiprotich
Imran Tawfiq

Description

A portable device that measures the PH states (alkaline, neutral and acidic) of soil and provides best farming practices and recommendations on the ideal crops to grow while providing insights on the best soil nutrients to apply for that particular crop to yield.

How It Works

The farmer turns on the device and places the PH sensor in the soil. Data collected from that soil sample is interpreted and recommendations generated are sent to the farmer through a text message.

Impact

Farmers will be able to effectively carry out soil analysis using a modern and affordable method. Farmers will have better yield since they will have good crop recommendations for their type of soil or the kind of nutrients to add in order to grow their crop of choice. The data collected can be used by researchers and the government to inform decisions

The Role of Multidisciplinary Mentors in the Success of the Agritech Hackathon 2024

The recently concluded Agritech Hackathon 2024 stands as a testament to the power of collaborative innovation in solving critical agricultural challenges in Uganda. A key driver behind its success was the mentorship provided by a group of highly skilled, multidisciplinary professionals who brought together expertise in engineering, computer science and IT, business management, Entrepreneurship, and agriculture.

These mentors hailed from both academia and industry including UICT, the National ICT Innovation Hub, StartHub Africa, CamTech Uganda, and the Innovation Village. Their collective guidance was instrumental in shaping the hackathon's outcomes, equipping participants with the tools, knowledge, and motivation needed to develop impactful solutions for Uganda's agricultural sector.

One of the core advantages of having mentors from various disciplines was the depth of knowledge and perspectives they brought to each team. Participants gained insights into technical, practical, and entrepreneurial aspects of their projects, an opportunity that broadened their approach to problem-solving. With engineers, computer scientists, and IT professionals addressing technical feasibility and design, business mentors strategizing market entry and scalability, and agricultural specialists grounding ideas in sector-specific needs, teams were able to create comprehensive solutions tailored to real-world agricultural challenges.

The engineering mentors provided technical insights crucial for designing solutions that could withstand the complexities of the agricultural environment. They advised teams on the choice

Left - right: Makenzie, Ivan, Nuriat, Angella, Martin

of materials, system integrations, and energy efficiency, which are essential factors in ensuring that agricultural technologies are durable, functional, and resource-efficient. Computer science and IT mentors, on the other hand, played a critical role in helping participants harness Industry 4.0 technologies like IoT, data analytics, and machine learning to build robust, innovative digital solutions for challenges like crop monitoring, water conservation, and pest control.

No solution can make a meaningful impact if it is not economically viable and scalable, and this is where the business management mentors came into play. These mentors worked closely with teams to develop practical business models that would allow their solutions to thrive beyond the hackathon. They provided insights on creating a strong value proposition, understanding market needs, and building sustainable revenue models.

Through this mentorship, participants not only refined their technical and innovative ideas but also built viable business frameworks to ensure their solutions would be commercially successful. The mentors' emphasis on financial planning, market entry strategies, and partnership building equipped participants with the knowledge they needed to transform their ideas into prototypes and systems and consequently into minimum viable products that could make a tangible impact on the agricultural sector.

Agricultural mentors and panelists enriched the hackathon experience by grounding participants in the practical realities of farming and food production in Uganda. They helped teams understand the specific challenges that farmers face, such as soil health management, access to inputs, and supply chain inefficiencies. By providing data on agricultural practices, the mentors ensured that the solutions were relevant and directly addressed the pain points in Uganda's agricultural sector. Additionally, these mentors guided participants on environmental considerations, urging them to create solutions that would promote sustainable farming practices and conserve resources.

In a hackathon setting, the pace of work is intense, and participants had to adapt quickly to evolving challenges. The mentors provided a supportive environment for learning and experimentation, enabling participants to iterate on their ideas and refine their projects. Coming from diverse organizations, the mentors created a vibrant ecosystem that fostered a cross-pollination of ideas. This collaborative spirit allowed participants to view problems from different angles and explore a wider range of potential solutions.

Mentors also shared their knowledge on networking and leveraging partnerships. Their guidance on building connections with other innovators, agricultural businesses, and research institutions gave participants a roadmap to sustaining and growing their projects beyond the hackathon. This mentorship has already paved the way for potential collaborations, partnerships, and even funding opportunities that will support the further development of some of the projects launched during the hackathon.

This hackathon has set a benchmark for future innovation events, demonstrating how a strong, multidisciplinary mentorship model can accelerate impactful solutions and foster long-term development. The collaboration between UICT, the National ICT Innovation Hub, StartHub Africa, CamTech Uganda, and Innovation Village exemplifies how partnerships can create sustainable platforms for young innovators, equipping them with the skills to transform Uganda's agricultural landscape and drive socio-economic progress.

Left - right: Francis, Joseph, Flavia

Expert Panels

The hackathon featured a series of expert panels that provided valuable insights and inspiration. The panels included a mix of technologists, agri-entrepreneurs, and academics who debated various aspects of technology in agriculture, offering diverse perspectives and advice to participants.

Bonita Beatrice Nanziri, Panel Moderator

Bonita Beatrice Nanziri is a Health Tech innovator and Entrepreneur with a strong background in software engineering. She is dedicated to revolutionizing healthcare through cutting-edge technology. As the founder of AfriGal Tech, Bonita has developed mDex, a smartphone-based diagnostic tool for sickle cell disease, designed to deliver rapid, accurate diagnostics in low-resource settings. Her pioneering work has earned her patents in both Uganda and the USA.

A distinguished leader, Bonita is a Global Health Corps 2018 alumna, Grace Hopper Fellow 2014, TEDx speaker, Microsoft Patent Program pioneer, and Switch Point speaker. She led her team to triumph at the Imagine Cup 2014 national finals and represented Uganda at the World Finals in Seattle.

Currently, Bonita is spearheading the creation of an African Health Image Data Bank. This is a comprehensive digitized microscopy dataset of stained blood slides, aimed at improving the diagnosis of African specific diseases like Sickle Cell, Anemia and Leukemia. She is developing a global resource that enhances diagnostic accuracy and accessibility for healthcare professionals and researchers. Her vision is to leverage an AI powered analytics platform and a mobile based diagnostic tool to address critical gaps in diagnosis and management in low resource settings. This will empower healthcare providers with reliable diagnostic tools, accelerate research through data driven insights and bridge the knowledge gap hence improving quality of care and outcomes.

Stephen Senkomago Musoke

Stephen is a technologist at heart whose current role revolves around providing an environment for teams to deliver custom software for clients. In previous roles in other organizations, he assisted customers in identifying user and business

Left - Right: Grace., Samuel, Bonita

needs, defining technical specifications to meet those needs, evaluating vendor capability, and supervising the implementation of complex IT systems. Stephen is passionate about growing the technology community in Uganda and on the continent, being a firm believer in the mantra "Coded in Africa, for Africans by Africans". He places particular emphasis during this journey to ensure that women play a significant role in the African technology revolution.

Samuel Ahumuza

CEO of The Farm Uganda. The farm currently employs 12 full-time staff and over 50 community members who participate in various on-farm agronomic activities during particular seasons in the production cycle. The Farm operates a 100-acre farm and is championing mechanized agriculture in the community with its fleet of Deutz Fahr tractors and their implements. The farm is into tractor hire to community members. On-going agricultural projects include Goats, a Banana Plantation, Local chicken, Maize, Soybean, and beans but is still limited to primary production.

Dr. Patience Bibohere Rwamigisa

Chairperson of the Quality Assurance and ICT Committee of Council. Dr. Rwamigisa has over 27 years of experience in Public Service, and he is an Assistant Commissioner for Agricultural Extension Coordination, in the Department of Agricultural Extension and Skills Management, Directorate of Agricultural Extension Services, MAAIF. He is a Research Associate with the International Food Policy Research Institute (IFPRI); Chairperson of the Advisory Board for Farm Radio International, Uganda Chapter; and Visiting Scholar at the Institute of Agricultural Sciences (Hans-Rothenberg Institute), University of Hoffenheim, Germany.

Grace Achire Labong

Head of Stakeholder Engagement, ICTAU Board, with more than 20 years' work experience in organizational and enterprise development with a special focus on, leadership, investment promotion, and business optimization. A founding owner of Vantage Communications Group, an established and one of the first truly professional PR agencies in Africa with operations in five countries in East and Central Africa (ECA). Expanded into the digital arena providing digital transformation services and solutions Arxia Romania East and Central Africa regional office. A banker and investment analyst turned communication expert; She holds an MBA from ESAMI/Maastricht Business School. She's a qualified and accredited PR practitioner (MCIPR) by PRCA UK. She has an Executive Masters in Communication Science with Universita della Svizzera (Lugano, Switzerland).

Left - right: Stephen Musoke, Dr. Patience Rwamigisa

Left - Right: Matthias Möbius, Dr. Ocen Gilbert, Osbert Osamai

Judging Criteria Used in the Agritech Hackathon 2024

The judging process for the Agritech Hackathon 2024 was structured to ensure a comprehensive assessment of each team's innovative solutions. The judges evaluated entries based on several critical criteria to determine their understanding of the agricultural challenges, innovation level, feasibility, impact, presentation skills, and team dynamics.

Problem Understanding

Judges assessed each team's ability to clearly identify and understand the challenges faced within the agricultural supply chain, with particular attention to each stage of the problem identified. The depth of analysis and research demonstrated by the participants provided insight into their grasp of the issue ¬¬and the seriousness of its impact on Uganda's agricultural sector.

Innovation and Creativity

The uniqueness and creativity of the proposed solutions were key components of the evaluation. Judges examined how innovative and distinctive the ideas were, particularly focusing on the effective and strategic application of Industry 4.0 technologies, such as AI, IoT, and data analytics, to address the agricultural challenges presented.

Feasibility and Scalability

The practical viability of implementing the proposed solutions in Uganda's agricultural context was essential in determining their feasibility. Judges considered resource requirements, cost-effectiveness, and the technical feasibility of each solution. Additionally, they evaluated the scalability potential of each proposal.

Impact and Sustainability

Another key aspect was the projected impact of each solution on promoting sustainable agricultural practices. Judges paid close attention to whether the solutions integrated environmental, social, and economic sustainability considerations. This included analyzing how the solution would enhance long-term agricultural productivity while conserving resources and minimizing adverse environmental impacts.

Prototype or Model

The presence of a well-developed prototype or model served as a practical demonstration of the solution's functionality. Judges looked for clarity, functionality, and relevance in each prototype or model, assessing how effectively it represented the problem and addressed the identified solution in a tangible way.

Presentation and Pitch

The ability to clearly communicate and effectively present the solution was crucial. Judges evaluated the coherence and effectiveness of each team's presentation in conveying the problem, the proposed solution, and its potential impact. Teams were also assessed on their ability to articulate the unique value proposition of their idea and engage the audience.

Team Collaboration and Communication

Finally, teamwork and communication were essential evaluation points. Judges observed the teams' collaboration abilities and how effectively they worked within a multidisciplinary context.

These criteria ensured a balanced evaluation of all participants and encouraged the development of innovative, feasible, and impactful solutions tailored to Uganda's agricultural needs.

Joram Ndagga

Judges' Comments and Feedback

- **Innovation and Practicality:** Judges were impressed by the innovative use of technology in tackling fundamental agricultural issues. However, they emphasized the need for practical deployment strategies that consider local farming conditions and technological accessibility.
- **Potential Impact:** The potential for significant impact on the agricultural sector was a common theme, with judges noting that many of the solutions could lead to substantial improvements in productivity and sustainability.
- **Areas for Improvement:** Judges suggested that some teams could enhance their solutions by incorporating more robust data analytics and considering the economic aspects of their models to ensure affordability and adoption by farmers.

Dr. Ocen Gilbert , Ms. Sylvia Nakanwagi

Feedback for Participant Innovators at the Agritech Hackathon 2024

Problem Statement

Ensure clarity in articulating the specific agricultural challenges in Uganda, particularly regarding soil health, water management, access to quality inputs, and supply chain inefficiencies. Support your statements with relevant data and statistics to emphasize the impact of these challenges on farmers' productivity and overall livelihoods.

Value Proposition

Define the unique value of your solution in addressing these issues. Emphasize how your innovation can improve crop yields, reduce resource wastage, increase farmers' profitability, and promote sustainable agricultural practices.

Solution

Clearly describe your proposed solution, detailing its key features and mechanisms for tackling the outlined agricultural challenges. Explain the practical ways in which your solution addresses the pain points faced by farmers, such as soil health management, water conservation, input optimization, or supply chain efficiency.

Sales Strategy

Provide a well-defined go-to-market strategy, identifying your target customer segments, distribution channels, and pricing strategy. Outline your approach to customer acquisition, retention, and expansion, and consider potential partnerships with agribusinesses or farmer cooperatives.

Business Model

Offer a concise overview of your revenue model, explaining how income will be generated through your solution. Justify your pricing approach and explore any recurring revenue options, such as subscription tiers or service packages.

Funding

Clearly articulate the funding amount needed and its specific allocation across areas like product development, marketing, operations, and team expansion. Ensure each category is logically connected to your scale-up plan.

Impact

Quantify the anticipated social, environmental, and economic impacts of your solution on the agricultural community. Define measurable indicators to track effectiveness and sustainability, demonstrating a commitment to positive change in the agricultural sector.

Competitive Analysis

Identify key competitors in the agritech field and analyze their solutions. Highlight what sets your solution apart, such as advanced technology, unique features, cost benefits, or market differentiation.

Team

Introduce your team members, emphasizing their skills, expertise, and relevant experience. Showcase how the collective strengths of your team position you well for effective execution of the business plan.

Market Opportunity

Provide a clear perspective on the size and growth potential of the agricultural market in Uganda, particularly for soil management, water conservation, input optimization, and supply chain logistics. Mention relevant trends, regulatory considerations, or dynamics that could influence your market strategy.

Technology and Innovation

Emphasize the technological innovation at the core of your solution. Discuss any proprietary elements, software platforms, IoT devices, or data analytics capabilities that provide a competitive edge and enhance scalability and adaptability.

Milestones and Achievements

Highlight any key milestones, such as pilot projects, partnerships, awards, or customer feedback. Showcasing progress and success to date enhances credibility and demonstrates your ability to bring the solution to market.

Risks and Mitigation Strategies

Identify potential risks, such as market competition, regulatory challenges, or technological constraints, and outline strategies to mitigate them. Providing a contingency plan reinforces confidence in your readiness to address potential hurdles.

Sustainability and Scalability

Describe your vision for sustainability and scalability, including plans for geographic expansion, product diversification, and revenue growth. Address how operational efficiency, cost management, and resource allocation will support your expansion plans.

Call to Action

End with a compelling call to action that invites investors, partners, and stakeholders to engage with your startup. Provide clear contact information for further discussions, investment opportunities, or partnerships.

> **"Uganda has no shortage of potential to develop impactful solutions, not only for our country but also for the global stage."**

MRS AGNES LUMALA
Academic Registrar, UICT

Harnessing our Potential

ICT solutions must be practical, address real needs, and demonstrate business viability to attract investment. Judges emphasized usability and market readiness, highlighting the importance of creating straightforward solutions for less technical end-users. Additionally, agriculture stakeholders called for integrating siloed ICT systems to enhance cohesion and maximize impact.

Allow me to acknowledge the representative of the Minister of Agriculture, the Permanent Secretary of MAAIF, Assistant Commissioner Achayo, the representatives of NITA-U and the Ministry of ICT, the UICT Governing Council, the Academic Board, the management team of UICT, the Team Leader of the National ICT Innovation Hub, our judges, mentors, and student hackers. Ladies and gentlemen, all protocol observed.

I would like share key highlights from the three-day journey we've undertaken. I applaud the incredible team behind this event, whose efforts have brought us to this inspiring moment. Let me begin with the best news: Uganda has no shortage of potential to develop impactful solutions, not only for our country but also for the global stage. Listening to the pitches, I'm convinced that we have the talent to create solutions applicable anywhere in the world.

However, to fully harness this potential, there are important lessons and calls to action for all of us, especially for the hackers. First, understand the ask. ICT solutions must address real needs and make business sense to attract investment. As the judges emphasized, spend time—30 to 40%—on research to understand the problem before developing your solution. Remember, the end-user may have basic needs and questions, but they hold the resources to pay for your solutions.

For UICT, there's a call to build digital literacy among the masses, particularly within the agricultural community, to ensure widespread adoption of ICT solutions. This feedback was clear: while the solutions presented are impressive, many users lack the foundational skills to use them effectively. We must address this gap with urgency.

Additionally, the agricultural community highlighted the need for integrating existing ICT solutions, which are currently siloed, to enable better interoperability and purpose-driven innovation. They also called for solutions incorporating accountability mechanisms, including robust monitoring and evaluation frameworks.

With these key takeaways, I conclude by urging everyone to take these lessons forward. Let's continue to innovate with purpose and create solutions that truly transform lives. Thank you, and I now invite the MC to take the floor.

For God and my country.

> **"The participation of multidisciplinary teams highlights how innovation and entrepreneurship transcend academic boundaries and drive economic growth."**

MR. AMOS MPUNGU
Representing the Commissioner of Research and Development, MoICT & NG

Innovation and Entrepreneurship, the Drivers of the Economy

The Digital Transformation Roadmap, launched last year, aligns seamlessly with this hackathon's goal of leveraging ICT to tackle agricultural challenges and boost productivity. Its five pillars—infrastructure, services, skilling, information security, and innovation—enable communication, deliver value, ensure accessibility, safeguard data, and drive impactful solutions for a resilient economy.

I am honored to be here today, representing the Commission on Research and Development, which is responsible for driving innovation and research. My message is a reminder of the Digital Transformation Roadmap we launched last year, a key initiative guiding efforts like this hackathon to develop ICT solutions for agricultural challenges. Agriculture, the backbone of our economy, is at the heart of these efforts, and I am impressed by the diverse and innovative ideas presented here, many of which aim to make agriculture more productive through technology.

I applaud the organizers—CamTech, UICT, and the National ICT Innovation Hub—for creating an inclusive platform that draws participants from far and wide, including Mbarara University. This diversity underscores the commitment to solving agricultural challenges collaboratively, even in a space like UICT that focuses primarily on ICT and electronics rather than agriculture. The participation of multidisciplinary teams highlights how innovation and entrepreneurship transcend academic boundaries and drive economic growth.

The five interconnected pillars of the Digital Transformation Roadmap—communication infrastructure, service delivery, skills development, information security, and innovation—are crucial to this endeavor. Infrastructure enables seamless communication, while skills development ensures solutions are accessible to their target users. Equally important are systems for secure data collection and privacy, which are integral to modern agricultural solutions. Innovation and entrepreneurship bind these pillars together, pushing the boundaries of how we design infrastructure, deliver services, and protect data.

Your participation in this hackathon is a significant achievement, regardless of rankings. The dedication, creativity, and endurance you have shown over the past 36 hours are commendable.

Let us continue innovating, collaborating, and driving impactful solutions for Uganda's agriculture and economy.

For God and our country.


I'M A
PUZZLER.
IEEE
NASA
SPACE APPS
picoCTF


Hub

> **"Hackathons are platforms for growth, where participants learn, relearn, and unlearn. Even those not crowned winners today have gained valuable insights for improvement."**

MR. MICHAEL NEWMAN
Representing ED-NITAU

Moving Forward

Hackathons foster growth by encouraging participants to learn, relearn, and unlearn. Even without winning, participants gain insights to refine their ideas. Success is a gradual process, much like life's progression—starting with small steps, learning from mistakes, and ultimately creating meaningful, transformative innovations.

Deputy Principal, distinguished representatives, and all protocols observed, I bring greetings from Dr. Hatwib Mugasa, ED of the National Information Technology Authority. Although unable to join due to other commitments, he extends his apologies and sends his best wishes, emphasizing his strong support for hackathons, which he holds close to his heart.

This event signifies just the beginning of many more hackathons. I encourage expanding these initiatives into other sectors aligned with Uganda's NDP III, such as education, health, and justice, to engage broader audiences. Drawing from CamTech's experience in Mbarara, I urge UICT to collaborate and learn from them, using their journey as a roadmap.

Hackathons are platforms for growth, where participants learn, relearn, and unlearn. Even those not crowned winners today have gained valuable insights for improvement. Success is a process, and with determination, you can refine your ideas and emerge stronger. The journey of innovation mirrors life's progression—taking small steps, learning from missteps, and eventually creating impactful disruptions.

To UICT management, I stress the importance of follow-ups with participants to nurture and scale their solutions until they achieve transformative impact. Consider extending hackathons to other regions to harness ideas from across Uganda. Continuous mentorship and engagement are crucial to ensure sustained growth and improvement.

On behalf of the National IT Authority, I commend your efforts and pledge our ongoing support. Let us establish communication channels, such as a WhatsApp group, to track progress and celebrate the solutions emerging from this vibrant community.

For God and my country.

"Walking through the exhibits and pitches, I was inspired by the passion and creativity of the youth, particularly their innovative approaches to agriculture—a sector often underestimated but vital as the backbone of our economy."

MS. CONSOLATA ACHAYO
Representing the Permanent Secretary, MAAIF

Collaboration and Integration

This hackathon redefines agriculture by showcasing its potential through technology, innovation, and youth engagement, with impactful ideas like food quality monitoring, water management, and traceability solutions. To maximize their value, we must support these innovators by connecting them with stakeholders to turn their concepts into practical, actionable solutions.

I extend my gratitude to all present, especially the Deputy Principal and the UICT team, for organizing this hackathon and focusing on agriculture as your starting point. To the hackers, participants, and media, thank you for your dedication. Walking through the exhibits and pitches, I was inspired by the passion and creativity of the youth, particularly their innovative approaches to agriculture—a sector often underestimated but vital as the backbone of our economy.

This hackathon challenges the perception of agriculture as outdated, highlighting its potential to be redefined with technology, innovation, and youth engagement. From systems that monitor food quality and water usage to traceability solutions, the ideas presented are timely and impactful. However, we must ensure follow-up to support these young innovators, linking them with stakeholders like ministries and agencies to transform their concepts into actionable solutions.

Collaboration and integration are essential to achieving this. Institutions like UICT and the Ministry of Agriculture must work closely to develop holistic, interconnected systems for production, irrigation, and soil management. This approach will strengthen the agriculture sector, making it more accessible, efficient, and appealing to young people.

I urge us to adopt a programmatic approach—planning and implementing together across sectors for greater impact. With adequate financial support and advocacy, particularly in ICT, we can scale these innovations and address critical challenges in agriculture. To the participants, know that failure is a stepping stone to success. Keep innovating, learning, and striving.

Let us partner, collaborate, and coordinate to transform agriculture into a thriving sector for Uganda's future.

For God and our country.

Technological Insights

Overview of the Technologies Showcased

Each team utilized a blend of modern technologies and innovative methodologies to address their given problem statements:

- **Blockchain:** Used to enhance transparency and trust in the agricultural supply chain, particularly for verifying the authenticity of inputs.
- **Artificial Intelligence (AI) and Machine Learning (ML):** Applied for predictive analytics in water management systems and for optimizing delivery routes in supply chains.
- **Internet of Things (IoT):** Sensors deployed in the soil to collect real-time data on soil conditions and water usage, enabling precise monitoring and control.
- **3D Printing**
- **Big Data and Analytics**
- **Design Thinking:** Adopted across all teams to ensure solutions were user-centered, focusing on the actual needs and challenges faced by farmers.

Impact and Future Prospects

Potential Impact of Innovations on Uganda's Agricultural Sector

The solutions developed during the hackathon hold significant promise for the future of sustainable agriculture in Uganda:

- **Prototype Development to Market-Ready Solutions:** With continued mentorship and support, several prototypes have the potential to be refined into market-ready products. For instance, the smart irrigation system and blockchain-based input verification app could greatly benefit local farmers by increasing efficiency and ensuring product authenticity.
- **Scalability and Implementation:** Many solutions demonstrated scalability, indicating their potential to be implemented on a larger scale across different regions in Uganda and possibly other countries facing similar agricultural challenges.

Future Opportunities for Agritech Innovation in Uganda

The hackathon showcased how integrating 4IR technologies can address real-world agricultural problems, contributing to both fields in the following ways:

- Innovation in Agriculture: The event highlighted novel applications of technology in agriculture, inspiring new approaches to enhancing productivity, sustainability, and profitability.

Technology Adoption: By demonstrating practical uses of advanced technologies, the hackathon encouraged wider adoption and acceptance of these tools among participants and the broader agricultural community.

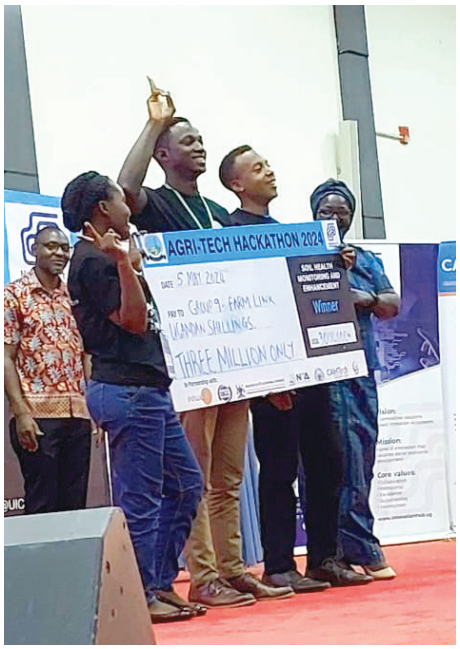
Awards and Prizes

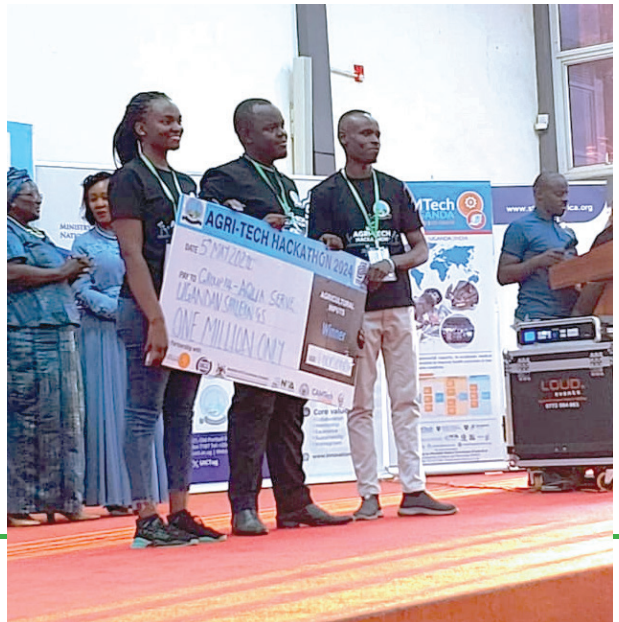
The hackathon concluded with the announcement of winners from each thematic area, as well as special awards for outstanding performance in specific categories:

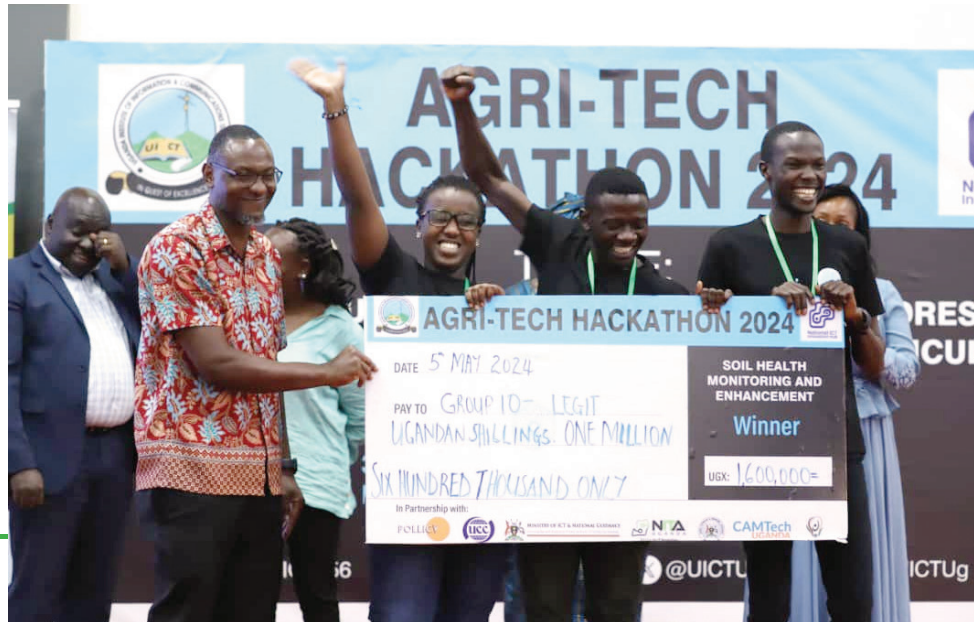
Category	Amount (UGx)	
	Theme Winners	Runners-Up
Enhancing Agricultural Inputs	3,000,000	1,600,000
Efficient Water Use	3,000,000	1,600,000
Optimizing Soil Health	3,000,000	1,600,000
Supply Chain Optimization	3,000,000	1,600,000

Special Awards

Runners-Up	Runners-Up
Best Pitcher	600,000
Audience Award	1,000,000







Plans for Supporting and Scaling the Innovations

A collaborative team from UICT, National ICT Innovation Hub/ Microfuse Computer Technologies Ltd, and a representative from Industry reviewed the detailed comments from the Agri-tech Hackathon Judges for the 16 innovations/pitches to identify the most impactful innovations with potential for scaling and commercialization. Below are the resulting innovations recommended for Incubation and Commercialization:

Soil-Tech Systems

1. **Optimizing Agricultural Productivity:**

- Soil health is fundamental to agricultural productivity. By providing real-time, accurate insights into soil conditions, Soil-Tech Systems can help farmers make informed decisions about crop selection, fertilization, and irrigation.
- Improved soil management leads to better crop yields, directly supporting food security and economic growth in Uganda.

2. **Addressing Soil Degradation:**

- Soil degradation is a significant issue in Uganda, exacerbated by poor farming practices and climate change. Soil-Tech Systems can help mitigate this by guiding farmers towards sustainable practices.
- By maintaining soil fertility, the project ensures long-term agricultural viability and productivity.

3. **Supporting Sustainable Farming Practices:**

- Real-time soil data enables precision agriculture, allowing farmers to use inputs more efficiently and reduce waste. This aligns with sustainable farming initiatives and environmental conservation efforts.
- Sustainable soil management practices contribute to the overall health of the ecosystem, promoting biodiversity and reducing the carbon footprint of agriculture.

Farm Link

1. **Ensuring Access to Quality Inputs:**

- Access to genuine, high-quality agricultural inputs is crucial for farmers to achieve high productivity. Farm Link provides a reliable platform to connect farmers with verified suppliers.
- Quality inputs, such as seeds, fertilizers, and pesticides, directly influence crop health and yield. Ensuring access to these inputs helps farmers improve their output and profitability.

2. **Combating Counterfeit Products:**

- The agricultural sector in Uganda faces challenges with counterfeit and substandard inputs. Farm Link helps mitigate this issue by connecting farmers with trusted suppliers.
- Reducing the prevalence of counterfeit products protects farmers' investments and ensures they achieve the expected outcomes from their inputs.

3. **Leveraging Technology for Inclusivity:**

- By using a USSD-based system, Farm Link ensures that even farmers in remote areas with limited internet access can benefit from the platform. This inclusivity is critical for widespread impact.
- The simplicity and accessibility of USSD technology ensure that a broad range of farmers, including smallholders, can easily access the service.

4. **Economic Empowerment:**

- By improving access to quality inputs, Farm Link empowers farmers to enhance their productivity and income. This has a direct impact on rural development and poverty alleviation.
- Stronger agricultural productivity contributes to the overall economic growth of Uganda, as agriculture is a major sector in the country's economy.

Aqua-Guide

1. Optimizing Water Usage:

- Water is a critical resource for agriculture, and efficient use of water can significantly enhance crop yields. Aqua-Guide uses machine learning to predict future rainfall patterns and optimize irrigation schedules.
- By guiding farmers on when and how much to irrigate, Aqua-Guide helps conserve water resources and ensures crops receive adequate water for optimal growth.

2. Climate Resilience:

- Uganda is vulnerable to climate change, with unpredictable rainfall patterns affecting agricultural productivity. Aqua-Guide's predictive capabilities help farmers adapt to these changes, building resilience against climate variability.
- Accurate water usage predictions reduce the risk of crop failure due to water stress or excess, supporting sustainable farming practices.

3. Enhancing Agricultural Efficiency:

- Efficient water management reduces costs and increases efficiency in farming operations. Aqua-Guide's data-driven approach ensures that water resources are used effectively, minimizing waste and maximizing productivity.
- By optimizing water usage, the project contributes to the sustainability of agricultural practices and supports the broader goals of environmental conservation.

4. Supporting Sustainable Development Goals (SDGs):

- Aqua-Guide aligns with SDG 6 (Clean Water and Sanitation) by promoting efficient water use and SDG 13 (Climate Action) by helping farmers adapt to climate change impacts.
- The project also supports SDG 2 (Zero Hunger) by improving agricultural productivity through better water management.

About the Organisers

National ICT Innovation Hub (NIIH)

Situated within the UICT Nakawa Campus, the National ICT Innovation Hub is dedicated to fostering homegrown digital solutions and promoting digital employment throughout Uganda. The hub serves as a dynamic environment for ICT innovators who face challenges with workspace, limited internet connectivity, and the need for creative spaces that spur innovative thinking. The National ICT Innovation Hub provided not only a conducive venue but also strategy, mentors, and staff that enabled the successful conceptualization and execution of the Agritech Hackathon 2024.

Start Hub Africa (SHA)

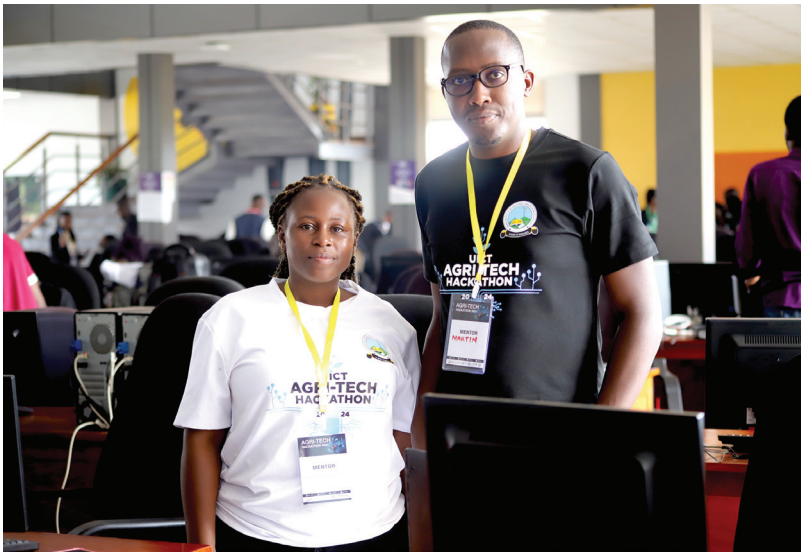
StartHub Africa is a hybrid social venture and an entrepreneurship support organization that offers practical training designed to help participants start profitable, scalable businesses that solve real problems. Beyond training, StartHub Africa provides mentorship and follow-up support to help businesses grow. The organization also assists other entities in becoming more innovative and user-focused, supporting them in reaching their impact targets. StartHub Africa's expertise in entrepreneurship and mentorship was crucial in being the implementing partner for the Hackathon. As the masterminds of the implementation strategy, SHA worked collaboratively with UICT & NIIH, and CAMTech Uganda to conceptualize and execute the Agritech Hackathon 2024.

Consortium for Affordable Medical Technologies (CAMTech) Uganda

The Consortium for Affordable Medical Technologies Uganda (CAMTech Uganda) is a medical innovation hub focused on improving health outcomes in low- and middle-income countries. CAMTech Uganda supports local innovators in developing solutions that can enhance health outcomes locally and globally. Their approach involves co-creation, where innovators from public health, engineering, and business collaborate with end-users to develop medical technologies. With over nine years of experience in organizing Hackathons, CAMTech Uganda enriched the UICT-NIIH Agritech Hackathon 2024 by providing their practical expertise and frameworks that ensured that we do not 're-invent the wheel' in the organization and execution processes. They also contributed strategic guidance in concept formulation and expert coaching and mentorship to staff and participants ensuring a successful event.

Together, these organizations provided a robust framework for the hackathon, ensuring participants had access to the necessary tools, mentorship, and support to turn their ideas into actionable solutions. For more specific reports on the operations of the organizing committee and teams, please use this link: *https://uict.umcs.go.ug/~NCcUU*

PICTORIAL HIGHLIGHTS

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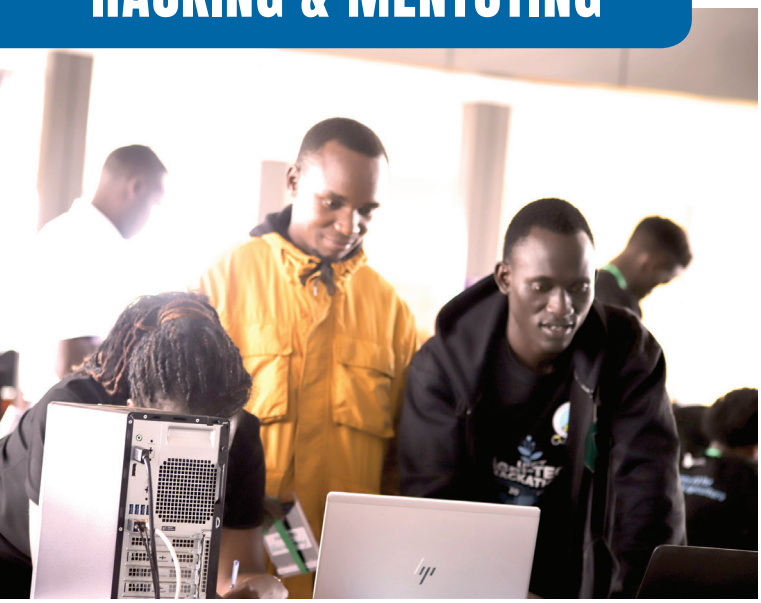
HACKING & MENTOTING



PITCHING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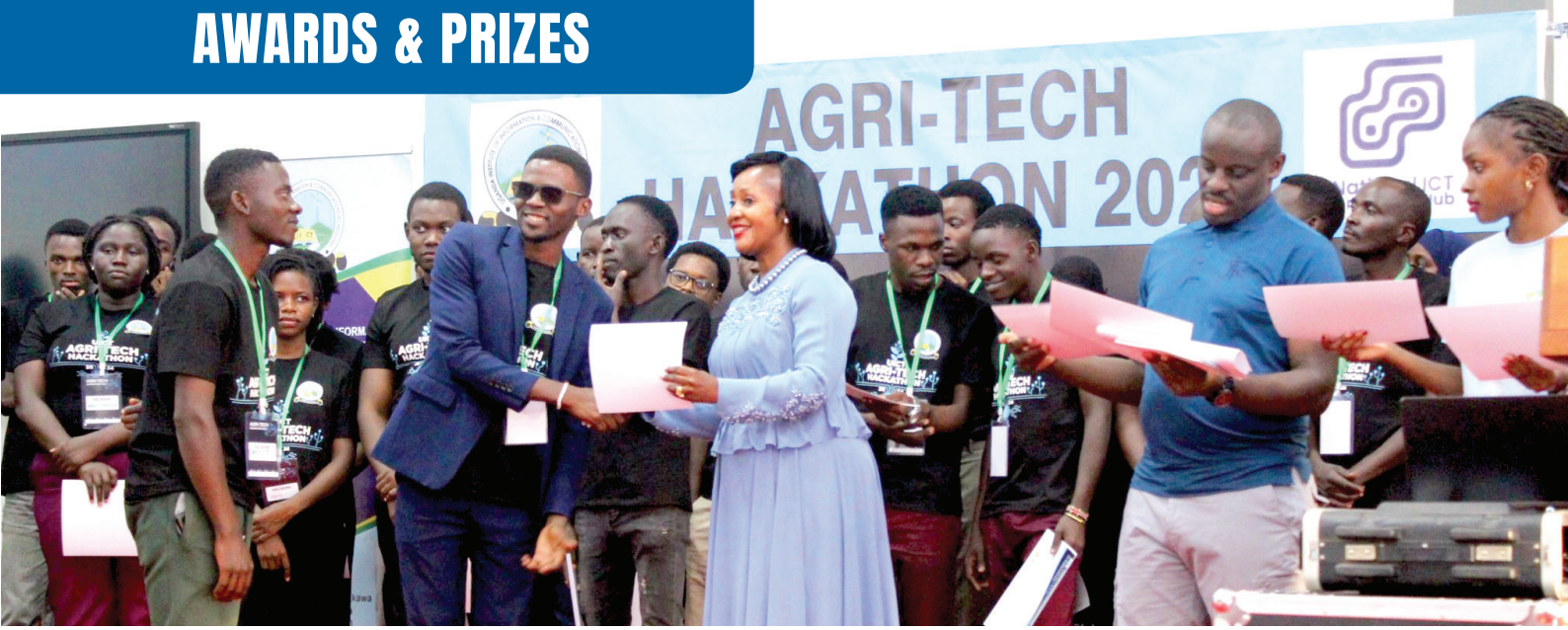
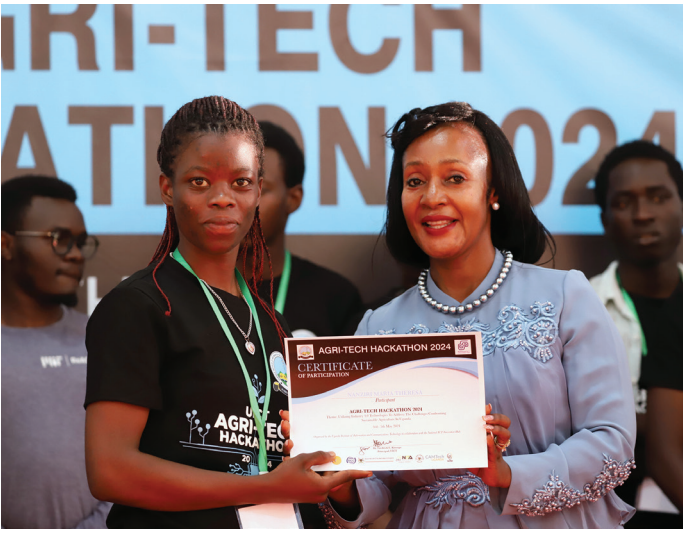
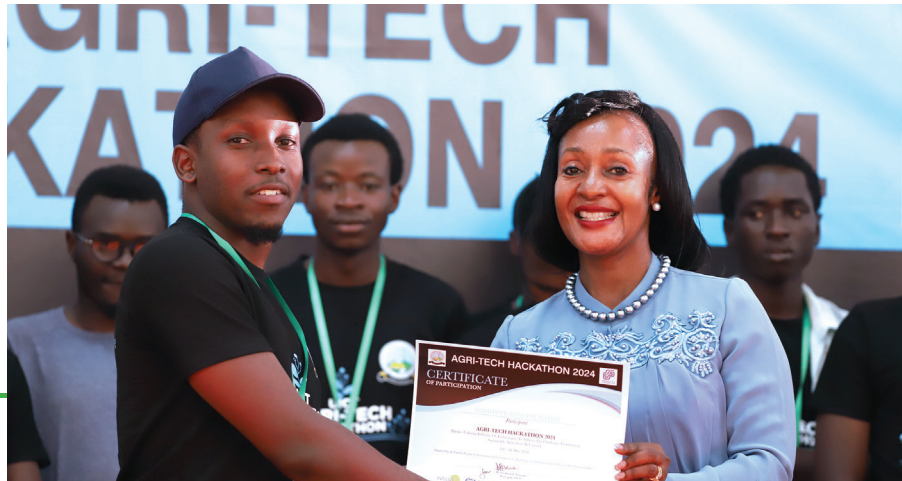
AWARDS & PRIZES





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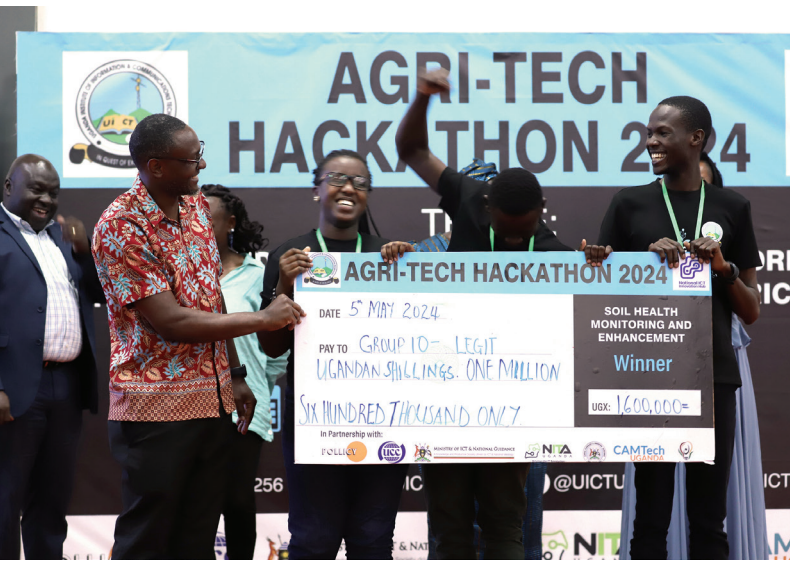
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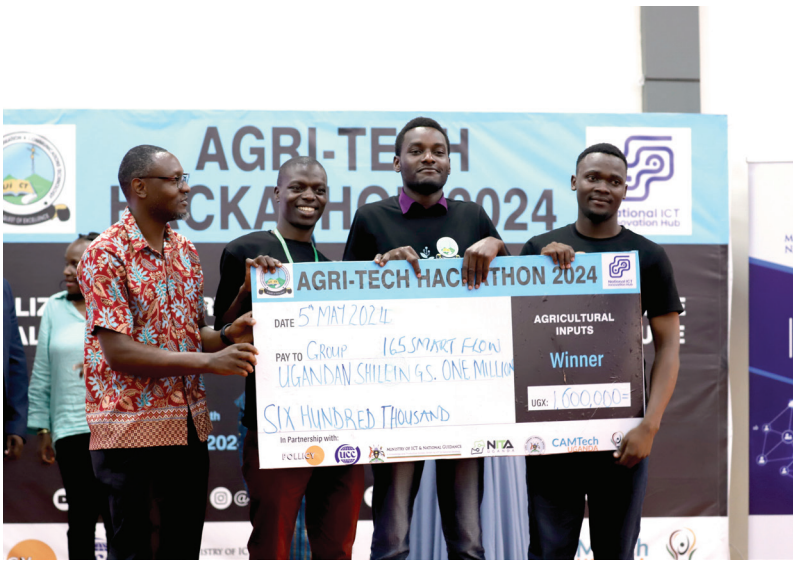
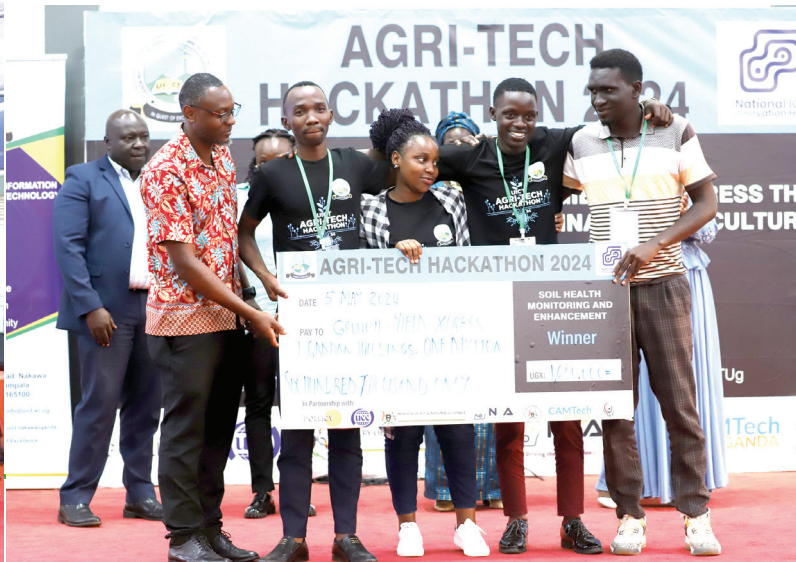
AGRI-TECH HACKATHON 2024
DATE 5th MAY 2024
PAY TO GROUP 10 - LEGIT
UGANDAN SHILLINGS. ONE MILLION
SIX HUNDRED THOUSAND ONLY
SOIL HEALTH MONITORING AND ENHANCEMENT
Winner
UGX: 1,600,000=
In Partnership with:


AGRI-TECH HACKATHON 2024
DATE 5th MAY 2024
PAY TO GROUP 165 SMART FLOW
UGANDAN SHILLINGS. ONE MILLION
SIX HUNDRED THOUSAND
AGRICULTURAL INPUTS
Winner
UGX: 1,600,000=
In Partnership with:


AGRI-TECH HACKATHON 2024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AGRI-TECH HACKATHON 2024
DATE 5th MAY 2024
SOIL HEALTH MONITORING AND ENHANCEMENT
Winner

NATIONAL ICT INNOVATION HUB

HOME OF INNOVATION THAT CATALYZES SOCIAL ECONOMIC DEVELOPMENT

Located inside the Uganda Institute of Information and Communications Technology (UICT) Nakawa Campus, it creates an environment for ICT innovators facing challenges with workspace, limited internet connectivity and searching for creative spaces that spur thinking.

The Hub seeks to become the "Home of ICT Innovation" with the ability to house and support the local innovation ecosystem in Uganda, harnessing the true concept of Nationalism (home-grown potential).

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innovationhub@ict.go.ug

MINISTRY OF ICT & NATIONAL GUIDANCE
A Knowledge and Productive Society driven by ICT & National Ideology

NITA UGANDA
- Driving the IT Revolution -

StartHub