

An Assessment of rice-based farmers' indigenous land preparation, crop establishment and soil fertility maintenance practices in Sierra Leone.

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Abstract: Indigenous farmers' knowledge forms a very significant source of farming techniques amongst rice farmers in rural communities. This study was conducted to identify and assess those rice-based farmers' indigenous knowledge systems and practices on rice production in rural Sierra Leone focusing on land preparation, crop establishment and soil maintenance practices and their potential to enhance smallholder farmers' livelihoods. The results show that a significant proportion of rice farmers in Sierra Leone use the traditional practice of slash-and-burn for land preparation. Some of the indicators used by farmers to determine favourable times for their various activities especially land preparation and crop establishment are highly dependent on weather conditions: (for example when the sun becomes very hot, after the Harmattan period¹, when deciduous trees drop their leaves, and after first 2-3 rains planting starts). Allowing land to fallow, slash and burn, planting of leguminous crops, addition of organic matter, and that God fertilizes the soil for them were among the soil fertility maintenance reported in all the surveyed ecologies. Conclusively, there is the need for synergy between improved technologies and farmers' indigenous practices, especially increasing availability, accessibility and affordability of agro inputs, the provision of machinery and micro credit aid for increased production.

Key Words: Indigenous knowledge Systems, Rice-Based Farmers, Farmers practices, Sierra Leone

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I. INTRODUCTION

Indigenous knowledge (IK) used in carrying out farming activities mostly in remote communities provides the much needed technical know-how for increased agricultural productivity and solving farmers' problems (Briggs, J.;2005). This is mostly true in communities where modern technologies are unreachable. Indigenous knowledge system is a set of perceived information and behavioral attributes used in local communities to guide in terms of land use and the use of natural resources. Agro-ecological activities have proven that, indigenous knowledge systems are sustainable, productive and less expensive when compared to modern technologies (Brouwers, J.H.A.M;1993). Indigenous knowledge is locally based and accustomed to by many in terms of use, it is experimental based on what people perceived appropriate in their communities and passed down from one generation to another. In other ways its perceived social with socially constructed networks with peoples' kingship relationship culturally accepted (Flavier, J.M. et al. 1995). Today, several indigenous knowledge systems are diminishing and many are at the risk of extinction. The world's indigenous knowledge, just as its biodiversity needed to be preserved and one way they can be preserve is their continuous use to increase quality and production level (Warren, D. M. (1991ab).

In Sierra Leone, rice farming is an important agricultural practice mostly by smallholder farmers leaving in remote communities across the country with crude tools and locally available technologies.

In spite of the widespread cultivation and consumption of rice in Sierra Leone, the local production levels have been found to always fall below the demand for the commodities produce especially rice, this necessitate huge rice importation in to the country. As a way of improving the output of domestic rice production, programs embodying imported technologies have been introduced and executed. Such programs included; System of Rice Intensification (SRI), Sustainable Agricultural Research and Development for Special

¹This is the period when very dry wind blows between December and January

Crops (SARD-SC) and several others. In spite of these programs, rice production level still remains unsatisfactory. This might be due to the neglect on developing appropriate technology for local rice farmers based on their indigenous knowledge and practices. Despite the fact that Sierra Leone rural communities produce the highest amount of food for the country, made their own farm implements, and conducted their own farming activities, the role of indigenous knowledge (IK) used has not been appreciated. The rural people to which all research development efforts are directed have their own body of knowledge that enables them arrive at decisions which would better their lots (De Walt B.R. 1994).

Researchers have observed that indigenous agricultural practices are cost-effective and pose less production risks and environmental degradation (Claxton, 2010). Considering the ever growing importance of rice in the diet of Sierra Leoneans and the desire for sustainable local production, this study was conducted to identify and assess the influence of rice-based farmers' indigenous knowledge systems and practices on Land Preparation, Crop Establishment and Soil Maintenance practices affecting rice production in Sierra Leone and their potential contribution to enhanced smallholders farmers livelihoods.

II. MATERIALS AND METHODS

2.1 Study site and sample design

The study was conducted in all rice growing ecologies in Sierra Leone which is divided into two major ecologies; upland and lowland. The upland is the most dominant rice growing ecologies in Sierra Leone; it constitutes 64% of the total land area under rice cultivation. The second major ecology is the lowland which is further divided into Inland Valley Swamps (IVS), Riverine Grasslands, Mangrove Swamps and Boliland. Two districts per ecology were purposively selected. For mangrove (Kambia and Moyamba), for upland (Kailahun and Kono), for IVS (Bo and Kenema), for Riverain (Bonthe and Pujehun) and Boliland (Bombali and Tonkolili) (Table 1 and Figure 1). This selection was done based on the comparative advantage of rice production ecologies (GOSL/AfricaRice, 2010). A list of all chiefdoms within each district was prepared and calculated at 25% proportion using the RAND function in excel programme. Thirty two (32) chiefdoms were selected and three villages per chiefdom were also selected, giving a total of 96 villages. Six rice-based farming households were randomly selected in gender disaggregated group in each village for the study. A multi-stage random sampling was done for the selection of the villages and respondents/households. Two lists of (male and female farmers), not couples of all farming household heads was prepared at community level and these were then randomly selected through a balloting process, thus making a total sample of 576 respondents.

Districts	No. of Chiefdoms	No. of villages per chiefdom	No. of Household Interviews
Kailahun	4	12	72
Kenema	4	12	72
Kono	3	9	54
Bo	4	12	72
Bonthe	3	9	54
Moyamba	3	9	54
Pujehun	3	9	54
Kambia	2	6	36
Bombali	3	9	54
Tonkolili	3	9	54
Total	32	96	576

Table 1: Distribution of samples

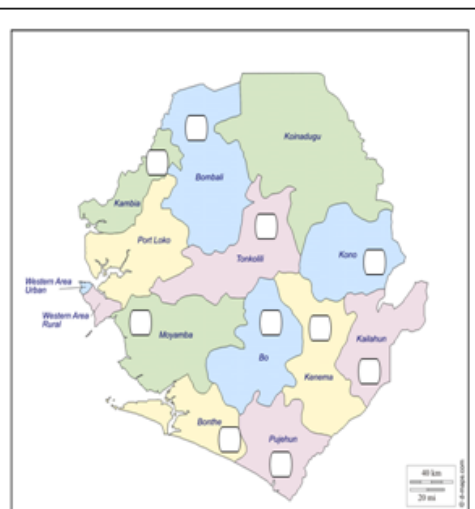


Figure 1. Map of Sierra Leone showing study districts

2.2 Data Analysis

Statistical analysis of data was conducted using SPSS and ARIS statistical packages. Chi-Square analysis was carried out to show the significant relationship between some of the qualitative variables and logistic regression was used to identify the relationship between categorical dependent variable and one or more independent variables.

III. RESULTS

3.1 Distribution of farmers' literacy rates

Education is a weapon of liberation that frees one from ignorance, poverty and diseases. In such, education has a direct influence on farmers' decision to adopt indigenous farming techniques as well as modern cultivation methods. From our study, farmers' literacy rates were assessed and results presented in table 2. Most of the sampled respondents in the different communities were illiterate, and the female population (76.0%) was found more illiterate than the male (46.5%). At the primary educational level, maximum number of both male and female respondents was found higher compared to the other level. In such, at every higher level of education, the population of literate respondents reduced. This is clearly visible at the tertiary level at which only 4% of female farmers had tertiary education.

Table 2: Educational Level of Respondents Across Surveyed Districts (%)

District	Educational level by District (%)											
	None		Literate/Koranic		Primary		Junior high school		Senior high school		Tertiary	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Kailahun	38.9	72.2	22.2	5.6	16.7	16.7	16.7	5.6	2.8	0.0	2.8	0.0
Kenema	36.1	69.4	22.2	0.0	25.0	30.6	5.6	0.0	8.3	0.0	2.8	0.0
Kono	51.9	85.2	14.8	0.0	3.7	3.7	14.8	11.1	7.4	0.0	7.4	0.0
Bombali	51.9	88.9	7.4	3.7	14.8	3.7	11.1	3.7	14.8	0.0	0.0	0.0
Kambia	44.4	88.9	0.0	5.6	27.8	5.6	11.1	0.0	16.7	0.0	0.0	0.0
Tonkolili	74.1	77.8	7.4	11.1	3.7	7.4	11.1	3.7	0.0	0.0	3.7	0.0
Bo	50.0	61.1	11.1	2.8	22.2	22.2	8.3	11.1	2.8	2.8	5.6	0.0
Bonthe	59.3	81.5	22.2	7.4	7.4	7.4	7.4	3.7	3.7	0.0	0.0	0.0
Moyamba	29.6	74.1	14.8	7.4	14.8	11.1	22.2	0.0	14.8	3.7	3.7	3.7
Pujehun	33.3	74.1	37.0	3.7	11.1	18.5	11.1	3.7	3.7	0.0	3.7	0.0
Average	46.5	76.0	16.7	4.5	14.9	13.9	11.8	4.5	6.9	0.7	3.1	0.3

Figure 2 shows the gender-based age distribution of respondents. Female respondents were found younger than their male counterparts. For the females, the lower quartile was between 35 to 44 years; the median age was 45 years, while the upper quartile was 55 years. For the male respondents, the lower quartile was between 45 to 47 years; the median age was 48 years and the upper quartile was also 55 years.

3.2 Farmers Land/Soil Preparation Methods

Farmers' indigenous practices used in land/soil preparation were investigated and results presented in table 3. Land/Soil Preparation Practices used by farmers included; slash-and-burn, planting on time, planting with hoes, digging deep early enough to ensure effective decay of vegetation, and site selection by identifying certain shrubs which indicate that the soil is fertile. The most common indigenous practices across all Districts

were slash-and-burn, followed by ploughing with hoes, for land/soil preparation, 97.2% of male respondents in Kenema District, 96.4% in Bo District, and 96.3% in Kono District; 100% of female farmers in Kono District, 97.2% in Kenema, and 86.1% in Bo District use slash-and-burn. Only 2.8% male farmers in Bo District acknowledged using planting on time, and also digging deep early enough to ensure effective decay of vegetation as farmers' practice but these practices were not used by female farmers in any District. Ploughing with hoe was used by 61.1% of male farmers in Kambia District, 51.8% in Bombali, and 44.4% in Tonkolili District, compared with 72.2% of females in Kambia District, 63.0% in Tonkolili District, and 48.2% in Bombali District.

Table 3: Farmers using indigenous practices for land/soil preparation (%).

District	Slash-and-burn		Ploughing with hoes		Site selection by identifying certain shrubs which tells you whether land is fertile or not	
	Male%	Female%	Male%	Female%	Male%	Female%
Kailahun	88.9	69.4	8.3	11.1	2.8	19.4
Kenema	97.2	97.2	0.0	0.0	2.8	2.8
Kono	96.3	100	0.0	0.0	3.7	0.0
Bombali	48.2	51.9	51.9	48.2	0.0	0.0
Kambia	38.9	27.8	61.1	72.2	0.0	0.0
Tonkolili	55.6	33.3	44.4	63.0	0.0	3.7
Bo	96.4	86.1	25.0	13.9	0.0	0.0
Bonthe	66.7	70.4	33.3	29.6	0.0	0.0
Moyamba	92.6	70.4	7.4	29.6	0.0	0.0
Pujehun	70.4	55.6	29.6	44.4	0.0	0.0
Average	75	66	26	31	1	3

3.3 Farmers' Suggestions For Improving Land/Soil Preparation

Table 4 presents farmers' suggestions for improving land/soil preparation. Farmers suggested the integration of both indigenous and modern system of farming to improve land/soil preparation. Some of these recommendations included; training on good agronomic practices, soil testing before planting, food for work, farm land should be given free of cost, provision of machines, and provision of micro-credit to hire labour. Most of the farmers suggested the provision of machines to address the challenges they encounter in land/soil preparation, followed by provision of micro-credit for hiring labour. The provision of machines was recommended by all male respondents (100%) in Bombali, Kambia, Tonkolili and Bonthe Districts, 94.4% in Bo District and 92.6% in Kono District, while all female farmers (100%) in Bombali, Kambia, Bo, Bonthe and Pujehun Districts, 96.3% in Tonkolili and 88.9% in Kono District. Soil testing was mentioned by 2.8% of male farmers and 5.6% of female farmers in Kailahun District. The provision of micro credit for hiring labour was requested on average by 5.4% male and 6.2% female farmers, while food for work was mentioned by 1.7% of both male and female farmers interviewed. Farm land should be given free of cost was suggested on average by 0.4% female farmers, and training on good agronomic practices was mentioned on average by 2.1% male and 0.3% female farmers.

Table 4: Farmers' suggestions for improving land preparation (%).

District	Farm land should be given free of cost	Provision of machines		Provision of micro-credit to hire labour		Training on good agronomic Practices	
	Female	Male	Female	Male	Female	Male	Female
	%	%	%	%	%	%	%
Kailahun	0	77.8	77.8	16.7	16.7	2.8	0.0
Kenema	0	77.8	72.2	11.1	18.9	0.0	2.8
Kono	3.7	92.6	88.9	3.7	7.4	3.7	0.0
Bombali	0	100	100	0	0	0.0	0.0
Kambia	0	100	100	0	0	0.0	0.0

Tonkolili	0	100	96.3	0	0	0.0	0.0
Bo	0	94.4	100	0	0	0.0	0.0
Bonthe	0	100	100	0	0	0.0	0.0
Moyamba	0	77.8	81.5	14.8	18.5	7.4	0.0
Pujehun	0	85.2	100	7.4	0	7.4	0.0
Average	0.4	90.6	91.7	5.4	6.2	2.1	0.3

3.4 Soil Fertility Management

Soil fertility management among farmers was investigated and results presented in table 5. The indigenous soil fertility management practiced by farmers included; slash-and-burn method of land preparation (Some farmers believe that ash adds fertility to the soil; others believe that God is the one that fertilizes the soil), planting of leguminous crops, addition of organic manure and allowing the land to fallow. Farmers in the study area see land fallowing as the most common methods suitable for soil fertility management (48.6% males and 46.2% females), followed by the use of organic manure (34.4% males and 32.6% females).

The addition of organic matter was mentioned by 36.1% of male farmers and 11.1% of female farmers in Bo District. More females (66.7%) than males (50%) in Bo District in contrast to Bonthe District, where 59.3% males and 14.8% females reportedly used this method. The planting of leguminous plants was practiced by only 5.6% of female farmers in Kailahun District compared to only 22.2% male farmers in Tonkolili District. In Kenema District, more females (55.6%) than males (27.8%) mentioned the addition of organic matter as an indigenous method of fertility management, whereas in Bombali and Bonthe Districts, equal proportions of both males and females used the method. In Moyamba District, equal proportions of male and female farmers (22.2%) use slash-and-burn – other methods were the addition of organic matter and fallowing of land.

Table 5: Farmers who used indigenous soil fertility management methods (%)

District	Slash and burn		God fertilizes it for us		Planting of leguminous crops		Addition of organic matter		Allow land to fallow
	Male%	Female%	Male%	Female%	Male%	Female%	Male%	Female%	Male%
Kailahun	13.9	19.4	0	30.6	27.8	30.6	27.8	30.6	19.4
Kenema	11.1	0	5.6	27.8	55.6	27.8	55.6	19.4	19.4
Kono	7.4	18.5	3.7	44.4	37	44.4	37	40.7	44.4
Bombali	0	3.7	0	37	37	37	37	44.4	29.6
Kambia	27.8	5.6	5.6	44.4	33.3	44.4	33.3	27.8	27.8
Tonkolili	0	3.7	0	40.7	37	40.7	37	14.8	44.4
Bo	13.9	22.2	0	36.1	11.1	36.1	11.1	13.9	8.3
Bonthe	3.7	37	7.4	29.6	29.6	29.6	29.6	3.7	18.5
Moyamba	22.2	22.2	0	22.2	29.6	22.2	29.6	0.0	7.4
Pujehun	22.2	18.5	3.7	37	37	37	37	0.0	0.0
Average	12.2	15.1	2.6	35.0	33.5	35.0	33.5	19.5	21.9

3.5 Suggestions for Improving Soil Fertility

Farmers' suggestions for improving soil fertility were recorded and results presented in table 6. Farmers suggested the application of inorganic fertilizer and organic manure, water management, crop rotation, and training of farmers on inorganic fertilizer usage as ways of improving soil fertility. The most suggested methods across gender and districts were the application of organic fertilizer followed by the training of farmers on the correct usage of inorganic fertilizer. The application of inorganic fertilizer as a means of improving soil fertility was suggested by all (100%) male farmers in Kono, 88.9% in Kailahun, and 81.5% in Bombali Districts. Among female respondents, 94.4% suggested the application of inorganic fertilizer in Bo, 92.6% in Pujehun and 88.9% in Kono Districts. The addition of organic manure was recommended by 11.1% of males in Kambia and Tonkolili Districts, compared to 11.1% of female farmers in Kambia and Tonkolili Districts, 3.7% in Bombali and 2.8% in Kailahun Districts. Water management was suggested by 27.8% of male farmers in Kenema D, 11.1% in Kailahun, 7.4% in Pujehun and 3.7% in Moyamba Districts, compared to 14.8% of female farmers in Bonthe and Moyamba Districts, 18.5% in Tonkolili, 7.4% in Pujehun and 5.6% in Bo districts. On

the other hand, crop rotation was recommended by 5.6% of male farmers in Kambia, and 2.8% in Kenema Districts, compared to 25.9% of female farmers in Bombali District. Training of farmers on fertilizer usage was suggested by 27.8% of male farmers in Kenema, 11.1% in Kailahun and 7.4% in Pujehun Districts, as against 36.1% female farmers in Kenema, 27.8% in Kailahun and 11.1% in Kono Districts.

Table 6: Farmers' suggestions for improving soil fertility (%)

District	Application of inorganic fertilizer		Addition of organic manure		Water management		No Idea		Practicing crop rotation	Training of farmers on inorganic fertilizer usage	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
	%	%	%	%	%	%	%	%	%	%	
Kailahun	88.9	69.4	0.0	0.0	0.0	11.1	11.1	0.0	0.0	11.1	27.8
Kenema	69.4	61.1	0.0	0.0	0.0	27.8	27.8	0.0	2.8	27.8	36.1
Kono	100	88.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1
Bombali	81.8	63.0	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kambia	77.8	72.2	11.1	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.0
Tonkolili	77.8	70.4	11.1	7.4	18.5	0.0	0.0	18.5	0.0	0.0	0.0
Bo	75.0	94.4	0.0	25.0	5.6	0.0	0.0	5.6	0.0	0.0	0.0
Bonthe	74.1	85.2	0.0	25.9	14.8	0.0	0.0	14.8	0.0	0.0	0.0
Moyamba	66.7	81.5	0.0	29.6	14.8	3.7	3.7	14.8	0.0	3.7	3.7
Pujehun	74.1	92.6	0.0	18.5	7.4	7.4	7.4	7.4	0.0	7.4	0.0
Average	79	78	2	11	6	5	5	6	1	5	8

3.6 Farmers' Indigenous Indicators to Determine Favourable Land Preparation Time.

Agriculture in Sierra Leone involves different operations ranging from selection of sites, land preparation (i.e. brushing and trees felling, clearing, burning and ploughing), planting, weeding, harvesting, processing and marketing. Several indigenous indicators were cited by farmers for determining the most appropriate time to undertake land preparation as shown in table 7. For male farmers, the most popular indicator for the commencement of land preparation was 'when the sun becomes very hot' (22.3%), followed by "at the end of the festive season" (22.2%). For female farmers, the indicators were "at the end of the festive season" (19%) and "when the sun becomes very hot (15.6%). Some farmers (2.2% males and 6.9% females) mentioned "immediately after initiation into secret societies" for the commencement of land preparation, "presence of worms" for site selection, and "humus" as a sign of fertile land was mentioned by 5% male farmers and 5.5% female farmers; while "when dew starts falling" was an indicator for the commencement of land preparation for 4.6% of males and 3.2% of females.

Table 7: Farmers Indigenous Indicators to Determine Favourable Land Preparation Time (%)

District	After Harmattan period land preparation starts		When certain trees begin to bear fruit land preparation starts		When deciduous trees drop their leaves, land preparation starts		When the sun becomes very hot time for land preparation		At the end of the festive season, land preparation starts		Start of weeding in the upland, means start of land preparation in the lowlands		Shedding of cotton by cotton trees start of land preparation	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Kailahun	22	18	0	0	6	6	16	6	28	25	0	0	14	13
Kenema	3	6	3	0	3	6	22	11	50	53	0	0	0	0
Kono	7	4	11	4	4	0	15	4	22	19	23	19	7	11
Bombali	0	0	19	19	0	0	26	11	11	11	20	24	0	4
Kambia	11	6	11	22	34	34	32	20	6	6	6	6	0	6
Tonkolili	21	18	22	20	14	10	17	15	11	15	7	11	4	4
Bo	19	14	11	11	1	3	25	14	15	28	0	0	17	11

Bonthe	15	17	4	7	4	0	20	42	19	7	4	4	15	4
Moyamba	0	7	4	0	7	4	33	22	30	26	0	0	4	4
Pujehun	4	19	4	11	11	7	17	11	30	0	0	4	15	19
Average	10.2	10.9	8.9	9.4	8.4	7	22.3	15.6	22.2	19	6	6.8	7.6	7.6

3.7 Chi Squared Analysis of Farmers' Indigenous Practices of Soil Fertility Management Across Surveyed Districts

Data in table 8 shows the chi squared values of 88.9 and 45 degrees of freedom indicate that the type of farmers/producers practices used for fertility management is significantly District specific ($p=0.00011$). This means that the type of farmers/producers practices used for fertility management depends on the District of the respondent.

Table 8: Chi squared analysis of farmers' indigenous practices of soil fertility management across surveyed Districts.

District	Farmers' indigenous practices used for soilfertility management						Total
	Slash & burn	God fertilizes it for us	No idea	Addition of organic manure	Allow land to fallow	Opening of water channel	
Kailahun	12	0	0	22	38	0	72
Kenema	4	1	4	30	33	0	72
Kono	7	0	0	22	24	1	54
Bombali	1	0	1	22	30	0	54
Kambia	6	0	1	14	15	0	36
Tonkolili	1	0	0	22	31	0	54
Bo	13	0	0	17	42	0	72
Bonthe	11	0	7	16	20	0	54
Moyamba	12	0	0	14	28	0	54
Pujehun	11	1	1	20	21	0	54
Average	7.8	0.2	1.4	19.9	28.2	0.1	57.6

IV. DISCUSSIONS

Indigenous knowledge provides adequate knowledge for solving farmers' problems especially those in deprived communities with crude tools and less access to research and extension personnel (Agrawal A, 1995). If fully earnest, indigenous knowledge can contribute immensely to agricultural transformation (World Bank, 1998). The main strength of indigenous knowledge system is that, it has evolved in close contact with nature and the environment and has proven to be more sustainable over longer periods (Spencer, D. et al (2009). In our study, farmers suggested the adoption of mechanized farming backed up with indigenous knowledge systems where suitable. They believe the use of machines in rice farming is more effective and productive as it requires less labour, saves time and can increase the area of cultivation over a short period of time. This in turn helps improve the lives of rural farmers and such contribute to alleviating their socio-economic problems. Rural farmers have excellent informal knowledge acquired through trial and error practices during their farming activities in risk prone agro-ecosystem, with such knowledge, farmers have for several years have adopted varying ways of overcoming possible failures bound to befall their farming operations and reduce yields (Hill, C;

1993). In our study, farmers have been able to adopt several farm management practices such as; Site selection by identifying certain shrubs which tell you whether land is fertile or not for cultivation, land preparation is done immediately after initiation into secret societies, the presence of worms and humus as a sign of fertile land re-used by farmers as indigenous knowledge during the commencement of farming operations.

Therefore, indigenous knowledge used in farming operations can be used as indicators in modifying modern technologies appropriate enough to increase production and contribute to environmental sustainability across rice growing ecologies (Feldstein, H.S. and Poats, Susan V. (eds) ;1989). In other parts of the world, the introduction of modern technologies through formal education and informal training programmes in rural farming communities have exposed farmers to varying techniques of farming and much easier cultivating methods. Tapping into those useful indigenous knowledge systems practiced by rural farmers in Sierra Leone and synagising them to modern technologies can yield dividend for our rural farmers.

V. CONCLUSIONS

Indigenous knowledge methods are highly utilized by rice farmers in Sierra Leone. Majority of them use indigenous methods solely in the production, harvesting, threshing and storage of rice and this is being transmitted from one generation of farmers/producers to the other. The Indigenous knowledge methods mostly practiced by the rice farmers included slash and burn, planting of leguminous crops, addition of organic matter, and bush fallow. Reasons adduced for high patronage of Indigenous knowledge methods included the high cost of modern methods, especially the availability and use of machines and chemicals, and the ease with which farmers utilize their indigenous methods. Another strong reason in favour of the use of Indigenous knowledge use is the support of the agricultural extension agents; this will sustain the use and ensure the spread, even among generations.

VI. RECOMMENDATIONS

- Both basic and applied research should be encouraged to promote the use of IKS
- Farmers need to be sensitized on climate smart agriculture and provided with more reliable indicators for determining farming operations rather than the reliance on weather conditions in the present midst of climate change/variability, there is an therefore an urgent need to develop policy intervention on climate smart agriculture and also to sensitize and train farmers in this regard.
- There is the need for synergy between improved technologies and farmers' indigenous practices, through farmers' learning fields and improved availability, accessibility and affordability of agro inputs.
- Appropriate policies should be formulated and their implementation monitored to ensure their effectiveness.

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REFERENCES

- [1]. Agrawal, A. (1995). Dismantling the Divide Between Indigenous and Scientific Knowledge. *Development and Change*, Vol.26 No. 3). Pp 413-439. Published by International Institute of Social Studies. The Hague.
- [2]. De Walt, B.R. (1994). Using Indigenous Knowledge to Improve Agriculture and Natural Resources Management. *Human Organisation Issue*, 53(2):Pp 123-131
- [3]. Claxton, M, (2010). Indigenous knowledge and sustainable development, international consultant in sustainable development, on september1, 2010. Document available at (<http://sta.uwi.edu>)
- [4]. Briggs, J. (2005). *Progress in Development Studies*, 5(2) Pp: 99-114. Department of Geography and Geomatics, University of Glasgow, Glasgow G12 8QQ, UK.
- [5]. Brouwers, J.H.A.M. (1993). Rural people's response to soil fertility decline: The Adja case (Benin). *Wageningen Agricultural University Papers* 93-4.
- [6]. Flavier, J.M. et al. (1995). *The Regional Program for the Promotion of Indigenous Knowledge in Asia*. In Warren, D.M.L.J. Slikkerveer and D. BrokenshaEds) (1991). *The cultural Dimension of Development: Indigenous Knowledge System*. London, Intermediate Technology Publications Pp 479-487.
- [7]. Feldstein, H.S. and Poats, Susan V. (eds) (1989). *Working together: Gender analysis in agriculture*. West Hartford: Kumarian Press.

- [8]. Hill, C. (1993). Healthy communities, healthy animals: reconceptualizing health and wellness. Pp. 4-32 In *Indigenous and local community knowledge in animal health and production systems: Gender perspectives*. Ottawa: The World Women's Veterinary Association.
- [9]. Spencer, D. et al (2009). *Economics of Rice Production in Sierra Leone. Report of a Survey in three Northern Districts*. Soros Economics Development Fund (SEDP), New York, USA.
- [10]. Warren, D. M. (1991a). *The Role of Indigenous Knowledge in Facilitating the Agricultural Extension Process*. Paper presented at the International Workshop on Agricultural Knowledge Systems and the Role of Extension. Bad Boll, Germany, May 21-24, 1991.
- [11]. Warren, D. M. (1991b). *Using Indigenous Knowledge in Agricultural Development*; World Bank Discussion Paper No.127. Washington, D.C.: The World Bank.
- [12]. World Bank, (1998). *Knowledge and Skills for the Information Age. The First Meeting of the Mediterranean Development Forum; Mediterranean Development Forum*, URL: <http://www.worldbank.org/html/fpd/technet/mdf/objectiv.htm>

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