SUSTAINABLE SOIL MANAGEMENT TECHNOLOGIES UPSCALE THROUGH RESEARCH-EXTENSION-FARMERS-INPUT LINKAGE SYSTEM; IMPLICATIONS FOR EFFECTIVE POLICY DEVELOPMENT AND IMPLEMENTATION IN NIGERIA

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SOILS: WHERE FOOD BEGINS

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GLOBAL SOIL PARTNERSHIP

Introduction

- *Soils: Where Food begins……..*

- The valuable economic, environmental and social roles of soil cannot be over-emphasized as it is the most significant medium for agriculture, providing the opportunity to feed and nourish everyone on earth

- soils now form the inter-connecting point of multiple United Nations Sustainable Development Goals (SDGs),
- It accounts for a large volume of the global food provision and also provides many essential ecosystem services
- However,
- the degradation of soil emanating from poor land management practices has been a major threat to environment, agricultural production and management of natural resources

- *This calls for Sustainable Soil Management upscale*

- For SSM technology delivery system targeted at the end users (farmers) to be successful, there should be in place, an effective linkage system among the actors involved in the generation, dissemination and utilization of the knowledge and information.

Objectives of the study

- The study

a. identified the specific Sustainable Soil Management (SSM) technologies generated, disseminated and adopted among the actors through Research-Extension-Farmer-Input Linkage System activities;

b. determined the level of actors' involvement in linkage activities for the upscale of SSM technologies

c. assessed the perceived appropriateness of SSM technologies transferred among the farmers in Oyo State, Nigeria.

Methodology

- A Multi-stage sampling technique was used
- Thirty researchers were across the four research institutes in Oyo state Nigeria, namely: IAR&T, CRIN, FRIN and NIHORT
- 44 extension agents were selected across the four Agricultural Development Programme (ADP) zones,
- 336 farmers were selected across the four ADP zones and
- 33 input dealers were selected from the registered members in the state.
- A total of 443 respondents were sampled for the study.
- Questionnaire and structured interview Schedule were used to elicit quantitative information while
- Focus Group Discussion and Key Informant Interview guides were used to elicit qualitative information. Data analysis:

-frequency, percentage, mean and standard deviation. Linear regression analysis was employed to draw inferences for the study

Results:

- Sustainable Soil Management Technologies identified among the actors:

- A total of 24 SSM technologies were identified to have been generated, disseminated and adopted by the SSM actors. These were categorized into 6, namely:

i. Soil Erosion Control,
ii. Soil Nutrient Management,
iii. Minimum Soil Disturbance,
iv. Water Management Techniques,
v. Vegetation Management
vi. Agroforestry System

Objective 1: SSM Technologies generated, transferred and practiced

SSM Technologies	Generated		Transferred		practised	
	percentage	rank	percentage	rank	percentage	rank
Soil Erosion Control						
Erosion chambers	30.0	1st	54.5	4th	32.1	4th
Use of vetiver grass and sweet potato strips	23.3	3rd	34.1	5th	30.7	5th
Semi-Circular bonds (for slopy areas)	23.3	3rd	56.8	3rd	40.2	3rd
Ridge tying and (or) ridging across the slope	30.0	1st	72.7	1st	65.5	2nd
Mulching	16.7	5th	72.7	1st	77.4	1st
Soil Nutrient Management						
Production and Application of organic fertilizer (Cassava-based and vetiver-based compost)	13.3	5th	65.9	2nd	52.1	2nd
Production & use of bio-char	86.7	1st	54.5	5th	26.5	5th
Use of bio-fertilizer (Noodles in the roots of plants, Rhizomes)	70.0	2nd	63.6	3rd	27.4	4th
Precision in organic & inorganic fertilizer use (application rate, type and timing)	56.7	4th	61.4	4th	61.3	1st
Composting	63.3	3rd	75	1st	33	3rd
Minimum Soil disturbance						
Minimum Tillage	26.7	1st	81.8	1st	66.1	1st
No-till	16.7	2nd	59.1	2nd	18.8	2nd
Water Management						
Water harvesting from concentrated run-offs(for irrigation)	30.0	3rd	56.8	1st	11	2nd
Micro-check dams (for irrigation)	30.0	3rd	34.1	4th	7.4	4th
Tube wells	36.7	1st	45.5	2nd	12.8	1st
Low-cost PVC-based sprinkler irrigation	36.7	1st	45.5	2nd	10.4	3rd

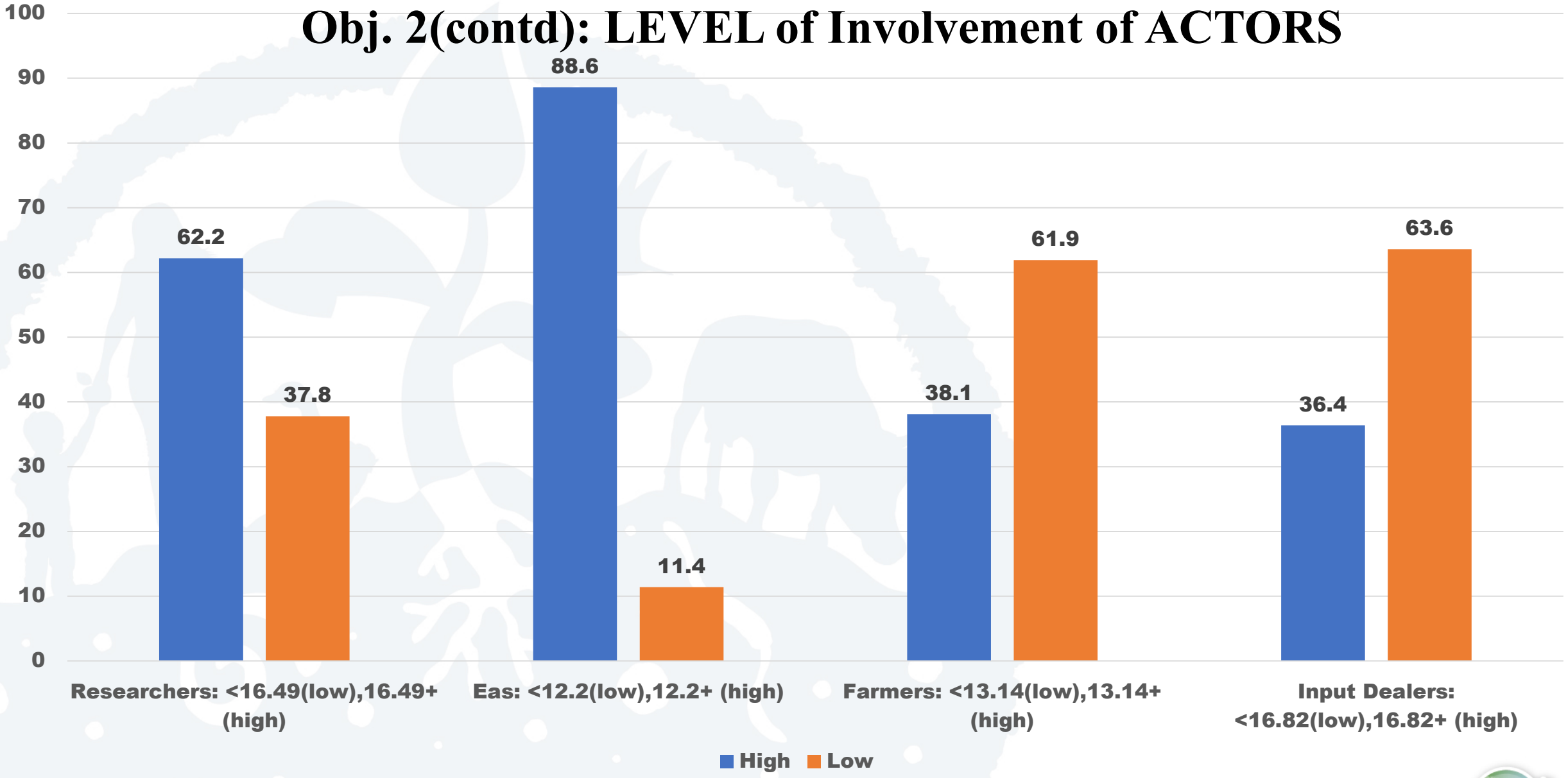
Objective 1: SSM Technologies generated, transferred and practiced

SSM Technologies	Generated		Transferred		practised	
	percentage	rank	percentage	rank	percentage	rank
Vegetation Management						
Choice plant species/ use of improved hybrids	46.7	2nd	88.6	2nd	59.5	4th
Crop rotation	16.7	4th	72.7	4th	81.8	2nd
Short term fallow with planting of legumes (to be ploughed back into the soil as manure)	33.3	3rd	50	5th	44	5th
Multiple cropping, inter-cropping	60.0	1st	90.9	1st	84.5	1st
Shifting cultivation	3.3	5th	84.1	3rd	64	3rd
Agroforestry systems						
Planting of leguminous herbs(Moringa, Leucaena, glyricidia, e.t.c	53.3	2nd	88.6	1st	78.6	1st
Planting tree crops on croplands	56.7	1st	84.1	2nd	50.3	2nd
Trees for bio-drainage (Live fences and hedge rows)	13.3	3rd	50	3rd	47.9	3rd

Objective 2: Involvement of the SSM actors in Linkage activities

REFILS activities	Researchers		EAs		Farmers		IDs	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Joint Problem Identification	1.20	1.42	2.09	0.98	0.77	1.01	**1.73**	0.84
Joint priority, planning, setting, Programming and Review meeting	1.10	1.24	2.39	1.04	0.60	0.88	1.33	1.02
Joint diagnostic survey	0.93	1.17	1.73	1.11	0.58	0.92	0.58	0.71
Joint Technology Review Meeting	1.03	1.16	1.84	1.26	0.79	0.91	1.03	0.59
Small Plot Adoption Trial	**2.63**	1.59	**2.61**	0.72	**1.42**	1.01	**2.09**	0.88
On-farm Adaptive Trial	1.87	1.14	2.43	1.09	0.93	1.01	**2.09**	0.88
REFILS Workshop	1.07	1.31	1.45	1.17	0.83	0.90	0.73	0.76
Field days/open days	1.10	1.24	**2.7**	0.95	1.40	1.07	2.45	0.71
Agric shows	1.07	1.20	2.41	1.04	**1.79**	0.83	2.3	0.68
Seminars/ Trainings	**2.07**	1.05	**2.52**	1.21	**1.82**	0.91	1.55	1.2
TV & Radio Programmes	**2.10**	1.18	2.02	1.37	0.66	1.00	0.18	0.39
Publications (journals, Bulletins, Extension guides	1.87	1.55	2.05	1.43	0.88	1.14	0.18	0.39
Evaluation meetings	1.70	2.02	1.95	1.41	0.68	1.02	0.58	0.71

Obj. 2(contd): LEVEL of Involvement of ACTORS



Objective 3: Perceived appropriateness of SSM technologies

	Ease of Application (8)		Ecological benefit(10)		Economic benefit(12)		Socio-Cultural benefit(13)	
Soil Erosion Control	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**
Erosion Chambers	2.17	1.07	2.27	1.33	2.51*	1.26	2.57*	1.31
Use of vetiver grass and sweet potato strips	2.51*	1.32	2.50*	1.31	2.42	1.26	2.65*	1.38
Semi-Circular bonds (for slopy areas)	1.59	0.89	2.08	1.03	2.26	1.08	2.25	1.10
Ridge tying and (or) ridging across the slope	1.85	1.12	2.26	1.08	2.53*	1.12	2.53*	1.21
Mulching	2.96*	1.05	2.91*	1.08	3.18	1.05	3.22*	1.15
Soil Nutrient Management								
Production and Application of organic fertilizer (Cassava-based and vetiver-based compost)	1.84	1.08	2.44	1.22	2.50*	1.23	2.19	1.13
Production & use of biochar	1.37	0.86	1.60	0.77	1.80	0.98	2.12	1.28
Use of bio-fertilizer (Noodles in the roots of plants, Rhizomes)	1.76	0.96	2.20	1.24	1.94	1.10	1.84	0.84
Precision in organic & inorganic fertilizer use (application rate, type and timing)	2.63*	1.10	2.50*	2.00	2.71	1.22	2.69*	1.07
Composting (Partially Aerated Composting Technique and Accelerated Composting Technique to reduce the period of composting)	1.76	1.06	2.06	0.98	2.50*	1.23	2.39	1.17
Minimum Soil disturbance								
Minimum Tillage	**2.98***	0.97	**2.56***	1.00	**2.85***	1.16	**2.73***	1.05
No-till	2.00	1.19	1.66	0.88	1.72	0.98	1.55	0.85

	Ease of Application		Ecological benefit		Economic benefit		Socio-Cultural benefit	
Water Management	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**
Water harvesting from concentrated run-offs (for irrigation)	1.75	1.10	1.85	1.07	2.08	1.16	1.70	0.91
Micro-check dams (for irrigation)	1.43	0.79	1.5	0.88	1.74	1.03	1.55	0.75
Tube wells	1.50	0.70	1.4	0.78	1.68	0.93	1.69	0.96
Low-cost PVC-based sprinkler irrigation	1.47	0.84	1.83	0.94	1.94	1.09	1.86	1.95
Vegetation Management								
Choice plant species/ use of improved hybrids	2.84	1.06	**2.81***	1.03	**2.93***	1.20	**2.70***	1.07
Crop rotation	**3.20***	0.86	3.1	0.90	**2.80***	1.05	**3.13***	**0.82**
Short term fallow with planting of legumes (to be ploughed back into the soil as manure)	2.18	1.11	**2.84***	1.10	**2.70***	1.09	**2.88***	1.15
Multiple cropping, inter-cropping	**3.13***	0.90	**2.85***	0.94	**2.91***	0.87	**3.00***	0.91
Shifting cultivation	**2.42**	1.08	**2.81***	1.08	**2.74***	1.06	**3.06***	1.08
Agroforestry systems								
Planting of leguminous herbs (Moringa, Leucaena, glyricidia, e.t.c	**2.98***	0.98	**2.98***	0.84	**2.96***	0.92	**3.07***	0.88
Planting tree crops on croplands	2.48	1.04	**2.50***	0.90	**2.64***	1.07	**2.82***	0.89
Trees for bio-drainage (Live fences and hedge rows)	1.81	1.02	2.08	0.87	2.34	1.34	2.40	1.04

*Mean>2.5Appopriate

CONCLUSION

➢ **24 SSM technologies were identified to have been generated by the researchers in the zone, transferred by the Extension Agents and Practiced by the farmers**

- Extension Agents were more involved in linkage activities for SSM upscale than other actors while the farmers had the least level of involvement in linkage activities

- **the REFILS actors' level of involvement in linkage activities for SSM development in the region was: in the decreasing order of magnitude:**

Extension Agents>Researchers>Input Dealers>Farmers

Conclusion(contd)

The farmers perceived the SSM technologies transferred to them to be appropriate based on:

- i. The ease of application(mulching had the most)
- ii. Ecological benefits(planting of leguminous herbs had the most)
- iii. Economic benefits (use of improved hybrids had the most)
- iv. Socio-cultural acceptability(mulching had the most)

RECOMMENDATIONS

- Synergy among Sustainable Soil Management (SSM) actors should be promoted
- More effort to promote SSM technologies perceived to be appropriate among the end-users (farmers)
- Better participation of farmers in SSM linkage activities should be encouraged by SSM implementers
- SSM implementers should explore farmers' indigenous knowledge of soil management and health

RECOMMENDATIONS

- Media publicity of SSM technologies among farmers should be well funded

- Policy on Research-Extension-Farmer-Input Linkage system (REFILS) should be well developed so as to achieve a well organized structure and delivery of SSM upscale and governance among the end-users

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Thank you !
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