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Empowering Smallholder Farmers: Research and Extension Options for Optimizing Soil Health

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Outline:

I. Introduction

II. Understanding Soil Health and its Importance

III. Advances in Soil Health Management/ Insights

IV. Extension Options for Optimizing Soil Health (SHF)

V. Conclusion and Recommendations

Background of Nigeria

- Nigeria's geographical location and dimensions
  - Lies between Longitudes 2˚2' and 14˚30' east and between Latitudes 4˚ and 14˚ north.
  - Land mass of about 924,000 km^2.
  - Over 120 million people about 25% of Africa's Population.
  - 450 million people by 2050.
- Agricultural production lags behind population growth leading to
  - rising food imports
  - declining levels of national food self-sufficiency
- Expansion in agriculture is essentially based on cultivating more land rather than increased use of novel technologies

Introduction- Smallholder Farmer (SHF) Characteristics

- Nigeria's SHF cultivates 0.5 -1 ha of land on average
  - Produce 80-90% of national agricultural outputs
  - Faces financial and technological challenges;
  - Most rely on rainfed agriculture
  - Vulnerable to changing climate manifestations
  - Most use traditional farm tools (mechanization is rarely available)
  - Agricultural extension services are weak
- **Empowering SHF is critical for sustainable agriculture and environmental conservation:**
  - Co-developed research & extension to create soil management solutions tailored to smallholder needs and preferences.
  - Empowering SHF on soil health.

Introduction: challenges faced by SHF in maintaining soil health

- Low and imbalanced nutrient inputs, soil erosion, declining organic matter, soil compaction, soil acidity and salinity.
- Climate change and variability,
- Limited access to climate-resilient cropping practices.
- Resource Constraints (Physical, financial and technological): Limited availability and access to soil testing kits, improved seeds, fertilizers, irrigation, and conservation agriculture practices.

Introduction: challenges faced by SHF in maintaining soil health

- Knowledge gaps on the benefits, modalities, and adoption of soil health management practices.
- Land Tenure Systems: Uncertainty about land ownership or use rights can discourage investment in long-term soil health practices.
- Inadequate data, policy, and institutional support for soil health development, such as soil mapping, soil information systems, soil health indicators, soil health policies and regulations, and soil health extension services

Table 1 Scenarios of Inputs use

Low-level inputs/traditional management-assumption	Intermediate-level inputs/improved management-assumption,	High-level inputs/advanced management- assumption,
-Farming system largely subsistence. - Production is based on the use of traditional cultivars, labour intensive techniques, - no use of chemical fertilizers, agrochemicals for pest and disease control.	-Farming system is partly market oriented. -Production for subsistence plus commercial sale -Medium labour intensive, - some fertilizer and chemical application	-Farming system is mainly market oriented. - Commercial production is a management objective. - Production is based on improved high-yielding varieties, is fully - uses optimum applications of nutrients and chemical pest, disease and weed control.

Broad and Specific Objective

- Broad Objective: To explore collaborative research and extension strategies aimed at empowering Nigerian smallholder farmers with sustainable soil health practices for productive agriculture.
- Specific Objective:
- Highlight the critical role & challenges of smallholder farmers face in maintaining soil health.
- Discuss the importance of soil health \
  - for sustainable food production
  - improved livelihoods of smallholder farmers
- Discuss research avenues & extension approaches tailored to effectively deliver research findings to smallholder farmers and optimize soil health practices

Scope:

- The presentation focuses on the context and challenges faced by smallholder farmers in Nigeria, highlighting the diversity, resource constraints, and specific challenges faced by these farmers in maintaining soil health.

- It discusses extension strategies for effective knowledge dissemination of research findings to smallholder farmers, including participatory approaches, capacity building, and communication methods.

- This presentation aligns with the Africa Fertilizer and Soil Health Summit 2024, uniting our collective expertise to empower smallholder farmers through enhanced soil health and sustainable agricultural practices.

Functional Definition and Components of Soil Health

- Soil health is the ability of soil to function as a living ecosystem, supporting plant and animal life, maintaining clean water and air, and promoting overall environmental health. It depends on the biological, physical, and chemical properties of the soil and the management practices of the farmers.
- Components:
  - Biological component
  - Soil's Physical Component
  - Chemical component

Characteristics of a Healthy Soil

- Inhabited by tiny helpers, some visible like earthworms and others too small to see.
- light and crumbly, allowing tools to move through easily during tillage.
- Well aerated and enhances crops health and vigor.
- Dark and Rich Soil: indicating the presence of organic matter and nutrients necessary for plant growth.
- Ability to absorb and retain rainwater like a sponge, providing a consistent water supply to crops and reducing the risk of drought stress.

Importance of Soil Health

1. **Resilience in the Face of Challenges:**

   Healthy soils are more resistant to erosion and degradation, and can better withstand environmental stresses, safeguarding harvests and livelihoods.

2. **Improved Resource Efficiency:**

   Healthy soils retain water more effectively and promote nutrient cycling, reducing reliance on irrigation and external fertilizers.

3. **Enhanced Productivity**:

   Healthy soil fosters vigorous plant growth and higher yields, increasing food production and potentially generating a surplus for income generation.

Importance of Soil Health contd…

4. **Reduced Environmental Impact**: Healthy soils act as natural filters, minimizing agricultural runoff and pollution of water resources.
5. **Empowering Smallholders**: Improved soil health reduces dependence on expensive external inputs and increases farm efficiency, leading to higher incomes, improved food security, and greater resilience

Insights and research advancements in soil health management-

- Nutrient Management for Enhanced Soil Health
  - Cover crops and rotations
  - Crop Rotation
  - Soil Amendments
  - Biofertilizers
  - Micronutrients
  - Residue Management
- Benefits for smallholders:
- Improved soil health & fertility; Increased crop yields; Reduced reliance on synthetic fertilizers; Enhanced long-term sustainability.

Advances contd 2

- **Sustainable land management for improved soil health**

- **Conservation Agriculture: Agroforestry Practices:**

- **Benefits for Smallholder Farmers:**
  - Improved crop physiology & health
  - Increased yields & nutrient uptake
  - Enhanced soil health indicators (organic matter, water retention)
  - Reduced erosion & water runoff

Advances contd 3

- Biological and bio-based products for improved soil health:
  - Beneficial Microorganisms
  - Bio-stimulants
- Benefits for Smallholders:
  - Reduced Reliance on Chemicals: Lower input costs compared to synthetic fertilizers and pesticides.
  - Improved Soil Health: Increased organic matter, leading to better water retention and nutrient cycling.
  - Enhanced Crop Yields: Healthier soil fosters stronger plant growth and potentially higher harvests.
  - Sustainable Practices: Promotes long-term soil health and environmental well-being
-

Advances contd 4

- Optimizing Soil Health with Soil sensors, Digital and Precision Tools :
  - Affordable soil sensors tailored to Nigerian soil and farm sizes.
  - Satellite Imagery: Monitor crop health and target problem areas.
  - Mobile apps in local languages: Deliver localized recommendations based on real-time data.
- Benefits for Farmers:
  - Precise Irrigation: Apply water efficiently, saving resources.
  - Targeted Nutrients: Deliver nutrients only where needed, reducing waste.
  - Data-Driven Decisions: Make informed choices based on soil health insights.

Goal and Issues of Soil Health Extension

- Goal:
  - facilitate the dissemination of knowledge and adoption of best practices in soil health management tailored to the specific needs of smallholder farmers
- Issues and challenges
  - Limited access to technical knowledge and information by farmers on soil health practices.
  - Resource Constraints & land tenure insecurity:.
  - Inadequate extension services
  - Dynamic Adaptation in Soil Health Recommendations:

    Current soil health recommendations need to be dynamic and adaptable, taking into account the specific conditions and changes within each individual farming system.
  - Socio-cultural Factors:

    Short-term economic considerations often outweighing long-term investments in soil health.

Extension Options for Knowledge Transfer-

- Required for the adoption of relevant technical recommendations.
- Interventions designed to promote increased use of fertilizer should consider farmers experience and context.
- Farmer-to-Farmer Learning Networks and Demonstration Plots
  - e.g, AGRA NAERLS SG2000 CBA Model, ARCN NAERLS Adopted Village Concept, etc;
- Participatory Learning and Action Research (PLAR) Methodologies
  - e.g Innovation Platforms, Farmer Field Schools etc.

Extension Options for Knowledge Transfer- Diverse Communication Channels

- Diverse Communication Channels
  - • Multi-Channel Approach: Employ a broad spectrum of dissemination tools, including print, electronic media, and ICT platforms to cater to diverse preferences and maximize reach.
  - • Recognize that farmer preferences for information channels vary; tailor channel use to specific situations and objectives.
  - • Radio remains the most valued mass media tool among farmers for its wide reach and accessibility.

Extension Options for Knowledge Transfer- Enhancing Information Dissemination

- **Strengthening E-Extension Services/ Innovative Collaborations for Farmer Engagement**
- NAERLS is strengthening e-extension options (farmer helpline) for real-time feedback
- Available extension publications on NAERLS website (www.naerls.gov.ng) provide guidance on soil management recommendations.
- Collaboration with Digital Green to use WhatsApp chatbot to reach farmers to reach farmers with context specific recommendations
- Discussions ongoing with IITA to integrate IITA's digital resources into the National Farmer Helpline (NFHL) for a comprehensive knowledge hub.
- Discussions ongoing with IFDC to integrate IFDC Fesrwam digital resource into the National Farmer Helpline (NFHL) for context specific recommendations

Extension Options for Knowledge Transfer- Promoting Synergy in Soil Health Recommendations

- • Importance of Integrated Approach
  - Integrate Soil Health into the larger agricultural Management Plans to ensure effective implementation of soil health recommendations- Decisions regarding soil health and improved practices like using better seeds are **intertwined**.
  - Consider Interplay Between Agricultural Practices
- Holistic Recommendations
  - Address Entirety of Farming System
  - Ensure Compatibility with Other Agricultural Improvements
- Farmer Involvement
  - Engage Farmers in Development Process
  - Ensure Recommendations are Practical and Suited to Realities

Extension Options for Knowledge Transfer- Building Capacity

- Training Extension Agents on Effective Soil Health Communication Strategies
- Empower extension professionals with communication skills to:
  - Clearly explain complex soil health concepts to farmers.
  - Tailor messages to the specific needs and context of smallholder farmers.
  - Best Practices in Soil Health Management
  - Provide comprehensive guidance to farmers on the interconnectedness of soil health management and other improved agricultural practices such as improved seed utilization.

Conclusion

- Soil health is fundamental to ensuring sustainable agricultural productivity, food security and livelihoods of smallholder farmers.

- Bridging Knowledge Gap through Effective Extension Services

- **Holistic Understanding:**
  - Recognizing the interconnectedness of soil health

- **Collaborative Approach**

Recommendations

- Strengthen extension services with practical training and resources.
- Prioritize participatory approaches involving smallholder farmers in decision-making and capacity building.
- Develop integrated soil management strategies that consider all aspects of the farming system.
- Leverage digital technologies for knowledge dissemination.
- Economic and Policy Implications: Research is needed to assess the economic and policy implications of implementing soil health management practices, including cost-benefit analyses, incentive structures, and supportive policy frameworks for smallholder farmers.

Call to action

- Form multi-stakeholder partnerships and knowledge-sharing platforms to ensure widespread adoption of sustainable soil management practices amongst smallholder farmers.
- Multi-Stakeholder Collaboration:
  - The SSSN, NISS, FMAFS, FMEnv, AU, FARA, and other key organizations should work together to adapt the African Fertilizer and Soil Health Action Plan and the Soil Initiative for Africa (SIA) to the Nigerian context, as well as develop and implement actionable strategies for empowering smallholder farmers with soil health optimization practices.
- Advocate for policies supporting sustainable soil management.
- Prioritize funding of research, extension and farmer

- Merci beaucoup, French
  - Eba'- Ogori, Nigeria
    - Thank you!

  - GOD bless Nigeria
    - God bless SSSN

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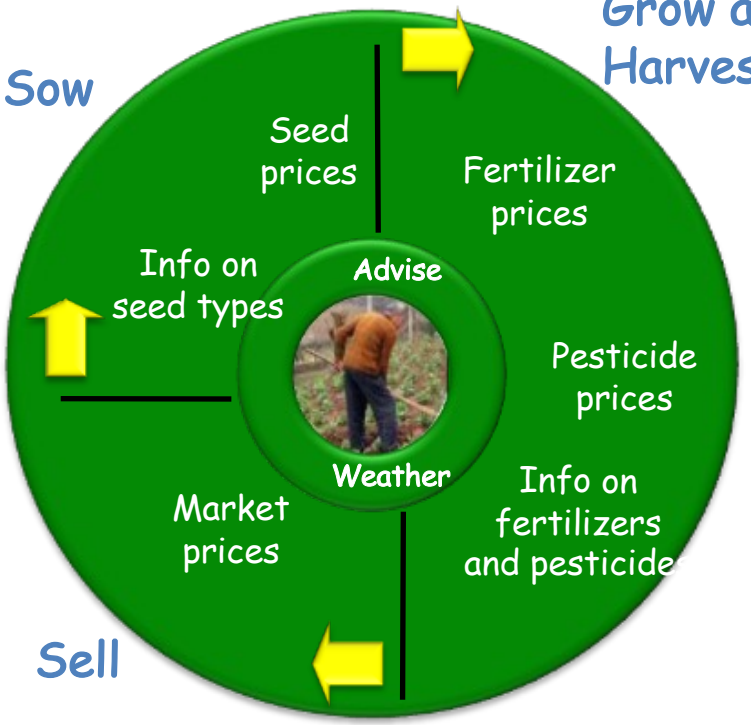
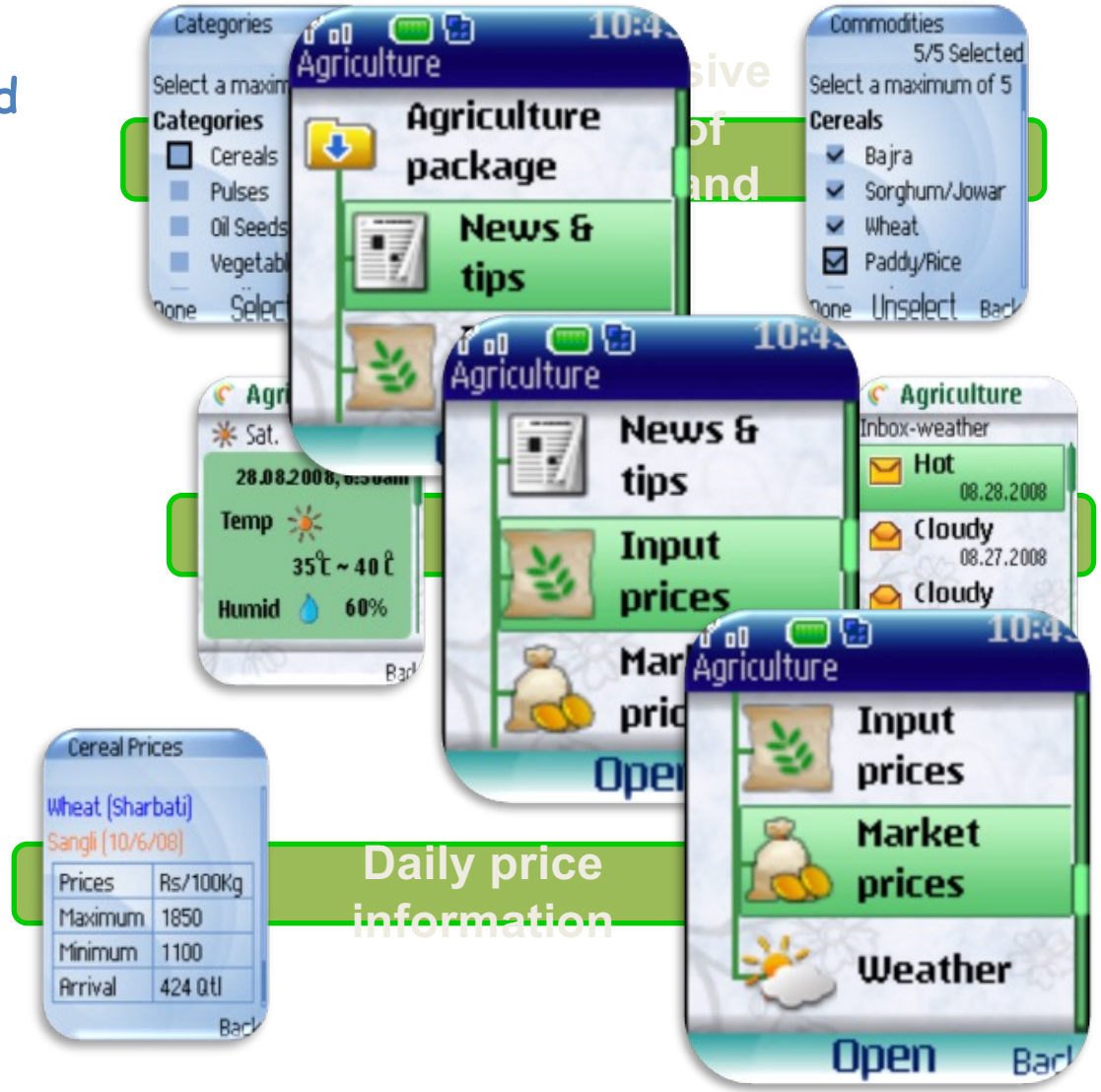
NAERLS, ABU, Zaria.

NFHL in Agriculture: M/Prices, weather/Agric Info & Tips relevant to Production Cycle in one package.





NFHL in Agriculture: M/Prices, weather/Agric Info & Tips relevant to Production Cycle in one package.

Web - Phone Support Services

Web to phone in form of SMS

- Commodity Prices
- Answer to question & request
- Input Prices
- Other urgent information