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TOWARDS TRANSFORMATION

ANNUAL REPORT 2022

MISSION & VISION

VISION:
Prosperous African farmers sustainably managing crop nutrition to provide consumers with a secure supply of nutritious foods at a reasonable price.

MISSION:
Enhanced plant nutrition for a resilient and food-secure Africa.

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ANNUAL REPORT 2022

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AFRICAN PLANT NUTRITION INSTITUTE

FOREWORD

It is my pleasure to introduce the third annual report of the African Plant Nutrition Institute (APNI). This 2022 edition sets the tone with a title so relevant to where African agriculture stands nowadays: *Towards Transformation*. Indeed, when it comes to its state of affairs or prospects, agriculture in our continent is at an inflection point.

2022 was a trying year for Africa's food security. Amid unexpected geopolitical developments, Africa woke up to the reality that it cannot always rely on food imports as a source of sustenance. Especially when it is home to 60% of the world's unused arable lands.

Now more than ever, the role of Africa's scientists in optimizing solutions is paramount to serving its complex agricultural value chain - from farming communities to food consumers. Such has been the mandate of APNI since its founding three years ago.

2022 was also an eventful year for APNI's teams, partners and followers in Morocco, Africa and beyond. This year I was particularly proud to see APNI's experts take center stage in global conferences on the future of agriculture, demonstrating Africa's role as a strong force of proposition in the field.

Equally delighting is the rising momentum of APNI's thought leadership potential. Be it in peer-reviewed articles, published works, media presence or digital outreach, the Institute's intellectual production has established its specialists as authorities on crop nutrition, fertilizer use, and soil health. *Growing Africa*, APNI's new digital magazine, is the next frontier in this regard: bridging the gap between agriculture specialists and a public opinion hungry for answers.

But nowhere was APNI's impact stronger this year than in its work in the field, within Africa – and Africa's lands are quite the field to cover.

Out of four regional offices, APNI's teams established close contact with farming communities in Morocco, Tunisia, Senegal, Ghana, Tanzania, Kenya, Ivory Coast, or Togo, whether they grew wheat, olives, cocoa, or coffee beans.

APNI's focus on partnering with agricultural communities stems from a conviction that they are the backbone of Africa's food systems. From drylands, to irrigation, to crop nutrition, to carbon sequestration to gender equality, the range of issues covered by APNI's field programs confirms yet again the intersectional nature of African agriculture.

I would therefore like to congratulate the members of APNI's community on a fruitful year. I am confident that their drive, passion, and leadership will keep inspiring more resilient food systems.

From Africa, for Africa,

Hicham El Habti
APNI Board Chair

MESSAGE *from the* DIRECTOR GENERAL

TRANSFORMATION

noun [C or U]

UK /ˌtræns.fəˈmeɪ.ʃən/ **US** /ˌtræns.fɚˈmeɪ.ʃən/

Defined as a marked change in form, nature, or appearance for better, "transformation" aptly articulates the modus operandi of the African Plant Nutrition Institute since its inception. Transformation is key for any organization to be relevant. Especially when changes in its operating environment are so abrupt and encompassing. Early 2022 brought surge in geo-political conflict capable of short-circuiting the plant nutrition and food production sectors globally, but particularly for Africa, where fertilizer became even more scarce and costly within the lowest fertilizer using continent.

While fertilizer is unquestionably the central pivot for improving crop productivity in Africa, high prices and low access continue to make it a difficult choice for farmers. This intensifies the downward spiral towards lower crop productivity, extensive land degradation, and subsistence livelihoods within African communities. Millions of Africans became more food insecure as input and output markets ceased to function adequately due to the recent disruptions.

In 2022, we focused on three key issues, a) improve the efficiency and effectiveness of available fertilizers; b) strengthen efforts to improve resilience in production systems against shocks; and c) connect farmers to green carbon markets as an additional source of revenue.

The *4R Solution* and the *Nutrient Catalyzed Agricultural Transformation (NUTCAT)* projects, spread over nine countries, provided the platforms needed to combine agronomic principles and tools with key partnerships to improve the efficiency and effectiveness of fertilizers in Africa. The *NUTCAT* project created the right ecosystem to develop new ways of farmer-centric experimentation to secure the adoption of better on-farm practices to improve yield and nutrient use efficiency in multiple crops and regions.

With arable land degradation reaching as high as 60%, the benefits of building below- and above ground carbon in African production systems is obvious. Better return on fertilizer investment and on-farm resilience towards climate and other disruptive shocks are linked to soil carbon and health. Besides the immediate benefit in productivity enhancement and long-term climate mitigation and adaptation processes, the emerging green carbon market is providing opportunities to improve livelihood of smallholder farmers. Under the flagships of *Resilient Agriculture for African Dryland (RAFAD)* and the *Tree Crop Systems Research (ATCS)*, we are now engaged with a large partner network to unravel the nutrient-water-carbon-livelihood nexus in field and tree crop systems in different management domains that we believe will contribute to the renewed continental focus on fertilizer, soil health and sustainability. *The Sustainable Agriculture Matrix (SAM) Consortium* continues to provide key insights to strengthen our sustainability initiatives at national, sub-national and cropping system scale.

Growing Africa magazine added a proud feather in our on-going efforts to reach large audiences with actionable plant nutrition solutions. Along with the very successful 2nd edition of the *African Conference on Precision Agriculture (AfCPA)*, *Growing Africa* has helped develop a clear connection with stakeholders who believe in innovative plant nutrition as a key to enhancing livelihoods in Africa through food and nutrition security.

Africa will need more investment in building capacity in crop nutrition research and what is a better way than working with young and bright graduate students, who have become force multipliers in our research and outreach efforts. Along with them, we are leveraging our award and fellowship programs, and the *African Plant Nutrition Research Fund (APNRF)* to recognize and support excellence in plant nutrition education and research to create the much-needed pool of soil fertility and plant nutrition specialists for Africa.

The Consortium for Precision Crop Nutrition (CPCN), coordinated by APNI, has mobilized resources within the global fertilizer industry and other key groups with a stake in ag. development in Africa. Collaborations support critical adaptive on-farm research and innovative data management and access initiatives for effective knowledge transfer.

Our Annual Report is a celebration of our partnership and collaborations across the African continent and beyond. The NARES of several countries, the CGIAR institutions, and many other public and private organizations contributed to our understanding of the nuances of crop nutrition in diverse African agro-ecologies and how to manage them for greater public good. They help us do credible science, stay contextually relevant and legitimate, and act nimbly for impact.

I feel privileged to work with a brilliant and dedicated group of scientists at APNI who believe in new ways of doing science…open collaboration to create impact. Insights from our Scientific Advisory Committee were invaluable in managing our priorities and opening new vistas of engagement in 2022 and beyond. The APNI Board of Directors, and the Board Chair and President Mr. Hicham El Habti, are keen to help build APNI as a future-facing organization. With such support the future looks exciting for us!

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Director General

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APNI's Organization 2022

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Dr. Steve Phillips, Principal Scientist
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Dr. Hakim Boulal, Program Manager
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Ms. Angela Gitonga, Research Assistant
Mr. Mahdi Dahane, Agronomist
Mr. Joses Muthamia, Agronomist

apni AFRICAN PLANT NUTRITION INSTITUTE

Visiting with maize farmers participating in our Nutrient Catalyzed Nutrient Transformation (NUTCAT) Project in Togo.

HIGHLIGHTS *from* 2022

2022

JANUARY

- *Nature Food* publishes *"On-Farm Experimentation to Transform Global Agriculture"* co-authored by Dr. Oberthür.

AFRICAN PLANT NUTRITION RESEARCH FUND

Finalists announced for #APNRF research supporting African agricultural research for development. Call opens for 2022 round of preliminary APNRF proposals.

FEBRUARY

Representing the Scientific Panel on Sustainable Plant Nutrition, Dr. Majumdar speaks during IFA's webinar *"Realigning 4R Nutrient Stewardship for Future Farming Systems."*

- APNI holds Senegal Workshop in partnership with EID Afrique as part of IDRC project *"Enhancing the Resilience of Smallholder Farms through Upgrading of Women-Managed Dairy Value Chains."*
- Frontiers in Sustainable Food Systems publishes *"Assessment of the 2006 Abuja Fertilizer Declaration with Emphasis on Nitrogen Use Efficiency to Reduce Yield Gaps in Maize Production"* co-authored by Dr. Mutegi.

MARCH

- Dr. Zingore is a panelist on *"Economic Challenges of Feeding the Planet"* during #UM6PDays at Dubai Expo 2022.
- Dr. Chivenge speaks about *"Soil Carbon Sequestration and #Food_security in sub-Saharan Africa: Synergies and Tradeoffs"* at 4per100/GIZ Climate Soil Community of Practice.

APNI organizes Sustainable Agriculture Matrix (SAM) workshop in Nairobi, Kenya.

APRIL

- APNI holds workshop on Sustainable Maize Food Systems in Eastern Kenya in Embu, Kenya.
- Drs. Chivenge, Zingore & Njoroge co-author *Field Crops Research* article titled *"Progress in Research on Site-Specific Nutrient Management for Smallholder Farmers in sub-Saharan Africa."*

In collaboration with the FAO & WHO, APNI contributes to UNEP report on *"Environmental & Health Impacts of Pesticides & Fertilizers & Ways to Minimize Them."*

MAY

- MoU signed by APNI & INRA for launch of Olive FertiClim project.
- APNI publishes inaugural issue of *Growing Africa* magazine.

1st Annual APNI Staff Meeting held in Marrakech.

JUNE

- APNI publishes *2021 Annual Report.*
- Dr. Phillips is appointed President-Elect of the International Society of Precision Agriculture.

ISPA International Society of Precision Agriculture

JULY

- Graduation ceremony takes place for 2nd student cohort of UM6P/ESAFE Executive Masters in Precision Agriculture.
- APNI's team holds a multi-stakeholder workshop centered around our NUTCAT project's post-harvest assessment of on-farm experimentation in Korhogo, Côte d'Ivoire.

AUGUST

- CPCN launches the Open Databases on Crop Nutrient Removal & Nutrient Omission Trials.
- Dr. Murrell speaks on *"Opportunities for improving potassium recommendation for grain crops"* at the 19th International Plant Nutrition Colloquium.
- *Agronomy for Sustainable Development* publishes *"Novel Insights into Factors Associated with Yield Response and Nutrient Use Efficiency of Maize and Rice in sub-Saharan Africa,"* a review co-authored by Drs. Zingore, Mutegi, Adolwa, Chivenge, Phillips, & Oberthür.
- Dr. Mutegi delivers talk on *"The Future is in the Soil: Fertilizers and Soil in Africa"* at Regional Policy Dialogue Conference on Collective Action Towards Sustainable Climate Resilient Agrifood Systems for Enhanced Food Security, Ending Hunger & Achieving Climate Objectives.

SEPTEMBER

- Dr. Zingore delivers keynote speech on *"Managing Soil Acidity for Resilient Food Systems on the Continent during the AGRF."*
- MoU signed between APNI, OCP Africa, & Fertilizer Canada to improve food security in sub-Saharan Africa using the 4R Nutrient Stewardship Framework.
- Dr. Njoroge give talk on "How 4R Benefits Farmers" during the AGRF.
- APNI's team holds a SAM workshop in Morocco in collaboration with INRA.

OCTOBER

Drs. Majumdar & Zingore participate in 2022 FAO Science & Innovation for African Agriculture. Dr. Majumdar spoke about *"Challenges of Soil Fertility in Africa."*

Dr. Majumdar presented on *"The Role of Phosphorus in Smallholder Production Systems & Its Sustainable Management"* at the Multi-year Experts Meeting on Commodities Development held by UNCTAD in Geneva.

NOVEMBER

- Dr. Zingore spoke at the High-Level Panel on the Africa Fertilizer & Soil Health Summit during ReNAPRI's 9th Annual Stakeholders' Conference
- Dr. Zingore co-chaired the Natural Resources Management Session as part of FAO's Global Conference on Sustainable Plant Production.
- Dr. Chivenge presented the *"Co-Benefits of Nutrient Management Tailored to Smallholder Agriculture"* at the 2022 ASA CSSA SSSA International Annual Meeting during the session on Public Engagement for Healthy People & a Healthy Planet.
- Dr. Mutegi spoke about *"Management of Soil Health and Fragile Ecosystems in Network Society"* during the RuForum Annual General Meeting.
- Dr. Chivenge attended the SAM Consortium's Second Stakeholders Meeting in Istanbul, Turkey.

DECEMBER

Dr. Boulal delivered talk on Conservation Agriculture during the EiA Meeting of CGIAR held by ICARDA.

- APNI holds the Second African Conference on Precision Agriculture.
- Recipients of 2022 Precision Ag Awards Announced.
- APNI announces the recipients of the 2022 APNRF.

APNI holds its First On-Farm Experimentation Workshop in Nairobi, Kenya.

CLIMATE & WEATHER SMART PLANT NUTRITION

Our Climate & Weather Smart Plant Nutrition Theme explores the main challenges for African agriculture as it adjusts to climate change.

Activities are focused on how innovations within the plant nutrition domain can mitigate the impacts of increasing water scarcity, promote technologies for carbon sequestration, and improve crop diversification.

Whether the consequences of slowly changing climate trends, or the more frequent weather extremes, this theme's activities are aimed at generating local adaptation strategies for farmers through improved plant nutrition practices suited to managing these adverse conditions.

RESILIENT AGRICULTURE *for* AFRICAN DRYLAND (RAFAD)

RAFAD is a new initiative exploring viable solutions to the main challenges of African dryland agriculture using adapted plant nutrient management strategies. This initiative strives for inclusive partnerships equipped to develop evidence-based nutrient management solutions that produce tangible improvements in the livelihood of farmers in dryland areas.

Priority activities include interventions for narrower yield gaps, improved water and nutrient use efficiencies, increased agricultural biodiversity best suited for a changing climate, and stronger capacity for research and innovation in dryland systems.

Opportunities exist for synergy by developing new actionable research concepts aligned within our strategic R&D themes, initiatives, and projects. Short-term priorities target the North Africa region where, for example in Morocco, RAFAD supports its national "Green Generation Plan."

INITIATIVE

TIMEFRAME

CONCEPTUAL DESIGN (2021)

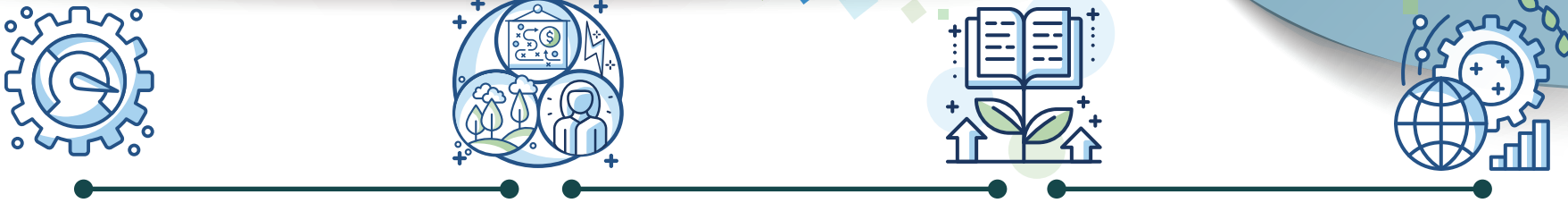
INITIATED (2022)

PARTNERS

Ministries of Agriculture
National Agricultural Research Systems
Universities
Agricultural Industry
CGIAR
International Organizations

TRANSFORMATIONAL PATHWAYS

2022



INCENTIVIZING CARBON MANAGEMENT IN DRYLAND TREE SYSTEMS

Comparative analysis of C sequestration.

Assessing the role of crop nutrition in increasing the rate of carbon sequestration.

IMPROVING DRYLAND SYSTEMS DIVERSIFICATION

Inclusion of legume species in cereal & olive cropping systems.

Diversifying production & sources of incomes as a strategy to cope with vulnerabilities inherent to dryland systems.

Assessing the inclusion of medicinal & aromatic plants in tree cropping systems.

Empowering the inclusion of women in smallholder value chains in Morocco.

ENHANCING NUTRIENT & WATER MANAGEMENT

Establish a research initiative supporting nutrient management options in olive trees under deficit irrigation.

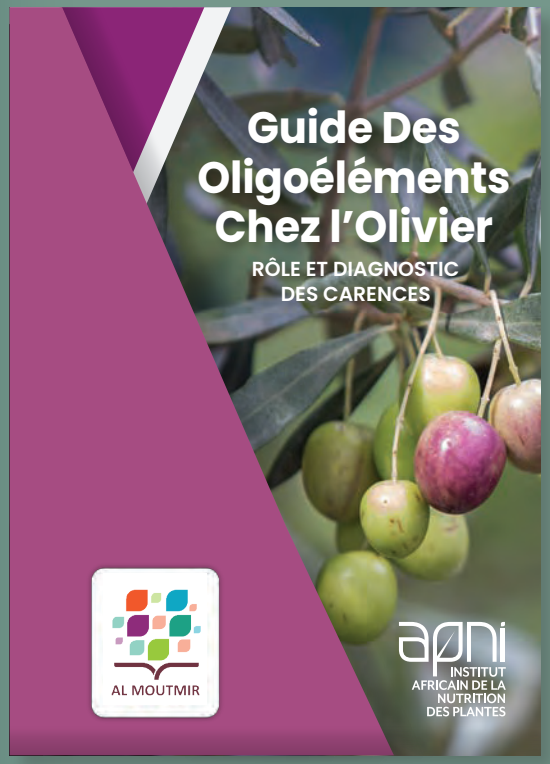
Promote & test best nutrient management practices for soil & water conservation.

Explore water x nutrient use efficiency interactions under no-till cereal systems.

PARTNERING FOR CAPACITY BUILDING & SCALING OF RESEARCH INSIGHTS

Engage APNI expertise with National & International partners.

Build capacity for collaborative R&D activities that promote new & effective plant nutrition options for African dryland cropping systems.



KEY MOMENTS

2022

- **New Field Guide** released on the Role of Micronutrients in Olive Production & Diagnosing Symptoms of Micronutrient Deficiency.
- Four field training events held for Al Moutmir-OCP Engineers guiding deficiency symptom diagnosis & leaf sampling for foliar analysis.
- Three Al Moutmir-OCP field days on best management practices for olive orchards.

CLOSING KNOWLEDGE GAPS *for* NUTRIENT MANAGEMENT *in* OLIVE ORCHARDS

Olive is one of the most important perennial cash crops in North Africa; however, nutritional deficits in olive orchards remain prevalent and they commonly result in productivity losses, low fruit quality, and sub-optimal tree health.

Pilot demonstration plots and hands-on field training events across the region provide opportunities to extend lessons learned from leading edge on-farm research on the impact of optimized fertilizer application in olive orchards.

SUPPORTING RESILIENCE *in* DRYLAND CROPPING SYSTEMS

In collaboration with national extension and research institutions, and fertilizer companies, our continued aim is to improve the knowledge of farmers and extension agents on best nutrient management practices, based on 4R Nutrient Stewardship, to increase farmers' incomes through improved crop production.

Through pilot training platforms, field days, and educational material development this effort demonstrates the benefits of adopting improved nutrient management on crop productivity, farm profitability and sustainability.

KEY MOMENTS 2022

- **New Field Guide** released on the Role of Micronutrients in Wheat Production & Diagnosing Symptoms of Micronutrient Deficiency.
- Training course for Al Moutmir-OCP engineers on micronutrient deficiency assessment in wheat.
- Training held for Al Moutmir-OCP engineers on data analyses methods for fertilizer experimental platforms.
- APNI Team supported & assessed the implementation of field demonstration platforms on micronutrient fertilization.

ENHANCING RESILIENCE *of* SMALLHOLDER FARMS *in* NORTH *and* WEST AFRICA: UPGRADING WOMEN MANAGED MILK VALUE CHAINS

PROJECT

TIMEFRAME

INITIATED (2020)

COMPLETED (2023)

This project addresses the problem of vulnerability of family farms in Morocco and Senegal to global and local forces of climate change, land degradation, economic power imbalance, market shocks, and the exclusion of rural women from participating in the development of more resilient local solutions to these problems.

The primary aim of this research is to enhance dairy value chains with commercial, social or institutional interventions that can generate additional smallholder income, especially for women.

Implemented amongst the emerging women managed cooperatives in Morocco's Rehamna region, this project has generated a range of initial strategies targeted towards strengthening the local goat milk value chain and improve the resilience of the region's small farms.

GOAT MILK PRODUCTION - MOROCCO

KEY RESULTS

2022

Established a novel & climate resilient value chain for intensive goat production with a combination of 1) salt-tolerant *Atriplex sp.* planted in association with annual legume & cereals, 2) irrigated forages, & 3) barley hydroponics.

☛ The irrigated system produced 100 t/yr of fodder while hydroponics generated 500 kg/day of green barley fodder.

Herd & Farm facilities improved through higher use of pure milk-producing breeds, feed rationing according to adapted dairy goat standards, better goat shed layouts, & adoption of best practices for dairy hygiene & production.

☛ Women farmers demonstrated an increase in milk production from 0.3 liters/day/goat to 2 liter/day/goat.

Cooperative governance improved as well as skills amongst women members related to climate change adaptation, entrepreneurship awareness, & regulatory tools for cooperatives.

Technological change & capacity built through targeted training modules on good practices for managing livestock operations & awareness on producing, processing & marketing perishable dairy products in high temperature climates for about 120 male & female farmers, engineers, technicians, & extension agents.

In Senegal, the livestock sub-sector ranks second among primary sector activities. It is practiced by nearly 350,000 families, corresponding to about 3 million individuals, for whom it is a critical provider of food and economic security. In the semi-arid Ferlo region of north central Senegal, extensive grazing systems are most common but more intensive systems are evolving that are less prone to the affects of seasonal drought and erratic weather patterns.

This project identified a list of key improvements needed to upgrade the local dairy value chain in Ferlo. These vulnerabilities included a need to improve the competitiveness of local producers and better secure adequate domestic milk supplies; the professional connectivity within the value chain was characterized as weak leading to a steady loss in opportunities to thrive; although women continue to play a dominant role within the dairy value chain, they remain vulnerable to exclusionary forces and inequitable distribution of resources and benefits; seasonal variability of milk production, enforced by climate, remains a structural challenge for the region.

PARTNERS

International Development Research Centre
R&D Maroc
IED Afrique

KEY FINDINGS 2022

COW MILK PRODUCTION - SENEGAL

The work of evaluating the economic & social performance of the milk value chain in the semi-arid Ferlo region, has **identified a series of challenges that hinder its development.**

Irregularity in the availability of livestock feed

Fodder resources dwindle in the dry season (9 out of 12 months) due to the lack of adequate rain, while the rainy season is a period of abundance thanks to the revegetation of natural pastures.

Difficulties in marketing milk production

Significant losses are recorded during periods of high production due to the saturation of the local market. Only 12% of producers have the resources to market their products outside the locality.

Absence of a national authority for regulating markets and organizing the sector

Despite the prominence of the milk sector in the national economy, it lacks an organization that can provide the consultancy & regulatory framework needed to bring together professionals in the sector.

IMPROVING OPPORTUNITIES *for* WOMEN *in* SMALLHOLDER OLIVE VALUE CHAINS *in* MOROCCO

This research will shed light on the constraints currently challenging rural women in smallholder olive value chains in Morocco through its investigation on how socioeconomic, cultural, and cognitive dimensions affect women's authority and participation in leadership, decision-making, and economic opportunities.

With an understanding of the constraints, solutions can be identified to help women overcome their barriers to inclusion, and specific interventions can be designed to adequately consider rural women's needs and prioritize local supporting mechanisms.

PROJECT

TIMEFRAME

INITIATED (2022)

COMPLETION (2025)

PARTNERS

Mohammed VI Polytechnic University (UM6P)

KEY MOMENTS

2022

Ph.D. student, Aziza Tangi, empowering the inclusion of women in olive smallholder value chains in Morocco under joint supervision of UM6P & APNI.

Field visits were conducted in four women managed olive cooperatives in three areas targeted for case study (Essaouira, Ouazzane & Azilal).

Activities introduced the research project & conducted interviews with the local agencies & cooperative representatives to obtain overall impressions & gather information to help confirm site selections.

Kick off meetings began activities in Cooperative Tyout, Chiadma, Essaouira; Cooperative Taymate de Timoulilt, Azilal; & Cooperative El Houda, Ouazzane.

Interactions highlighted project objectives, expected outcomes & strategies, & implementation phases, while securing project support & relationships among stakeholders.

Kick off meeting at Olive Cooperative Taymate de Timoulilt, Azilal, Morocco.

Lush pastures and farmlands of Morogoro Town, Tanzania

Research & Development Theme

SOIL HEALTH FOR IMPROVED LIVELIHOODS

Our Soil Health for Improved Livelihoods Theme desires a sound basis for developing plant nutrition interventions that improve soil health and the quality of agriculture products. It links the dynamics of improved soil biology, chemistry and soil physical properties to the enhancement of crop yield and quality, and the "one health" concept of concerted improvement in human, animal and environmental health.

Activities within this theme take center stage in developing knowledge on the role of plant nutrition in food security, livelihoods and environmental sustainability; and in building a broad base of partnerships designed to enable APNI's contribution to Africa's food system initiatives.

TREE CROP SYSTEMS RESEARCH & DEVELOPMENT

INITIATIVE

The APNI Tree Crop Systems (ATCS) research and development initative is striving towards increased soil organic carbon, reduced trade-offs between improved soil health and farmer livelihoods, and resilience of cocoa, olive, and coffee systems to climate change in West, North, and East Africa, respectively.

A better understanding of below ground biomass production in tree crop stands in West, North, and East Africa is a critical prerequisite needed to link soil health and carbon sequestration towards more climate-friendly cocoa, olive, and coffee systems.

The ATCS initiative is moving towards tree crop systems improvement in Africa through several transformational pathways:

TIMEFRAME

DESIGN PHASE (2021)

INITIATED (2022)

TRANSFORMATIONAL PATHWAYS

2022

CAPACITY STRENGTHENING

for partner institutions with graduate student engagement & training.

BETTER UNDERSTANDING

of contributions of tree crops to livelihoods & farmers' perception of soil health & carbon sequestration potential & drivers.

IDENTIFICATION, TRIALING & SCALING

of sustainable tree crop plant nutrition innovations.

ADDING INSIGHT

into the investigations on nutrient uptake & removal responses under improved nutrient management interventions & carbon sequestration potential.

PROVIDING OPPORTUNITY

through novel crop nutrition interventions that generate transferable knowledge, principles, & practices for optimal soil, animal, human, & environmental health.

Dr. Kokou A. Amouzou, Coordinator APNI Tree Crop Systems R&D

FRAME COCOA PROJECT *for* GHANA

PROJECT

This project is aimed at contributing to yield improvement in smallholder cocoa farms in Ghana by developing a remote sensing supported research framework for site-specific agronomic management.

Initial diagnostic surveys evaluated obstacles to farmer adoption of fertilizer recommendations and assessed supply and demand perspectives. Site-specific agronomic platforms were designed to begin to assess the impact of crop management, soil fertility, soil moisture, and micro-climate on cocoa yield.

CURRENT RESEARCH QUESTIONS

1. *Can integrated satellite, climate, soil, tree canopy data guide nutrient management practices?*
2. *What are the barriers/opportunities for adoption of site-specific nutrient use?*
3. *Which value chain partnership models can support adoption of site-specific nutrient recommendations?*

TIMEFRAME

DESIGN PHASE (2021)

IMPLEMENTATION (2022)

COMPLETION (2024)

PARTNERS

CSIR-Soil Research Institute

Kwame Nkrumah University of Science and Technology

SUPPORTED BY

AFRICAN PLANT NUTRITION RESEARCH FUND

KEY MOMENTS 2022

Diagnostic surveys conducted

Site selection completed

Multi-stakeholders' workshop

Business model developed to couple remote sensing & site-specific nutrient management practices towards improved fertilizer recommendation in cocoa systems

Ph.D. student, Bright Laboan, engaged to work on site-specific nutrient management for sustainable cocoa intensification in Ghana under joint supervision of APNI, Soil Research Institute, & Cranfield University (UK).

CSIR-Soil Research Institute staff inspect experimental cocoa tree stands.

FERTICLIM PROJECT for MOROCCO

PROJECT

This project seeks to optimize nutrient uptake and use efficiency of nutrients applied to olive. Tree response to nutrient application and soil water availability under deficit irrigation schemes implemented across the range of climates will be explored through the adoption of remote sensing technologies.

CURRENT RESEARCH QUESTIONS

1. *How much can deficit irrigation increase water and nutrient use efficiency and thereby increase climate resilience?*
2. *What economic benefit from yield and quality improvements can be realized from deficit irrigation?*
3. *What additional incremental environmental and economic benefits accrue with new genetic materials?*
4. *How can remote sensing be used to cost effectively scale water and nutrient management under deficit irrigation?*

TIMEFRAME

DESIGN PHASE (2021)

IMPLEMENTATION (2022)

COMPLETION (2024)

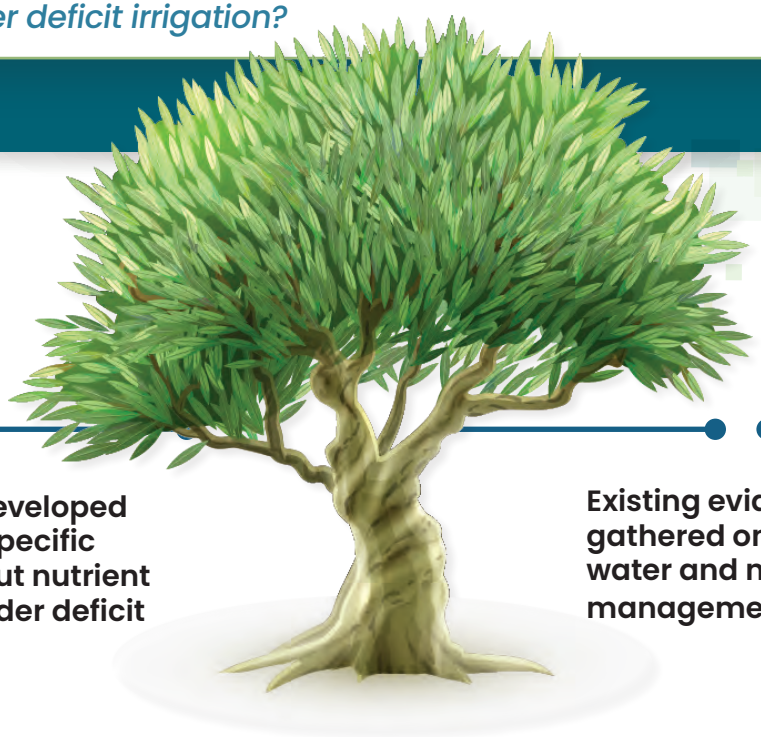
PARTNER

Institut National de la Recherche Agronomique (INRA Maroc)

SUPPORTED BY

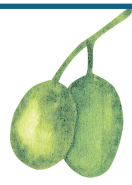
AFRICAN PLANT NUTRITION RESEARCH FUND

KEY MOMENTS 2022



Business case developed around variety specific information about nutrient performance under deficit irrigation.

Existing evidence gathered on olive water and nutrient management



Sites selected for the olive agronomy platforms

High density olive orchard near Sfax, Tunisia.

At the core of ATCS is it's collaborative Ph.D. research approach generating synergetic R&D with partner Universities, National Agricultural Research Systems, selected tree crop producers' networks, and private sector who collectively pledge for:

- **improved engagement** between research and extension services in finding fundamental knowledge gaps that hinder efficient nutrient use in tree crop systems,
- **a participatory research** process with effective farmers and private sector engagement for relevant research outputs dissemination; and,
- the alignment of **novel crop nutrition research and education** packages for tree crop systems with priorities of international, regional, and national research institutions and extension services as well as private stakeholders to catalyze adoption of innovation.

SOIL HEALTH & CARBON SEQUESTRATION *for* AFRICAN TREE CROP SYSTEMS

This project's overall goal is to generate basic evidence on nutrient uptake and removal, and carbon sequestration potential in cocoa, olive, and coffee systems where soils are recurrently over-exploited with poor nutrient management practices in the face of weather and climate variability. This research also aims to clarify the contribution of improved crop nutrition on livelihood improvement through added productive value and resilience.

The process of establishing collaborative research and studentship agreements was successfully engaged between APNI and local in-country partners in Tunisia, Morocco, Ghana, and Kenya.

PROJECT

TIMEFRAME

DESIGN PHASE (2021)

IMPLEMENTATION (2022)

COMPLETION (2026)

PARTNERS

CSIR-Soil Research Institute / University of Ghana / Olive Institute of Tunisia / University of Tunis El Manar
Institut National de la Recherche Agronomique / University of Marrakech

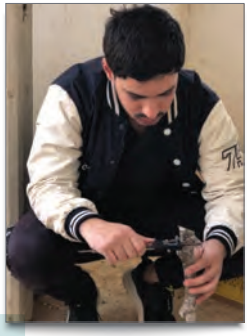
SUPPORTED BY

AFRICAN PLANT NUTRITION RESEARCH FUND

NEWLY ENGAGED PH.D. RESEARCH

2022

Jerome Agbesi Dogbatse - Studying Carbon Sequestration and Soil Health in Cacao Cropping Systems in Ghana under joint supervision of APNI, Soil Research Institute, and Department of Soil Science, School of Agriculture, University of Ghana.



Rabii Lanwer - Studying Carbon Sequestration and Soil Health in Olive Cropping Systems in Tunisia under joint supervision of APNI, Olive Institute, and University of Tunis El Manar.

Intissare Mouamine - Studying Carbon Sequestration and Soil Health in Olive Cropping Systems in Morocco under joint supervision of APNI, INRA, and Faculty of Science and Technology, Marrakech University.

APNI research staff discuss olive tree management issues with Tunisian Olive Institute researchers.

GREEN CARBON FINANCE *for* IMPROVED AGRONOMY *in* SMALLHOLDER COFFEE SYSTEMS *in* UGANDA

This project's key objective is to discover the impact of increasing monetizable aboveground carbon in the Robusta coffee producing communities in south-western Uganda. This consortium of R&D partners is looking to improve our knowledge on the impact of improved soil nutrient management on carbon credit creation and market responsive diversification along the coffee value chain, and address production challenges related to climate change.

The project's initial conceptual designs for farmer-led experimentation targeting improved coffee yield and quality, and higher carbon sequestration are set for launch in 2023. The project will also support graduate student research within Uganda's coffee sector.

PROJECT

TIMEFRAME

DESIGN PHASE (2021-2022)

IMPLEMENTATION (2023)

COMPLETION (2026)

PARTNERS

Ankole Coffee Producers Co-operative Union Ltd.
Mohammed VI Polytechnic University
Environmental Conservation Trust of Uganda (Ecotrust)
OCP-Foundation
Makerere University
NARO Uganda
Producers Direct

KEY MOMENTS

2022

Conceptual design completed

Working partnerships developed

WHAT'S NEXT

Project Launch in early 2023

GUIDING *the* PURSUIT *for* SUSTAINABILITY *by* CO-DEVELOPING *a* SUSTAINABLE AGRICULTURE MATRIX

PROJECT

TIMEFRAME

INITIATED (2021)

COMPLETION (2023)

PROJECT LEAD

University of Maryland Center for Environmental Science

SUPPORTED BY

Belmont Forum Partners

The Sustainable Agriculture Matrix (SAM) is a framework developed by the Center for Environmental Science, University of Maryland, to measure agriculture sustainability and contribute to accountable and transparent monitoring of the SDGs. SAM aims to serve as a platform to engage conversations among stakeholders involved in agriculture and to forge positive changes towards sustainability while avoiding unintended consequences.

APNI is part of the multi-disciplinary team forming the SAM Consortium and has initially supported the evaluation and development of the SAM framework in Kenya, Ghana, and Morocco across socio-economic and environmental contexts.

KEY MOMENTS

2022

National-level workshop held in Nairobi on 31 March on adapting SAM framework for maize food systems in Kenya.

Sub-national workshop held in Embu on 4 April on sustainability of maize-based food systems in eastern Kenya.

Multi-stakeholder SAM workshop held in Kumasi on 27 July on the sustainability framework for cacao cropping systems in Ghana.

Organized SAM workshop in Marrakech on 22 September to engage key stakeholders & partners to develop a narrative for the sustainability of olive-based food systems in Morocco.

SAM Consortium held its first in-person meeting in Istanbul on 21 October to showcase findings on strategies for further development & refinement, outreach, engagement, & cross-country partnership.

> **The SAM Consortium is a transdisciplinary and transnational partnership that seeks to guide the pursuit of sustainable agriculture globally.**
>
> – **Dr. Pauline Chivenge,** Principal Scientist

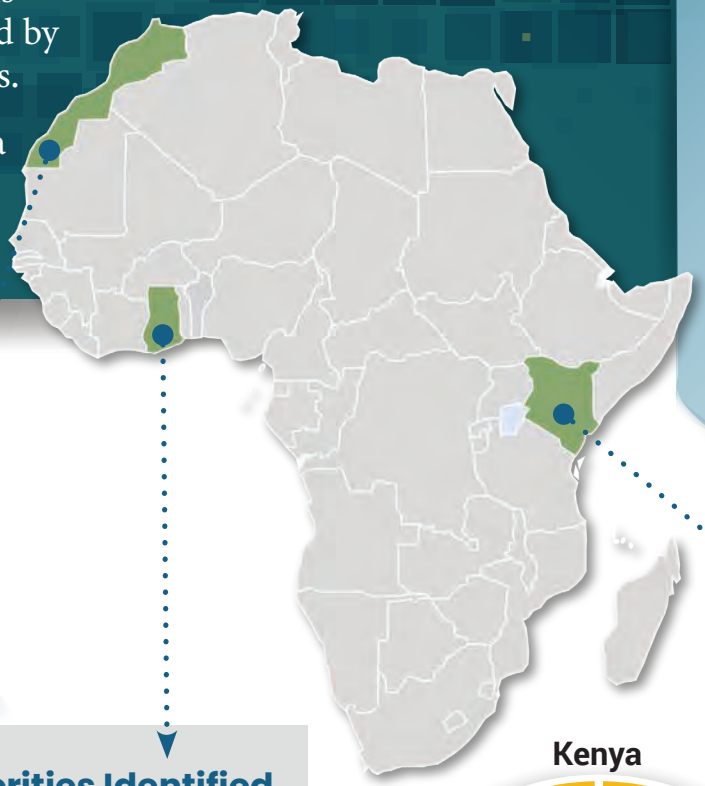
Watch Dr. Chivenge describe the SAM Consortium and its goals.

Workshop participants in Morocco and Ghana work to prioritize economic, social, and environmental indicators within the sustainable agriculture matrix (SAM).

ZEROING *in on* KEY SUSTAINABILITY CHALLENGE *for* AFRICA

Our work is aimed at evaluating national scale SAM models through on-the ground qualitative assessments conducted by open consultation with national and sub-national stakeholders.

APNI is working towards integrating the SAM framework as a means of on-going project monitoring, evaluation, and strengthening.

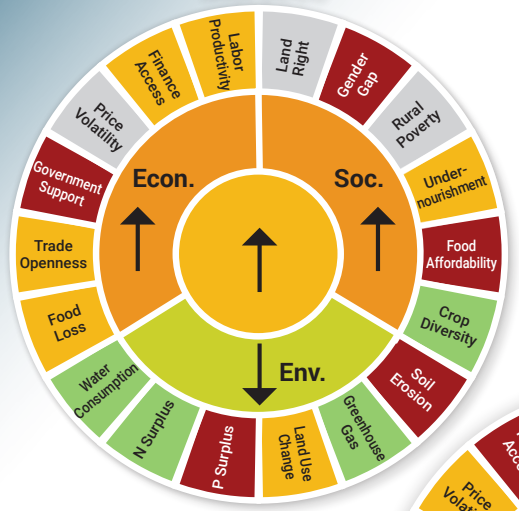


NEXT STEPS

- Further data analyses
- Incorporation of other relevant indicators from other African regions (e.g., access to irrigation, nutrient balances, carbon sequestration, child labor, agriculture productivity, etc.)
- Close examination at subnational scales and food or cropping systems

National Scale SAM Models under Assessment

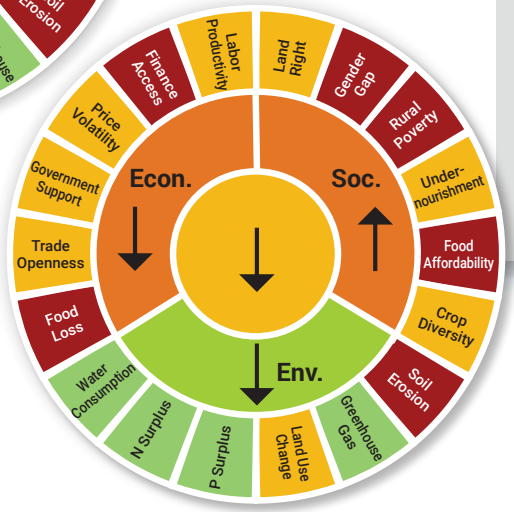
Morocco



Priorities Identified by Stakeholders

1. Irrigation water consumption
2. Rural poverty ratio
3. Crop diversity
4. Access to finance

Ghana



Priorities Identified by Stakeholders

1. Land use change
2. Access to finance
3. Rural poverty ratio

Kenya

Priorities Identified by Stakeholders

1. Soil erosion
2. Rural poverty ratio
3. Land use change
4. Food affordability

PRECISION NUTRIENT MANAGEMENT

Activities within the Precision Nutrient Management Theme contribute to principles and processes that can be structured, packaged, scaled, and presented for African farmers to precisely manage plant nutrition according to the specific conditions on their farm to optimize crop yields and economic returns.

Improved nutrient management strategies are developed according to the principles of 4R Nutrient Stewardship, which guide applications of the right nutrient source at the right rate, right time, and in the right place, and is important for developing sustainable cropping systems that support improved food production, increased income for farmers, and enhancement and maintenance of soil fertility.

The PNM thematic framework is foundationally established on the platforms of on-farm experimentation, researcher-led and benchmarking trial networks, and the use of geospatial, remote sensing, and climate data.

NUTRIENT CATALYZED AGRICULTURAL TRANSFORMATION (NUTCAT)

PROJECT

The NUTCAT project is our flagship project for co-design, co-development and delivery of relevant precision nutrient management innovations for cereal-based cropping systems in Africa. The project consists of three interconnected workstreams focused on improving cereal production with precision nutrient management, developing scalable decision support tools, and implementing farmer-centric research through on-farm experimentation.

NUTCAT is uniquely poised to implement a transformative process in African agricultural landscapes anchored on scalable behavioral change that is supported by agronomic insights and validated by digital data.

TIMEFRAME

INITIATED (2021)

COMPLETION (2026)

PARTNERS

OCP Africa
Al Moutmir
Digital Earth Africa
National Stakeholders

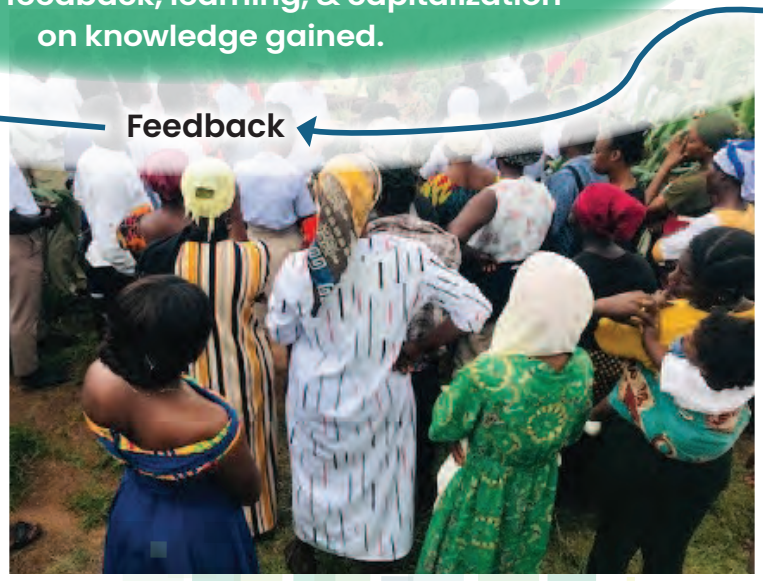
KEY MOMENTS

2022

- Established 20 maize trials in northern Ghana demarcated into two treatments: Optimized treatments (scientist managed) & Farmer practice (farmer managed).
- Three additional formal Cereal Improvement Teams (CITs) formed in Kenya, Ghana, & Tanzania.
- Two Post-Harvest Dialogue workshops held in Kenya & Cote d'Ivoire to operationalize the OFE process.
- Five Ph.D. students recruited by the project to handle various aspects of the three workstreams (cereal production, remote sensing methods, & OFE).
- An OFE reflection workshop held in Nairobi to bring together potential OFE practitioners as a first step to forming an OFE community of practice.

New Knowledge → Engagement → Participatory Research → Data Analyses → Interpretation → Feedback

On-farm experimentation (OFE) is central to NUTCAT's approach. It establishes an iterative cycle of farmer engagement, landscape-scale trials, data analysis, feedback, learning, & capitalization on knowledge gained.



> ***NUTCAT*** **is transformative as it implements a transdisciplinary approach to research that is focused on supporting an endogenous, farmer-centric growth process.**
>
> **- Dr. Ivan Adolwa, APNI**
> **Farming Systems Scientist**

WORKSTREAM 1 - Improve cereal system production using precision nutrient management.

Emmanuel Odoom - Precision Nitrogen Management for Sustainable and Profitable Maize Production in Ghana under joint supervision of APNI and University of Cape Coast, Ghana.

Elogne Mandela N'douba - Holistic Approach On Field Experiment (OFE) In Maize Crops In Northern Côte d'Ivoire: Case of Korhogo Ferké and Boundiali under joint supervision of APNI and Institut National Polytechnique Félix Houphouët-Boigny (INP-HB), Cote d'Ivoire.

Joses Muthamia - On-farm Experimentation to Enhance Adoption and Scaling of Soil Fertility, Nutrient Management and Climate-smart Technologies among Smallholder Farmers in Kenya under joint supervision of APNI and University of Embu, Kenya.

WORKSTREAM 2 - Remote sensing methods to evaluate grain yield potential and spatial variation in smallholder agriculture

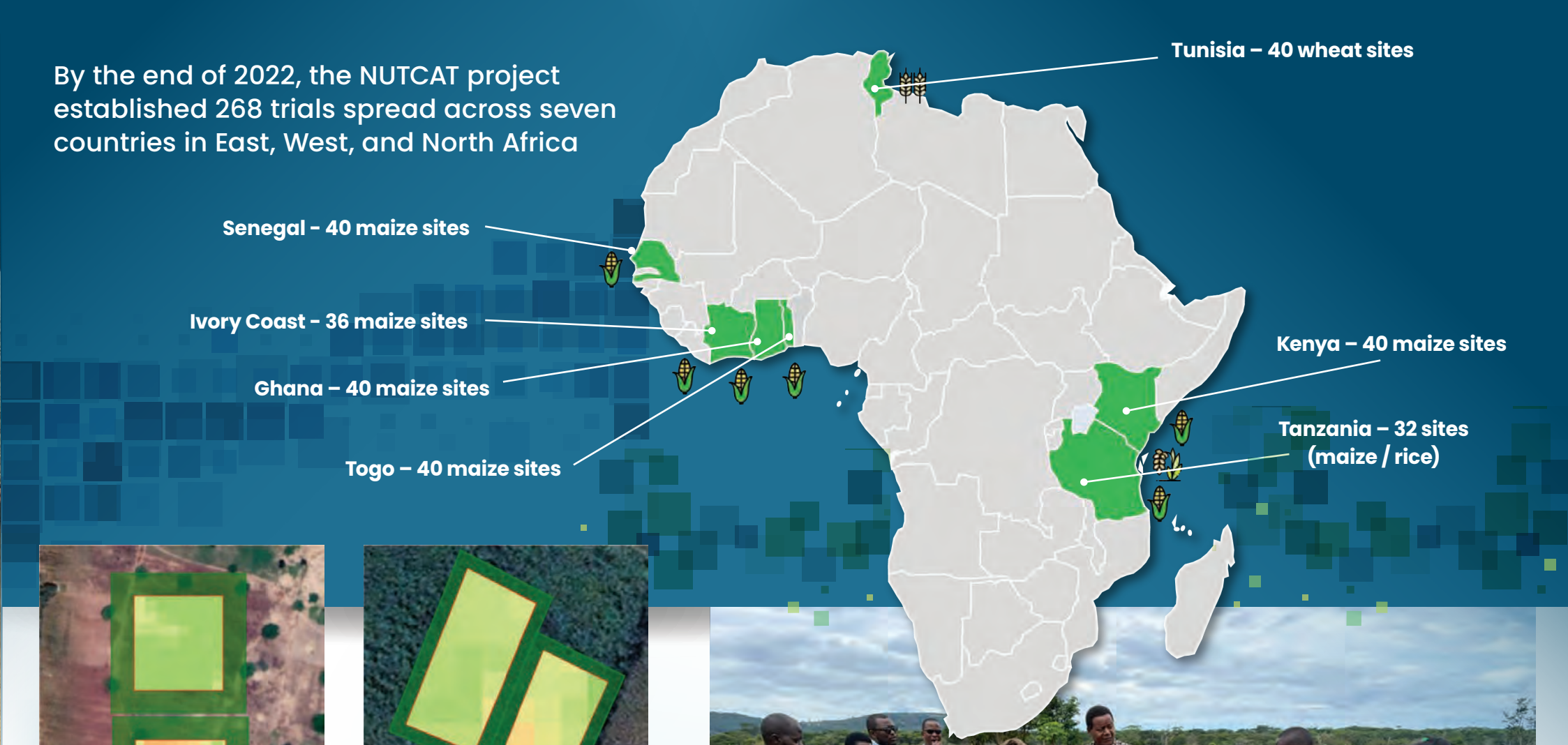
Aicha Biaou - Approach On Field Experiment (OFE) In Maize Crops In Northern Côte D'ivoire: Case of Korhogo Ferké and Boundiali under joint supervision of APNI and INP-HB, Cote d'Ivoire.

WORKSTREAM 3 - Farmer engagement and on-farm experimentation

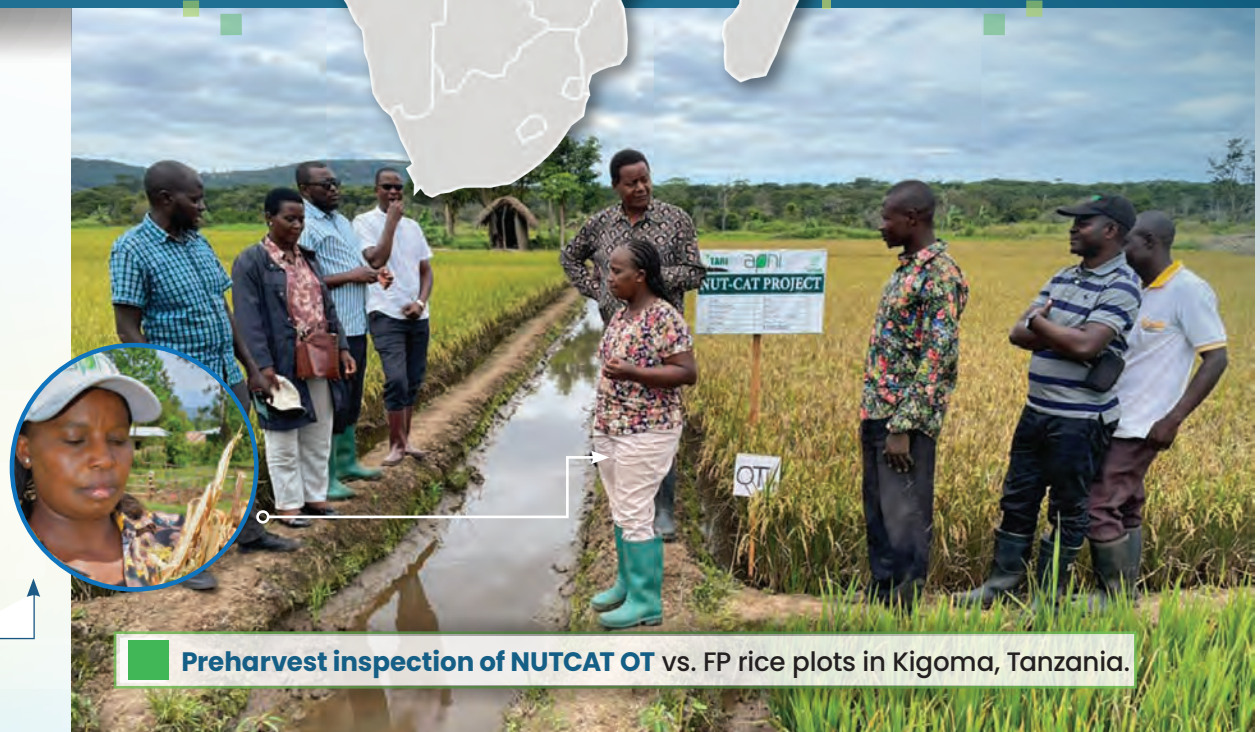
Hervé Kouassi Brou - Understanding Farmers Engagement For Technology Packages Adoption in Maize-Based Cropping Systems in Northern Côte D'Ivoire and Senegal under joint supervision of APNI and INP-HB, Cote d'Ivoire.

Dr. Steve Phillips (left), Dr. Thérèse Agneroh (center) and Dr. Ivan Adolwa (right) pictured with Ph.D. students engaged within NUTCAT project workstreams.

By the end of 2022, the NUTCAT project established 268 trials spread across seven countries in East, West, and North Africa



Remotely-sensed results from optimized (OT) and farmer practice (FP) plots at NUTCAT sites in Côte d'Ivoire (left) and Kenya (right).



Preharvest inspection of NUTCAT OT vs. FP rice plots in Kigoma, Tanzania.

Angela Ndanu Kathuku-Gitonga - Studying Soil Organic Carbon Dynamics as Influenced by Nutrient and Moisture Management Technologies under Coffee and Maize Cropping Systems in Kenya under joint supervision of APNI and University of Nairobi.

PROJECT

The project seeks to improve the socio-economic wellbeing and resilience of 80,000 smallholder farmers, particularly women in Ethiopia, Ghana and Senegal by improving crop productivity and farm income through the incorporation of 4R Nutrient Stewardship practices into fertilizer management while incorporating important gender and environmental resilience strategies.

4R Solution

CURRENT OBJECTIVES:

1. *Sustainable crop production using climate-smart, best management practices in agriculture, and increased value chain access and integration by women and men farmers.*
2. *Enhanced representation and influence of women in leadership positions and decision-making bodies in farmers' cooperatives.*
3. *Increased integration of gender-sensitive 4R principles in relevant standards and policies.*

TIMEFRAME

ESTABLISHED (2019)

COMPLETION (2024)

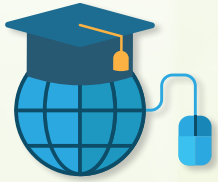
PARTNERS

- Savanna Agricultural Research Institute
- SEND Ghana
- Ethio-Wetlands and Natural Resources Association
- Amhara Region Agricultural Research Institute
- ONG 7a
- Senegal Department of Rural Development Service
- Global Affairs Canada
- Co-operative Development Foundation of Canada
- Fertilizer Canada
- Plant Nutrition Canada

2022 KEY MOMENTS

On-farm 4R validation trials for wheat & teff established in Ethiopia.

Developed locally adapted 4R cropping guides for maize, soybean, & groundnut in Northern Ghana.



Online 4R extension course taken up by extension agents & researchers from 23 African countries.

Project achievements & impacts presented at the AGRF 2022 Summit.

Launched community based 4R learning sites for maize, rice, & vegetables in Senegal.

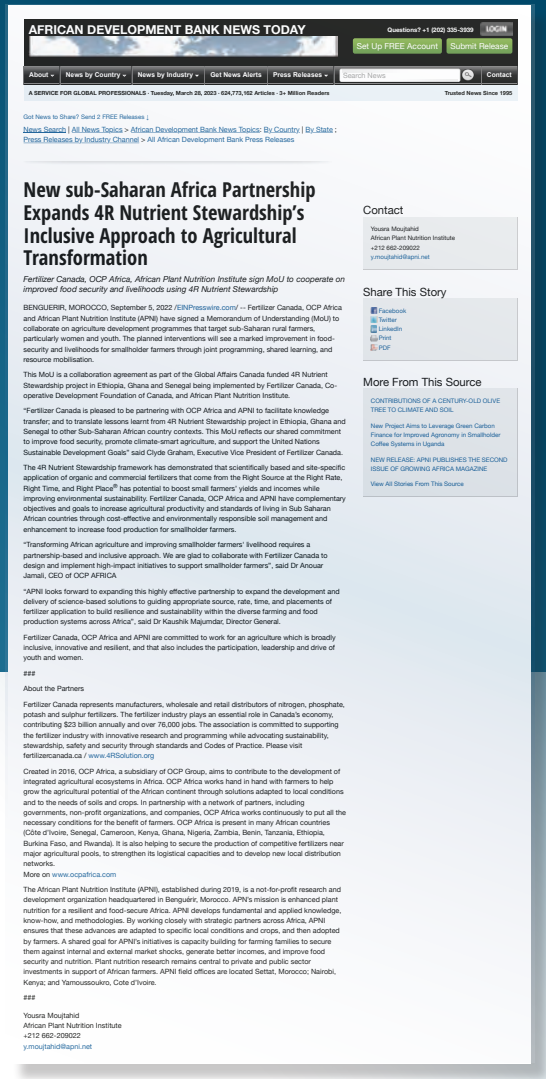
Community based 4R Nutrient Stewardship learning sites for vegetable garden in Senegal.

> The 4R Solutions project is helping to transform fertilizer use practices in smallholder farming systems in Africa towards more efficiency, productivity, profitability, and sustainability by adopting a farming systems approach to nutrient management. The required fertilizer applications are determined not only by the nutrient requirements of the current crop, but also by considering the potential nutrient contribution of the previous crop in the cropping system, and nutrient contributions from organic sources available to different farmers.
>
> – **Dr. Samuel Njoroge**, 4R Nutrient Stewardship Coordinator

EXPANDING 4R NUTRIENT STEWARDSHIP APPROACH *to* AGRICULTURAL TRANSFORMATION

During the most recent AGRF Conference this past September, Fertilizer Canada, OCP Africa and APNI signed a Memorandum of Understanding to collaborate further on agriculture development programs that target sub-Saharan rural farmers, particularly women and youth.

The goal is to coordinate and rapidly accelerate 4R farm extension capacity by leveraging tools and knowledge gained under the 4R Solution Project to other countries across the African continent.



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New sub-Saharan Africa Partnership Expands 4R Nutrient Stewardship's Inclusive Approach to Agricultural Transformation

Fertilizer Canada, OCP Africa, African Plant Nutrition Institute sign MoU to cooperate on improved food security and livelihoods using 4R Nutrient Stewardship

BENGUERIR, MOROCCO, September 5, 2022 /EINPresswire.com/ -- Fertilizer Canada, OCP Africa and African Plant Nutrition Institute (APNI) have signed a Memorandum of Understanding (MoU) to collaborate on agriculture development programmes that target sub-Saharan rural farmers, particularly women and youth. The planned interventions will see a marked improvement in food-security and livelihoods for smallholder farmers through joint programming, shared learning, and resource mobilisation.

This MoU is a collaboration agreement as part of the Global Affairs Canada funded 4R Nutrient Stewardship project in Ethiopia, Ghana and Senegal being implemented by Fertilizer Canada, Co-operative Development Foundation of Canada, and African Plant Nutrition Institute.

"Fertilizer Canada is pleased to be partnering with OCP Africa and APNI to facilitate knowledge transfer; and to translate lessons learnt from 4R Nutrient Stewardship project in Ethiopia, Ghana and Senegal to other Sub-Saharan African country contexts. This MoU reflects our shared commitment to improve food security, promote climate-smart agriculture, and support the United Nations Sustainable Development Goals" said Clyde Graham, Executive Vice President of Fertilizer Canada.

The 4R Nutrient Stewardship framework has demonstrated that scientifically based and site-specific application of organic and commercial fertilizers that come from the Right Source at the Right Rate, Right Time, and Right Place® has potential to boost small farmers' yields and incomes while improving environmental sustainability. Fertilizer Canada, OCP Africa and APNI have complementary objectives and goals to increase agricultural productivity and standards of living in Sub Saharan African countries through cost-effective and environmentally responsible soil management and enhancement to increase food production for smallholder farmers.

"Transforming African agriculture and improving smallholder farmers' livelihood requires a partnership-based and inclusive approach. We are glad to collaborate with Fertilizer Canada to design and implement high-impact initiatives to support smallholder farmers", said Dr Anouar Jamali, CEO of OCP AFRICA

"APNI looks forward to expanding this highly effective partnership to expand the development and delivery of science-based solutions to guiding appropriate source, rate, time, and placements of fertilizer application to build resilience and sustainability within the diverse farming and food production systems across Africa", said Dr Kaushik Majumdar, Director General.

Fertilizer Canada, OCP Africa and APNI are committed to work for an agriculture which is broadly inclusive, innovative and resilient, and that also includes the participation, leadership and drive of youth and women.

###

About the Partners

Fertilizer Canada represents manufacturers, wholesale and retail distributors of nitrogen, phosphate, potash and sulphur fertilizers. The fertilizer industry plays an essential role in Canada's economy, contributing $23 billion annually and over 76,000 jobs. The association is committed to supporting the fertilizer industry with innovative research and programming while advocating sustainability, stewardship, safety and security through standards and Codes of Practice. Please visit fertilizercanada.ca / www.4RSolution.org

Created in 2016, OCP Africa, a subsidiary of OCP Group, aims to contribute to the development of integrated agricultural ecosystems in Africa. OCP Africa works hand in hand with farmers to help grow the agricultural potential of the African continent through solutions adapted to local conditions and to the needs of soils and crops. In partnership with a network of partners, including governments, non-profit organizations, and companies, OCP Africa works continuously to put all the necessary conditions for the benefit of farmers. OCP Africa is present in many African countries (Côte d'Ivoire, Senegal, Cameroon, Kenya, Ghana, Nigeria, Zambia, Benin, Tanzania, Ethiopia, Burkina Faso, and Rwanda). It is also helping to secure the production of competitive fertilizers near major agricultural pools, to strengthen its logistical capacities and to develop new local distribution networks.
More on www.ocpafrica.com

The African Plant Nutrition Institute (APNI), established during 2019, is a not-for-profit research and development organization headquartered in Benguérir, Morocco. APN's mission is enhanced plant nutrition for a resilient and food-secure Africa. APNI develops fundamental and applied knowledge, know-how, and methodologies. By working closely with strategic partners across Africa, APNI ensures that these advances are adapted to specific local conditions and crops, and then adopted by farmers. A shared goal for APNI's initiatives is capacity building for farming families to secure them against internal and external market shocks, generate better incomes, and improve food security and nutrition. Plant nutrition research remains central to private and public sector investments in support of African farmers. APNI field offices are located Settat, Morocco; Nairobi, Kenya; and Yamoussoukro, Cote d'Ivoire.

###

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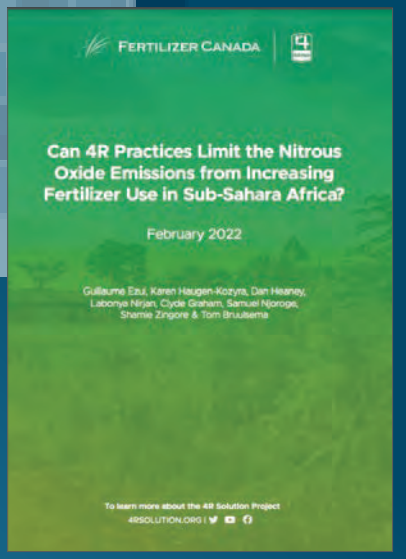
> **"APNI looks forward to expanding this highly effective partnership of development & delivery of science-based solutions to guiding appropriate source, rate, time, & placements of fertilizer application with the goal of building resilience & sustainability within the diverse farming & food production systems across Africa.**
>
> **– Dr. Shamie Zingore,**
> **Director Research & Development**

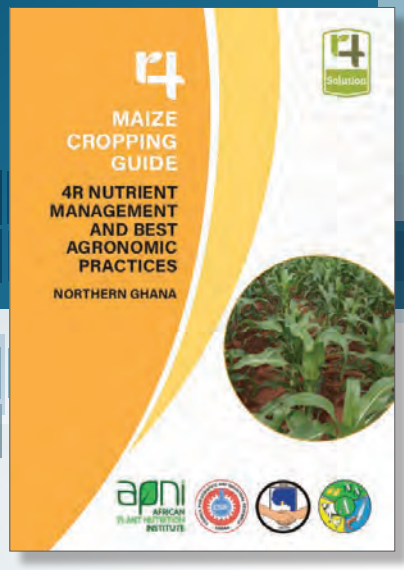
The 4R Solution Project has steadily built a library of resources including illustrative posters providing regional 4R recommendations and crop diagnostics, 4R Nutrient Stewardship learning modules, online learning courses, and crop-specific extension guides for the field.

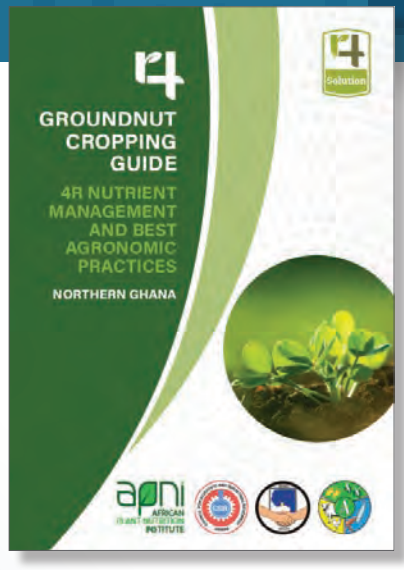
New White Paper available documenting the potential contribution of 4R Nutrient Stewardship towards climate change mitigation in sub-Sahara Africa through reduced N_2O emissions.

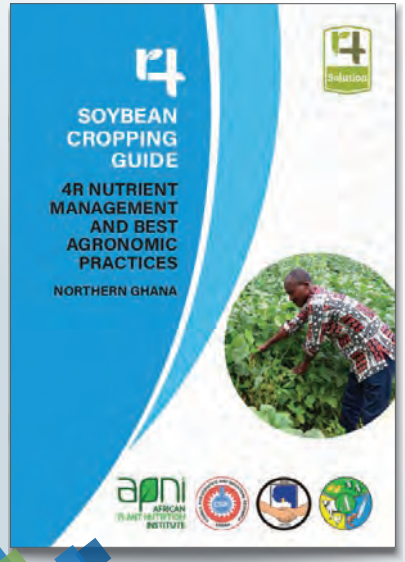


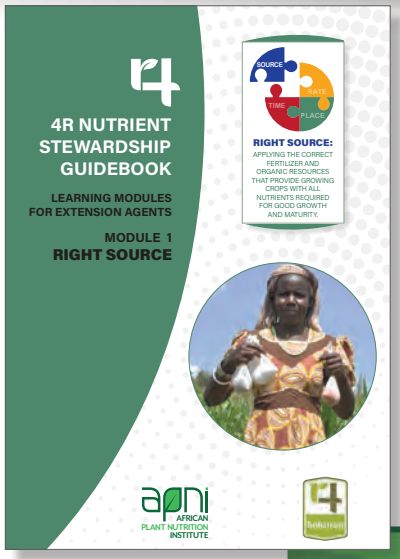
New 4R Cropping Field Guides available for Maize, Soybean, and Groundnut systems in Northern Ghana.

"Annual N_2O emission reductions of up to 7.5% by 2030 and 12.5% (2050) could be achieved with 30% and 50% adoption rates of 4R Nutrient Stewardship in sub-Saharan Africa.









Our e-learning course on 4R Nutrient Stewardship principles continues to be taken up by researchers, students & extension agents located within the current 4R Solution Project countries (light blue) and beyond.

OUT SCALING 4R NUTRIENT STEWARDSHIP KNOWLEDGE *for* INTENSIVE OLIVE PLANTATIONS

PROJECT

These two projects operate in Morocco and Tunisia to disseminate lessons learned from continuing on-farm olive research on best nutrient management practices based on the principles of 4R Nutrient Stewardship. Nutritional deficits are prevalent for olive orchards in Morocco and Tunisia, and they commonly result in productivity losses and low fruit quality. Farmer's need access to targeted information on optimizing fertilizer applications to balance the fertility of olive orchard soils and improve the nutritional status of olive trees.

GLOBAL OBJECTIVES:

1. *Establish pilot demonstration trials as applied research and 4R Nutrient Stewardship in-field learning sites.*
2. *Establish appropriate regional approaches for olive NPK fertilization.*
3. *Establish optimal ranges for nutritional diagnosis of olive.*
4. *Develop best nutrient management practices, educational resources and forums.*

TIMEFRAME

ESTABLISHED (2019)

COMPLETION (2023)

PARTNERS

- Olive Institute Tunisia (OIT)
- Institut National de la Recherche Agronomique (INRA Maroc)
- Office National du Conseil Agricole (ONCA)
- Direction Provinciale D'Agriculture (DPA)

KEY MOMENTS 2022

Tunisia

OIT/APNI workshop reviewed project results for the past three years & charted the path for future collaborative tree crop research & development.

Field events held at olive orchard study sites (Hammam Biadha, Borj Massoudi Zaghouan, Silana, Silana Sud, Borj el Amri Manouba) trained agricultural engineers, technicians & farmers.

Morocco

Farmers from Olea Mogador Cooperative Classroom participated in training events. Field sessions provided practical experience on leaf sampling for determination of nutrient status of trees, foliar fertilization, & leaf nutrient deficiency.

University of Tuttori (Japan) delegation visits on-farm demo site to learns about nutrient management in arid lands & APNI/INRA experiences.

Field training day at Borj Massoudi

UM6P graduate students visited our 4R experiment site to learn about in-field fertigation management of olive & discuss olive fertilization management techniques.

CONSORTIUM FOR PRECISION CROP NUTRITION

CPCN
CONSORTIUM FOR PRECISION CROP NUTRITION
https://precisioncropnutrition.net

The Consortium for Precision Crop Nutrition (CPCN) was established in 2021 to co-create common data, standards and resources that enable its members to develop, validate and disseminate their own customized nutrient management solutions.

Building on many previous research and extension activities, CPCN aims to join up R&D efforts and data from international and national research programs and better link them to industry stakeholders. CPCN interacts closely with other global or regional initiatives on data and digital tools for agriculture.

Currently, CPCN has 43 members; 14 from the fertilizer industry, 10 from within CGIAR, 15 from Universities or Research Institutions including NARES from Africa, and 4 NGOs.

TIMEFRAME

INITIATED (2021)

PARTNERS

International Fertilizer Association

CGIAR Excellence in Agronomy

KEY MOMENTS 2022

Global Crop Nutrient Removal Database launched as a universally recognized, open, & comprehensive database of crop nutrient concentrations to help determine the total amount of nutrients removed from fields.

Visit: https://cropnutrientdata.net

Nutrient Omission Trial Database launched to consolidate legacy nutrient omission research data from multiple sources into a single, standardized, & open database.

Global Cropland Nutrient Budgets Database released by IFA, FAO, Maryland University, Wageningen University, Swedish University of Agricultural Sciences, Polytechnic University of Madrid, & University of Nebraska-Lincoln to harmonize the IFASTAT & FAOSTAT databases & improve on the existing data gaps. APNI contributes data for Africa...one region with especially extensive gaps in nutrient use data.

Visit: https://www.fao.org/faostat/en/#data/ESB

Stakeholder engagements with industry partners sought feedback to guide projects & future collaborative work for CPCN members.

Bi-weekly seminar series welcomes 14 new presentations from Consortium members. Recordings continue to be archived on our website.

Visit: https://precisioncropnutrition.net/seminars

APNI's collaboration with the **International Fertilizer Association (IFA), Innovative Solutions for Decision Agriculture (iSDA),** and **Agmatix, the Nutrient Omission Trial Database** was formed to consolidate legacy nutrient omission research data from multiple sources into a single, standardized, and open database.

Wageningen University & Research (WUR), IFA, and **Agmatix** collaborated to create the **Global Crop Nutrient Removal Database** formed to promote open-science for analyzing crop nutrients big data and help ensure sustainable crop production worldwide.

Open access: https://cropnutrientdata.net


Conference on AfCPA 2022 Precision Agriculture
ISION AGRICULTURE in ACTION for AFRICA
EGYPT · ETHIOPIA · GHANA · NIGERIA · UGANDA
Precision Agriculture
2nd African Conference on AfCPA 2022 Precision Agriculture
PRECISION AGRICULTURE in ACTION for AFRICA
KENYA · COTE D'IVOIRE

2nd AFRICAN CONFERENCE *on* PRECISION AGRICULTURE

AfCPA 2022

The mission of the African Conference of Precision Agriculture (AfCPA) is to "connect the science and practice needed to put precision agriculture in action for Africa." AfCPA seeks to provide a pan-African platform focused on highlighting new advances in the fields of experimental and applied precision agriculture.

This effort is aimed at strengthening and supporting the precision agriculture community within the African continent. AfCPA wishes to engage key stakeholders including scientists, policy-makers, extension staff, crop consultants and advisors, agronomists, and service providers towards the common goal of building the capacity and resilience of African cropping systems.

PARTNERS

African Plant Nutrition Institute
Mohammed VI Polytechnic University
International Society of Precision Agriculture
African Association for Precision Agriculture

KEY MOMENTS 2022

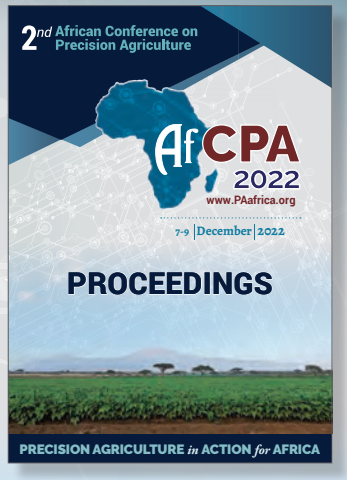
AfCPA 2022 organized on December 7-9. Nairobi, Kenya is selected as the main conference site - a hybrid program that connected +700 registrants in 34 countries (18 in Africa).

AfCPA organized 10 in-person satellite sites across north, west, east, & southern Africa which offered local plenary sessions to extend the scope of and give researchers a platform to discuss regional precision agriculture issues.

Over 2.5 days, the main program from Nairobi featured **7 keynote speakers, 20 plenary presentations,** and **3 in-depth panel discussions.**

African Association of Precision Agriculture (AAPA) renews & expands its executive board.

Watch Dr. Steve Phillips outline the goals of AfCPA and precision agriculture in Africa



EARLY 2023 RELEASE


GPi
GLOBAL PHOSPHORUS INSTITUTE
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Lenovo
AfCPA
2022


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Solution
AFRICA


ECISION AGRICULT
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Precision Agriculture
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FEMI JAMES ADEKOYA

AfCPA 2022


ican Conference on
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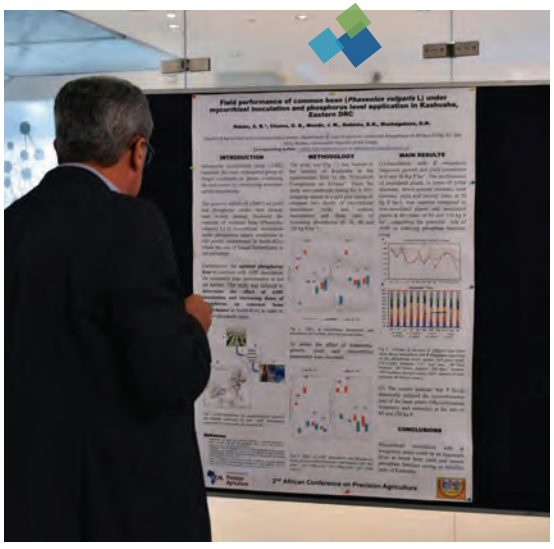
Precision Agriculture
PRECISION AGRICULTURE in ACTION for AFRICA
ETHIOPIA



INTRODUCING OUR NEW DIGITAL MAGAZINE!

Our new semi-annual, digital publication provides a forum for stakeholders interested in Africa-centric plant nutrition science and its impacts.

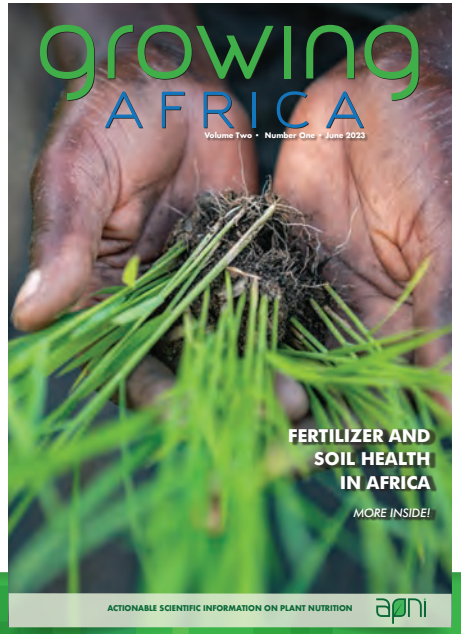
growing AFRICA

www.growingafrica.pub

KEY MOMENTS 2022

May - Inaugural issue released

December - issue 2 released



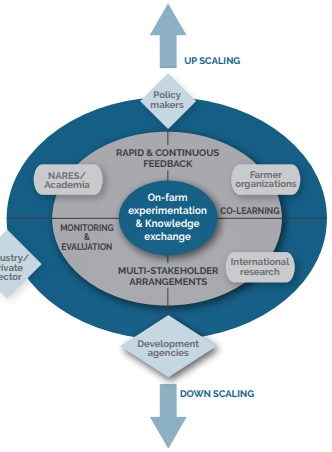
WHAT'S NEXT

First Issue of 2023 focused on Fertilizer and Soil Health in connection with the the upcoming African Union Commission-led **African Fertilizer and Soil Health Summit.**

Towards a Farmer-Centric Framework for Scaling Productive and Sustainable Cereal Cropping Systems

By Ivan S. Adolwa, Thomas Oberthür and Simon Cook

A case is made for an innovation system framework that integrates farmer-centric and systemic approaches to scaling plant nutrition innovations for positive transformation of cereal cropping systems in Sub-Saharan Africa. A case study from Ethiopia helps to build the case.



Cereal-based cropping systems are vital food production systems across Africa. In these systems, livelihoods are mainly derived from cereals such as maize, right rate, time, and place) and best crop management practices provides a plausible pathway for sustainably increasing the productivity of African cereal crop yields from the current 2.5 t ha^{-1}

Share your Snapshots

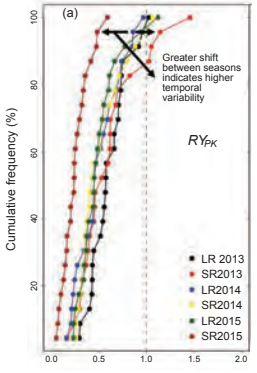
Share your photos from the field on Instagram using the hashtag #ShareGrowingAfrica

Not on Instagram yet? You can submit your photos to communications@apni.net for a chance to be featured in our next issue.

Exploring Climate Smart Cropping System Solutions for Smallholder Farmers

By Austin T. Phiri, Sarah E. Edewor, Judith S. Kahamba, Ijeoma Nwoko, and Ulemu Chimimba

The effects of climate change are threatening the stability of smallholder farmers in Malawi. As such, most farmers are receptive to adaptive strategies such as increased adoption of drought-tolerant crops like sorghum. Here smallholders provide insight into the long-term impacts of climate change, and related field research examines nutrient management within a new grain legume-sorghum cropping system offering food security and climate resilience.



Climate change awareness is steadily increasing (Venghaus et al., 2022) and has become a major concern among most stakeholders. In Malawi, the effects of increased where its productivity is very low. The average yield in Malawi is about 600 kg ha^{-1} against a yield potential of up to 3.5-6 t ha^{-1} for improved varieties available in the country (GAP, 2012). Improved

Why the Buzz on Regenerative Agriculture?

By Ken E. Giller

Regenerative Agriculture is taking the world by storm! Civil society, agribusiness, farmers, NGOs, multinationals—and increasingly researchers—are aligning around this new paradigm. But what is Regenerative Agriculture? What does it mean for the way we produce our food and for agricultural research in Africa?

I first heard the term Regenerative Agriculture in 2019 at an advisory meeting of a major food company. As an agricultural researcher I was embarrassed that I was not better informed, so together with an assistant we ran a quick scan of and Twitter, and a large body of farmers were communicating on this topic. Over the course of 2020 a large number of companies started to make commitments to move towards Regenerative Agriculture in their supply chains, and many international environmental NGOs a key role in fixing it. Although the idea of 'broken' food systems is often repeated, what this means is unclear. Many commentaries point to an agricultural crisis: a collapse in soil health, the sixth mass extinction of biodiversity, and the plateauing of crop yields. This begged the question as to why Regenerative Agriculture was gaining so much attention and demanded a deeper analysis. Here I provide a synopsis of the paper we wrote to try and understand the buzz around Regenerative Agriculture (Giller et al., 2021), and I specifically ask the question regarding what this means for Africa. In doing so I draw on papers from a special issue on '*Biomimicry and Nature-based Solutions*', which I edited together

Ask An APNI Expert

Question: How can I develop a model for precision agriculture?

Submitted by Tolera Goshu, Addis Ababa, Ethiopia

To answer this question, we need to first define "precision agriculture". Precision agriculture (PA) according to the International Society of Precision Agriculture is ***"A management strategy that takes account of temporal and spatial variability to improve sustainability of agricultural production."*** Notice that the word "technology" does not appear in the definition. Many people assume that PA is going to involve technology – sensors, satellites, computers, etc., but

Crop performance can vary greatly across a landscape due to natural soil properties plus the influence of field management history.

growing AFRICA

Growing Africa seeks out actionable scientific information to help enable Agricultural Research for Development.

This open access publication is aimed at strengthening the connections within the research community in Africa, and shining a light on its impactful solutions, programs, concepts, and activities.

As a provider of practical information, Growing Africa serves a broad target audience of agricultural practitioners including agronomists, researchers, and extension workers as well as university students, supply and value chain stakeholders, and policy makers.

SOMEDAY I WILL DO GREAT THINGS!

SCHOLAR AWARD

YOUNG AFRICAN PHOSPHORUS FELLOWSHIP AWARD

OUTREACH FELLOWSHIP

AFRICAN PLANT NUTRITION RESEARCH FUND

AWARDS & GRANTS

www.apni.net/awards
www.apni.net/research-fund

Ms. Kyria Kah Ngiah-Sah, 2022 Scholar Award Recipient, University for Development Studies, Tamale, Ghana.

APNI CONTINUED OUR RECOGNITION & SUPPORT *of* EXCELLENCE *in* PLANT NUTRITION RESEARCH *in* AFRICA

Over the past three years we have provided:

+$819,000

Across 17 African Countries

30 Post Graduate Awards

7 Research Grants

18 Research Fellowships

2 Research Awards

KEY MOMENTS 2022

AUGUST 2022

SCHOLAR AWARDS

- 10 M.Sc. or Ph.D. students from African Institutions provided awards of **$2,000**.

OCTOBER 2022

YOUNG PHOSPHORUS FELLOWSHIP AWARD

- Two early career phosphorus plant nutrition researchers granted awards of **$5,000**.

NOVEMBER 2022

AFRICAN PLANT NUTRITION RESEARCH FUND

- Three multi-year, strategically aligned research projects selected by fund committee.

DECEMBER 2022

PLANT NUTRITION OUTREACH FELLOWSHIP AWARD

- Two innovative scientists granted awards of **$5,000** in support of targeted outreach on improved plant nutrition.

Kyria Kah Ngiah-Sah, Doctorate
University for Development Studies, Tamale, Ghana

Effect of different levels of fertigation on yield & quality of vegetables in protected copping in the drylands of Cameroon.

Chantal Atut Tiku, Doctorate
University for Development Studies, Tamale, Ghana

Effect of soil moisture & potassium inputs on yam planting material for seed yam production in Tolon, Ghana.

Bira Cheneke Feyissa, MSc
Haramaya University, Dire Dawa, Ethiopia

Effect of Parkland Ziziphus spina-christi L. & Mangifera indica L. on selected physicochemical properties of soil & sorghum yield in Harari, Ethiopia.

Emmanuel Hanyabui, Doctorate
University of Cape Coast, Cape Coast, Ghana

Yield, nutritional quality of pineapple & soil ecosystems delivery in low nutrient soil amended with inorganic & organic fertilizers.

Sylvia Imbuhila Buleti, Doctorate
Jomo Kenyatta University of Agriculture & Technology, Juja, Kenya

Sustainable intensification of smallholder farming systems using push-pull as a template.

Mbarka Outbakat, Doctorate
Mohammed VI Polytechnic University, Benguérir, Morocco

Valorization of phosphogypsum in agriculture as an amendment & fertilizer.

Yahaya Mohammad Yusuf, MSc
Mohammed VI Polytechnic University, Benguérir, Morocco

A comparison of soil phosphorus extraction methods for soil test-based P fertilizer recommendation for tomato production in Kano State, Nigeria.

Damiano Raphael Kwaslema, MSc
Sokoine University of Agriculture, Morogoro, Tanzania

Influence of organic carbon & nitrogen sources on bacterial ability to solubilize rock phosphate & enhance plant growth in acidic & calcareous soils.

Daniel Anyigulile Mwaikambo, MSc
University of Dar es Salam, Tanzania

Assessment of the effects of soil physicochemical characteristics on fruit nutritional quality of local avocado germplasm grown in the Mbozi district.

Rumbidzai W. Nyawasha, Doctorate
University of Zimbabwe, Mt Pleasant, Harare, Zimbabwe

Soil organic carbon sequestration across scales in a subhumid region of Zimbabwe.

AFRICAN SCHOLAR AWARD RECIPIENTS

SCHOLAR AWARD

Each year, the Scholar Award is conferred to ten graduate students in science programs across Africa relevant to plant nutrition and management of crop nutrients.

The Award is granted independent of any assistantship, scholarship, or other award that the student may hold.

YOUNG AFRICAN PHOSPHORUS FELLOWSHIP RECIPIENTS

This Fellowship Award is available to up to five early-career scientists annually who are working in a National Agricultural Research and Extension System Institution in Africa, or African university.

The award encourages scientific programs relevant to understanding and improving phosphorus management in agro-ecosystems.

Dr. Uchechukwu Paschal Chukwudi
Lecturer, Department of Crop Science, University of Nigeria

Judicious Phosphorus Management: Assessment of rice farmers' knowledge & best practices.

Mr. Tonny Phirilani Tauro
Lecturer, Marondera University of Agricultural Sciences and Technology, Marondera, Zimbabwe

Rethinking P fertilizer recommendations for crop intensification in Zimbabwe: Mechanisms of unlocking microbial P immobilization.

AFRICAN PLANT NUTRITION OUTREACH FELLOWSHIP RECIPIENTS

This Fellowship Award is available to up to two innovative African scientists, extension specialists, or educators annually.

The Award supports education, training, and communication programs relevant to improving the use and efficiency of plant nutrients in African agro-ecosystems.

Mr. George Mbyazita Karwani
Agricultural Research Officer, Tanzania Agricultural Research Institute, Arusha Tanzania

Establishing and Scaling-Up Site-Specific Nutrient Management Recommendations Using the Nutrient Expert Tool on Maize Smallholder Farming Systems in the Northern Zone of Tanzania.

Dr. Ruth Njoroge
Lecturer, University of Eldoret, Eldoret, Kenya

Experiential Learning on Climate Smart Nutrient Management (ECLINUM) in Uasin Gishu County, Kenya.

Dr. Sibaway Mwango

National Coordinator Agricultural Natural Resources Management, TARI Mlingano, Tanga, Tanzania

Project: Guiding soil organic carbon sequestration potential under selected crop production systems in Tanzania

Organic carbon improves soil fertility, soil structure, soil moisture retention, soil pH, reduces soil acidity and soil health in general. Healthy soils are fundamental for sustainable and improved crop production and livelihood of farming communities. This project will study the contribution of various crop production systems to sequestered soil organic carbon for appropriate land resources management and minimized emission of greenhouse gases.

Dr. Nyambilila Amuri

Soil Scientist & Senior Lecturer, Sokoine University of Agriculture, Morogoro, Tanzania

Project: Fighting hidden hunger through micronutrient fertilization in maize and rice in Tanzania.

Previous research showed the potential of supplementation of zinc and iron in increasing rice yields and quality. This project seeks to streamline micronutrient fertilization to guide micronutrient fertilizer formulations, increase agricultural productivity, and alleviate hidden hunger in line with the APNRF theme of enhancing soil health for improved livelihoods.

Dr. Mouna Mechri

Chief Engineer, National Institute of Field Crops (INGC), Bousalem, Tunisia

Project: In-season nitrogen management for wheat in Tunisia using proximal & remote sensing.

The project's goal is to develop satellite image-based models for nitrogen (N) uptake in wheat in Tunisia, which shall be used as the basis for a decision support system for optimizing N recommendations to wheat farmers. This development will be possible through upscaling of calibration models developed from data collected by proximal sensing of wheat field trial plots. The project will encompass both relatively low-cost proximal sensing as well as satellite remote sensing, and development of a workflow of model transfer from field measurements to satellite data. It is envisioned that the working model will be useful also for future projects and other crops.

AFRICAN PLANT NUTRITION RESEARCH FUND RECIPIENTS

AFRICAN PLANT NUTRITION RESEARCH FUND

The aim of the African Plant Nutrition Research Fund (APNRF) is to enable scaling of improved nutrient and soil fertility management by synergistically extending research conducted in strategic priority areas of APNI.

Grant funding of up to **$20,000** per year, for up to two years, is available.

To be eligible, the lead applicants must be from an African National Agricultural Research and Extension System Institution or African university.

www.apni.net/research-fund

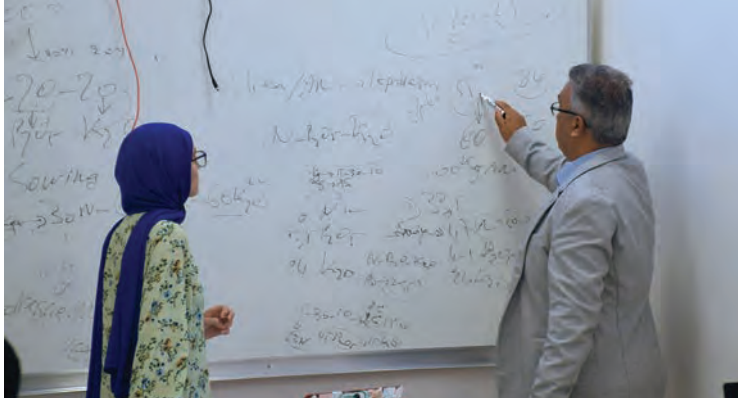
TEACHING & TRAINING

Our staff engages in graduate student training at Mohammed VI Polytechnic University (UM6P) through its School of Agriculture, Fertilization & Environmental Science (ESAFE), and provide mentorship opportunities for graduate students coming from agricultural and environmental science programs across Africa. These young scientists are the future for sustainable agricultural development in Africa through their developed expertise in advising farmers and industry stakeholders.

In the classroom, young M.Sc. students learn about the principles of improved nutrient management and fertilizer behavior in African soils. Internship activities provide guidance for literature review studies on research topics related to their areas of study, as well as field research and farm demonstration opportunities that develop practical skills and provide valuable interactions with farmers and the research community.

MOHAMMED VI POLYTECHNIC UNIVERSITY

Dr. Hakim Boulal (center) together with students from the School of Agriculture, Fertilization & Environmental Science (ESAFE) at UM6P.



APNI continued its institutional support of UM6P's full M.Sc. Program in Fertilizer Science & Technology at the School for Environmental & Agricultural Science through classroom instruction provided by our staff & practical internship opportunities.

APNI staff served as instructors within the Sustainable Fertilizer Academy e-learning platform delivered by the International Fertilizer Institute (IFA).

The platform provides fertilizer industry professionals an opportunity to learn about sustainability in fertilizer use. Our staff contributed lessons on sustainability within the African agricultural context, & lessons on data-driven crop nutrition practices.

The second Precision Agriculture Executive Masters' course was coordinated in collaboration with UM6P & ESAFE.

The course provides an opportunity for students to gain knowledge on the current concepts, technologies, tools, & information management strategies employed in precision agriculture.

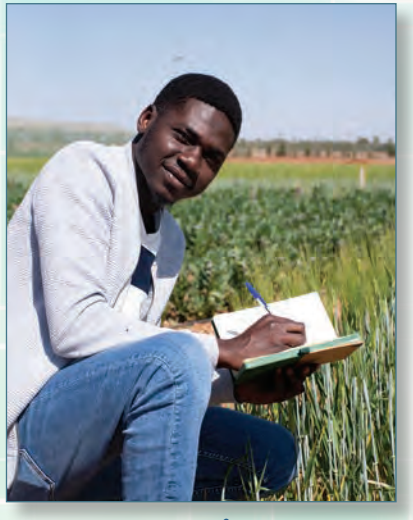
In 2022, the course attracted 11 individuals from ag industry, extension, & academia.

DOCTORATE RESEARCH PROGRAM SUPPORT

STUDENT	PROJECT	INSTITUTIONS
Ms. Aziza Tangi	Improving Opportunities for Women in Smallholders' Olive Value Chain in Morocco	UM6P, Benguérir, Morocco
Ms. Meryem Maatougui	Nitrogen Rate Recommendations in Wheat and Evolution of Satellite Imagery Reliability for Nitrogen Responsiveness	Oklahoma State University, USA
Mr. Haitam Moulay	Zinc Fertility and the Spatial Drivers of Phosphorus Response	Oklahoma State University, USA
Mr. Jerome Agbesi Dogbatse	Carbon Sequestration and Soil Health in Cacao Cropping Systems in Ghana	Soil Research Institute and University of Ghana, Ghana
Ms. Angela Ndanu Kathuku-Gitonga	Evaluation of Soil Organic Carbon Dynamics as Influenced by Nutrient and Moisture Management	University of Nairobi, Kenya
Mr. Joses Muthamia	On-Farm Experimentation Enhances Adoption and Scaling of Soil Fertility, Nutrient Management and Climate-Smart Technologies in Smallholder Farming Systems of Kenya	Embu University, Kenya
Mr. Bright Laboan	Site-Specific Nutrient Management for Sustainable Cocoa Intensification in Ghana	Soil Research Institute and Cranfield University, UK
Mr. Mandela N'douba Elogne	Holistic approach using on-farm experimentation in maize crops in northern Cote d'Ivoire: Case of Korhogo, Ferke and Boundiali	INP-HB, Côte d'Ivoire
Mr. Hervé Kouassi Brou	Understanding farmer engagement for technology packages adoption in maize-based cropping systems in northern Cote D'Ivoire and Senegal	INP-HB, Côte d'Ivoire
Ms. Aicha Biaou	Optimizing Fertilization for Maize Crops by using Remote Sensing and Assessment of Farmers Resources in Different Environments	UM6P, Benguérir, Morocco
Mr. Emmanuel Odoom	Precision nitrogen management for a sustainable and profitable maize production in Ghana	The University of Cape Coast, Ghana
Mr. Rabii Lanwer	Carbon Sequestration and Soil Health in Olive Cropping Systems in Tunisia	Olive Institute and University of Tunis El Manar, Tunisia
Ms. Intissare Mouamine	Carbon Sequestration and Soil Health in Olive Cropping Systems in Morocco	TBD

POST GRADUATE INTERNSHIPS

STUDENT	PROJECT	INSTITUTIONS
Ms. Marguerite Djogo Cho	Assessment of within Field Variability of Maize Yield in Response to Nutrient Management in the Tchologo Region of Côte d'Ivoire	INP-HB, Côte d'Ivoire
Mr. Antelme Yao Régis	Impact of Good Agricultural Practices on the Yield of Maize in the Bagoué Region of Côte d'Ivoire	INP-HB, Côte d'Ivoire
Ms. Aimé Kouassi Kouadio	Assessment of Spatial Variability of Yield of Maize in Response to Soil Management Practices and Crops in the Poro Region in Côte d'Ivoire	INP-HB, Côte d'Ivoire
Mr. Aboubacar Mariko	Assessment of Yield and Product Quality in Olive Systems: Systematic Mapping of Measurement Methods	Fertilizer Science and Technology, UM6P, Benguérir, Morocco
Mr. Reda Mokere	Effect of Nutrient Interventions on Olive Growth and Nutrient Uptake - A Systematic Map	Fertilizer Science and Technology, UM6P, Benguérir, Morocco
Mr. Oluwatobi Fakoya	Data Consolidation, Synthesis, Tool Development and Methods Analysis in Partnership with APNI`s Scientific Team	Collective Intelligence, UM6P, Benguérir, Morocco
Mr. Bolaji Akorede	Data Consolidation, Synthesis, Tool Development and Methods Analysis in Partnership with APNI`s Scientific Team	Collective Intelligence, UM6P, Benguérir, Morocco
Mr. Suleiman Abdulsalam	Data Consolidation, Synthesis, Tool Development and Methods Analysis in Partnership with APNI`s Scientific Team	Collective Intelligence, UM6P, Benguérir, Morocco



Aboubacar Mariko

Oluwatobi Fakoya

Bolaji Akorede

Reda Mokere

Suleiman Abdulsalam

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PEER-REVIEWED ARTICLES

1. W. Ntinyari, J. Gweyi-Onyango, M. Giweta, J. Mutegi, B. Mochoge, G. Nziguheba, and C. Masso 2022. Nitrogen budgets and nitrogen use efficiency as agricultural performance indicators in Lake Victoria basin. ***Front. Sustain. Food Syst.*** 6:1023579. http://doi.org/10.3389/fsufs.2022.1023579

A key outcome of the study is the authors contribution to the definition of critical N boundaries for food production systems in the basin through their definition of three distinct zones for safe (soil sustaining) operation, inefficient use of available N, and soil mining. Continued movement towards, and beyond, the Abuja 2006 target for N application is required to support food sufficiency and optimal use of N fertilizer inputs.

> *Our study is intended to help inform future policy on the changes of N management required to form adequate recommendations for farmers, and to achieve desired goals for sustainability and regional food security.*

Ntinyari et al. 2022. ***Front. Sustain. Food Syst.***

2. S.P. Singh, S. Dutta, S. Jha, S.S. Prasad, S.K. Chaudhary, M.C. Manna, K. Majumdar, P. Srivastava, P.S. Brahmanand, K.M. Singh, K. Kumar. 2022. Indigenous Nutrient Supplying Capacity of Young Alluvial Calcareous Soils Favours the Sustainable Productivity of Hybrid Rice and Maize Crops. ***Sustainability*** 14, 11585. https://doi.org/10.3390/su141811585

3. E. Mugi-Ngenga, L. Bastiaans, S. Zingore, N.P.R. Anten, K.E. Giller. 2022. The role of nitrogen fixation and crop N dynamics on performance and legacy effects of maize-grain legumes intercrops on smallholder farms in Tanzania. ***Eur. J. Agron.*** 141, 126617. https://doi.org/10.1016/j.eja.2022.126617

4. S. Zingore, I.S. Adolwa, S. Njoroge, J.-M. Johnson, K. Saito, S. Phillips, J. Kihara, J. Mutegi, S. Murell, S. Dutta, P. Chivenge, K.A. Amouzou, T. Oberthür, S. Chakraborty, G. Weldesemayat Sileshi. 2022. Novel insights into factors associated with yield response and nutrient use efficiency of maize and rice in sub-Saharan Africa. A review. ***Agron. Sust. Devel.*** 42:82. https://doi.org/10.1007/s13593-022-00821-4

> *Ultimately, the team was searching for actionable information to improve nutrient management for sustainable crop production intensification in SSA and identify future nutrient management research and development priorities that can help breakthrough existing knowledge gaps that are preventing yield improvement at scale. The results of the analysis provide valuable insights into the role of balanced fertilizer in improving the performance of cropping systems as the continent prepares for the Africa Union-led 2023 Africa Fertilizer and Soil Health Summit.*

Zingore, S. et al. 2022. ***Agron. Sust. Devel.***

5. E. Mugi-Ngenga, L. Bastiaans, N.P.R. Anten, S. Zingore, K.E. Giller. 2022. Immediate and residual-effects of sole and intercropped grain legumes in maize production systems under rain-fed conditions of Northern Tanzania. ***Field Crops Res.*** 87. https://doi.org/10.1016/j.fcr.2022.108656

6. C.I. Ludemann, R. Hijbeek, M.P. van Loon, T.S. Murrell, A. Dobermann. M.K. van Ittersum. 2022. Estimating maize harvest index and nitrogen concentrations in grain and residue using globally available data. ***Field Crops Res.*** 284. https://doi.org/10.1016/j.fcr.2022.108578

7. W. Ntinyari, M. Giweta, J. Gweyi-Onyango, B. Mochoge, J. Mutegi, G. Nziguheba, C. Masso. 2022. Assessment of the 2006 Abuja Fertilizer Declaration with Emphasis on Nitrogen Use Efficiency to Reduce Yield Gaps in Maize Production. ***Frontiers in Sust. Food Syst.*** 5, https://doi.org/10.3389/fsufs.2021.758724

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The review's consolidation of data from SSNM experimentation for the three crops over 30 years demonstrates

> *...greater yield, N use efficiency and gross return above fertilizer cost benefits when SSNM was compared with the farmer practice ...or blanket recommendations.*

More expertise in the development and support of farmer-friendly, digital support tools is also required to break through barriers to their acceptance. Also, concerted effort needs to be directed towards experimentation and extension programs that work alongside farmers to ensure SSNM interventions are supported by other key sets of improvement in on-farm agronomy.

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> ***Fertilizer alone will not be sufficient to lift crop yields, but it is the key ingredient to trigger a uniquely African Green Revolution in areas that are favorable for intensification …This [revolution] must be based on good information, incentives for efficient use of nutrients to avoid environmental harm, and specific measures to tackle the still persistent forms of malnutrition.***
>
> Dobermann, A. et al. 2022. ***Global Food Security***

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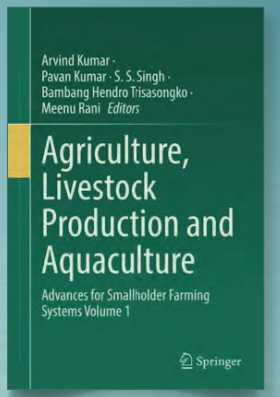

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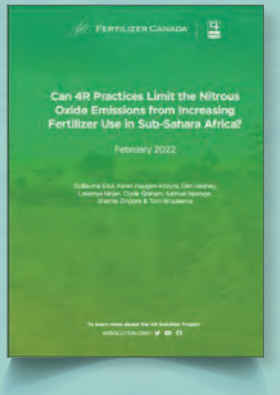
1. W. Ntinyari, M. Giweta, J. Mutegi, C. Masso, J.P. Gweyi-Onyango. 2022. Managing Agricultural Nitrogen Losses in Crop Production and Mitigation of Climate Change Effects. In: Kumar, A., Kumar, P., Singh, S.S., Trisasongko, B.H., Rani, M. (eds) ***Agriculture, Livestock Production and Aquaculture***. Springer, Cham. https://doi.org/10.1007/978-3-030-93258-9_2



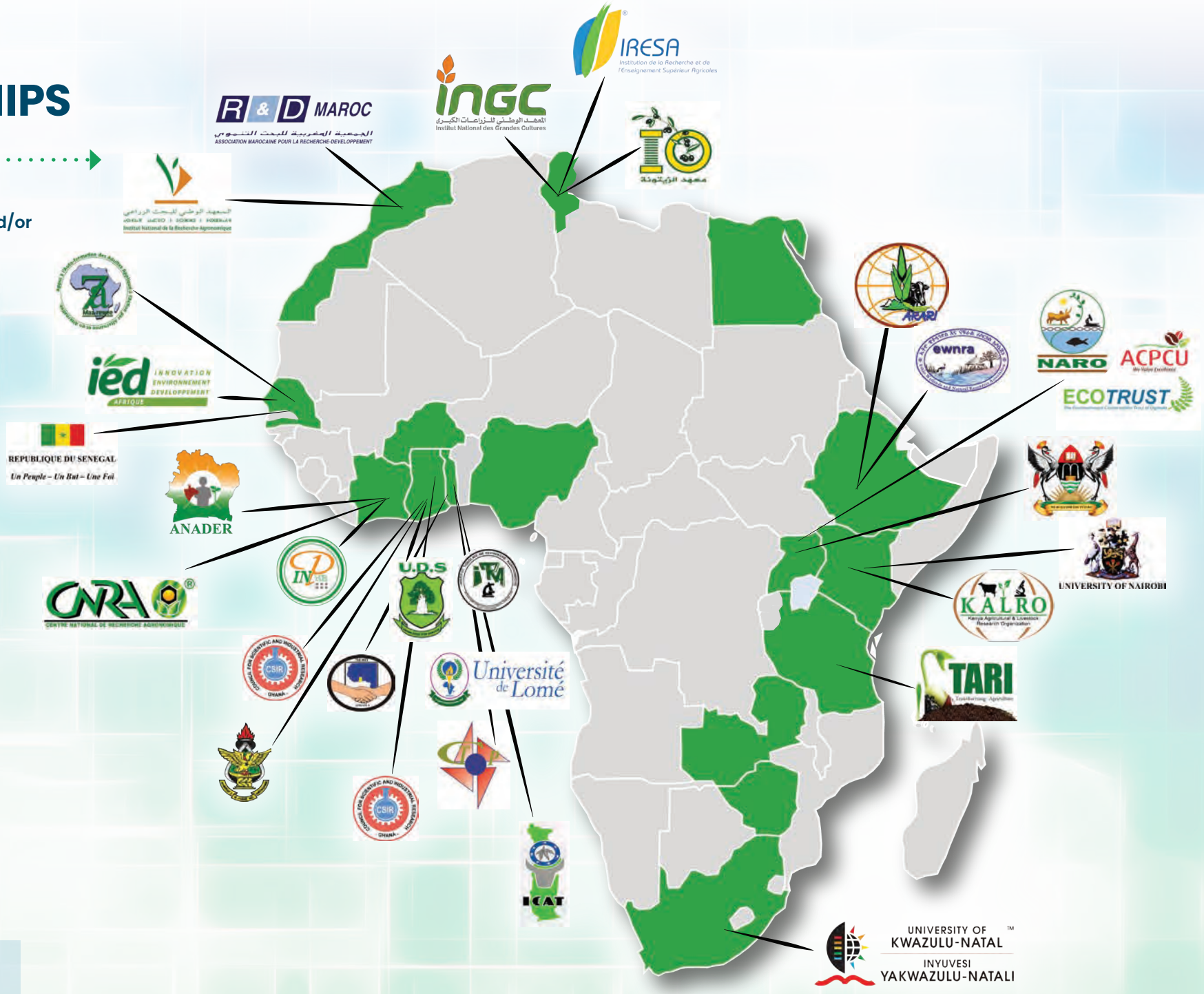
WHITE PAPER

1. G. Ezui, K. Haugen-Kozyra, D. Heaney, L. Nirjan, C. Graham, S. Njoroge, S. Zingore, T. Bruulsema. 2022. Can 4R Practices Limit the Nitrous Oxide Emissions from increasing Fertilizer Use in Sub-Sahara Africa?

https://4rsolution.org/wp-content/uploads/2022/03/4R_vs_GHG_Emissions_in_SSA_Whitepaper_Final.pdf

NATIONAL PARTNERSHIPS

Shaded countries have established Partnerships and/or Collaborations.



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FARMERS REVIEW AFRICA

APNI announces the 2nd African Conference on Precision Agriculture

By **Staff Reporter** · November 25, 2022 · 1841 · 0

The African Plant Nutrition Institute (APNI) in partnership with the International Society of Precision Agriculture (ISPA), the African Association for Precision Agriculture (AAPA), and Mohammed VI Polytechnic University (UM6P) is announcing the 2nd edition of the African Conference on Precision Agriculture (AfCPA).

L'ECONOMISTE

Oléiculture : L'APNI et l'INRA lancent "Olive-FertiClim"

Par L'Economiste| Le 20/05/2022 - 11:54 | Partager

L'Institut Africain de la Nutrition des Plantes (APNI) et l'Institut National de la Recherche Agronomique (INRA) ont procédé, jeudi à Marrakech, à la signature d'un mémorandum d'entente pour le lancement du projet "Olive-FertiClim", visant à améliorer l'efficience de l'utilisation de l'eau et des éléments nutritifs pour la résilience des systèmes oléicoles marocains aux changements climatiques.

NAIROBI DAILY NEWS

2nd African Conference on Precision Agriculture Forming Scientific, Technological and Educational Solutions for Farmers

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INDUSTRIES.ma
1ER PORTAIL DE L'INDUSTRIE, DE L'INVESTISSEMENT ET DE L'INNOVATION

Nutrition des plantes : APNI lance un appel à soumission

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mwn MOROCCO WORLD NEWS

Young African Phosphorus Fellowship Awards Opens Applications for 2022

AP

APNI announces 2nd edition of the African Conference on Precision Agriculture, to be held 7th to 9th December in Nairobi

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AUJOURD'HUI LE MAROC

Bilan scientifique satisfaisant de l'Institut africain de la nutrition des plantes

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AFRICA AGRICULTURE TODAY

NEW SUB-SAHARAN AFRICA PARTNERSHIP EXPANDS 4R NUTRIENT STEWARDSHIP'S INCLUSIVE APPROACH TO AGRICULTURAL TRANSFORMATION

مجلة صناعة المغرب
الصناعة يعيون المستقبل

لتعزيز مرونة أنظمة زيت الزيتون.. مشروع "Olive-FertiClim" يُحسّن كفاءة استخدام المياه والمُغذّيات

المشروع، بتنسيق مع المكاتب الجهوية للمعهد الوطني للبحث الزراعي بكلٍّ من مراكش ومكناس، "ينتمي إلى المشاريع الأربعة التي تم اختيارها من بين 100 طلب تم تلقيها في جميع أنحاء إفريقيا كجزء من دعوة لمشاريع تنافسية بطلقها سنوياً المعهد الإفريقي لتغذية النبات".

APNI, INRA Organize Workshop for Olive Trees Production in Morocco

This workshop is a follow-up to earlier workshops held in Ghana (focused on cocoa) and Kenya (oriented toward maize).

Aya Benazizi Sep. 22, 2022 7:01 p.m.

APNI, INRA Organize Workshop for Olive Trees Production in Morocco

Rabat - The African Plant Nutrition Institute (APNI) and the National Institute for Agronomic Research (INRA) organized a workshop to introduce and adapt the Sustainable Agriculture Matrix (SAM) to the case of olive trees in Morocco.

PRESS INTERVIEWS

FARMING FIRST
A global coalition for sustainable agricultural development

Nourishing Crops for Resilient Food Systems in sub-Saharan Africa

Dr Shamie Zingore, Director of Research and Development at the African Plant Nutrition Institute, delves into the relationship between soil health, crop productivity and human nutrition.

SHARE

Africa is home to an estimated 33 million smallholder farmers who contribute about 70 per cent of the continent's food supply. But these farmers face various constraints, such as low productivity and limited access to new agricultural technologies. The soils in sub-Saharan Africa (SSA) in particular are some of the poorest in the world due to nat… low fertility and insufficient soil conservation measures. It is estimated that the conti… loses over US $4 billion worth of soil nutrients each year, severely eroding its ability to feed it… Crops require an adequate and balanced supply of nutrients to produce good yields, currently, more than 60 per cent of SSA's agricultural land faces challenges around crop production.

SOCIAL

CSIR-SRI pilots remote sensing for fertilizer application on cocoa farms

DOSSIER

NUTRITION DES PLANTES, DES SOLUTIONS DE SÉCURITÉ ALIMENTAIRE RÉSILIENTES

L'Institut africain de la Nutrition des Plantes (APNI), créé en 2019, est un organisme de R&D à but non lucratif, sis au sein de l'Université Mohammed VI Polytechnique … érir. APNI vise à améliorer la nutrition … une Afrique résiliente et sûre sur le plan … aussi à mettre en place des solutions … effets de la dégradation des sols et les … rendements.

African Plant Nutrition Institue à Benguerir

Une meilleure gestion de la fertilisation et des autres pratiques agronomiques est essentielle pour doubler le rendement des cultures en Afrique. Les activités de APNI sont motivées par la recherche de liens supplémentaires entre l'amélioration de la nutrition des plantes et le développement rural, la stabilité économique, la sécurité alimentaire et nutritionnelle et la croissance de la chaîne de valeur. Ses scientifiques fournissent des connaissances spécialisées en agriculture de précision, en besoins nutritionnels dans les systèmes de culture, en nutrition des cultures pour améliorer la santé des sols et de l'environnement, et en résilience climatique, en gestion des données agronomiques et en évaluations socio-économiques.

A travers son affiliation avec l'Université Mohammed VI Polytechnique (UM6P) de Benguérir, APNI renforce la durabilité des éléments nutritifs à travers des initiatives comme celles du Global Phosphorus Institute. Les scientifiques africains en début de carrière bénéficient du support de APNI à travers des subventions de recherche et des bourses d'études et de recherche. L'APNI organise la Conférence africaine sur l'Agriculture de Précision (https://paafrica.org/). Il s'emploie à l'adhésion des principes de la gestion précise des éléments nutritifs dans l'enseignement du programme de 3ème cycle de l'UM6P et d'autres universités africaines.

Changer la vie des agriculteurs

L'adoption par APNI de l'approche 4R pour la gestion des éléments nutritifs comme concept scientifique pour les meilleures pratiques de gestion des éléments nutritifs, fournit un cadre de recherche sur le choix de la source appropriée, la bonne dose, le bon moment et le bon placement des engrais dans les divers systèmes agricoles et de production alimentaire au Maroc ainsi qu'à travers l'Afrique. L'un des exemples de l'application du concept 4R est l'outil d'aide à la prise de décision « Nutrient Expert » qui permet aux producteurs de blé au Maroc de prendre de meilleures décisions en matière de gestion des éléments nutritifs à l'échelle du champ. Les réseaux de recherche sur l'olivier et le palmier dattier en Afrique du Nord continuent d'explorer le manque de connaissances scientifiques qui contribuent aux déficits en nutriments, à l'utilisation inefficiente des engrais, aux faibles rendements et à la vulnérabilité climatique. L'amélioration de la résilience des petites exploitations agricoles et l'engagement des agriculteurs demeurent des thèmes prioritaires. Les déficits en éléments nutritifs, non seulement ils réduisent la productivité des cultures, mais nuisent aussi à la santé humaine en raison de leurs concentrations inadéquates dans les aliments. L'application des engrais est la façon la plus reconnue pour gérer de tels déficits. Dans ce sens, APNI étudie l'ampleur des carences en micronutriments au Maroc, à travers la cartographie des champs agricoles.

APNI développe des connaissances fondamentales et appliquées, en savoir-faire et en méthodologies. L'Institut veille à ce que les avancées soient adaptées aux conditions locales spécifiques et aux cultures, puis adoptées par les agriculteurs. L'un des objectifs communs des initiatives de APNI est de renforcer les capacités des familles agricoles.

PUBLIREDACTIONNEL

KAUSHIK MAJUMDAR

Dr. Kaushik Majumdar ist Direktor des African Plant Nutrition Institute in Marokko. Der Bodenmineraloge leitete davor das South Asia Program des International Plant Nutrition Institute (IPNI) in Indien.

Die Welthunger-Index 2022 liegt bei 18,2 (mäßig). Gegenüber dem Wert von 2014 (18,1) ist er kaum gesunken. Zum Vergleich: **Österreich ist nicht erfasst.** Syrien: bis zu knapp 50.

Angesichts sich überlagernder globaler Krisen wird sich die Lage noch weiter verschlechtern. Bleiben grundlegende Veränderungen aus, wird das Ziel Zero Hunger bis 2030 nicht erreicht.

…erschwere die Bemühungen, dem Pro… beizukommen. „Es scheint, als ob … mit allen technologischen und ande… Verbesserungen immer hinterherhin… würde", sagt Majumdar, der zurzeit … das Global Phosphorus Institute lei… sich mit Fragen der Nährstoffver… befasst. Dabei müsste es keines… sein: Studien würden zeigen, dass … produzierten Nahrungsmittel für zehn Milliarden Menschen reichen würden. „Ein Problem ist also die Verteilung und der Zugang zu Nahrungsmitteln", sagt der Wissenschaftler.

Fehlende Ernährungssicherheit bedeutet aber nicht nur Hunger, von Mangelernährung sind noch weitaus mehr Menschen betroffen. Eine gesunde und abwechslungsreiche Ernährung, die ausreichend Nährstoffe liefert, ist für rund zwei Milliarden Menschen nicht oder kaum leistbar und zugänglich. Auch für Matthias Raddant geht es bei der Sicherstellung der Versorgung mit Lebensmitteln um ein „weltweites Koordinierungsproblem". Raddant ist an der Universität für Weiterbildung Krems sowie am Complexity Science Hub in Wien tätig, sein Forschungsfokus umfasst globale Finanzmärkte und ökonomische Netzwerke. Für die Koordination der Lebensmittelversorgung erschwerend kommt laut Raddant der Umstand hinzu, dass jedes Land seine Land-

POLITICS | AFRICA

Why is Africa dependent on imported grain?

Monir Ghaedi
06/29/2022

Despite having vast amounts of arable land, nutritious indigenous crops and a booming agricultural sector, Africa still imports most of its grain.

APNI *on* SOCIAL MEDIA

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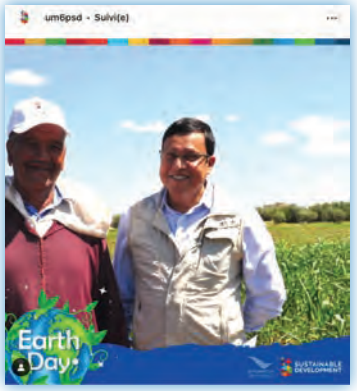

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