
Lofa
Guinea
Gbarpolu
Grand Cape Mount
Bong
Nimba
Côte d'Ivoire
Gomi
Margibi
Montserrado
Grand Bassa
Rivercess
Grand Gedeh
Sinoe
River Gee
Grand Kru
Maryland
N
W
E
S
County

TITLE OF CONSULTANCY ASSIGNMENT:

"ASSESSMENT ON THE LEVEL OF ADOPTION OF THE SRI (INTENSIVE RICE CULTIVATION SYSTEM) IN LIBERIA"

NATIONAL COORDINATING ORGANIZATION**:**

"THE NATIONAL RICE FEDERATION OF LIBERIA (NRFL)"

INTERNATIONAL COORDINATING ORGANIZATION**:**

CRCOPR/ROPPAA

STUDY CONDUCTED BY NATIONAL CONSULTANT**:**

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ABSTRACT

The system of Rice Intensification (SRI) is a sublime fusion of principles and practices of rice cultivation that enhance high yield, income and reduce poverty in pro-poor smallholder communities. SRI should be viewed not just as a set of agronomic practices in paddy fields, but a typical agricultural technology which effects depend on ideas rather than on the inputs required for high yield and productivity of crops. The adoption of the principles and practices of SRI has been the preoccupation of many stakeholders that have participated in the application of the technology or understood its befits to farmers. The adoption of this technology is cardinal to the reduction of poverty and food security. However, a study was conducted in three counties (Bong, Lofa, and Montserrado counties) and eleven (11) communities (Lofa: Foyah, Voinjama & Kolahun; BongCounty: Suakoko, Bellemu town, Gbarngasiawuelleh town; Montserrado county: Zubah town, Lakpazee, Soul clinic, Thinkers village & Duport road) in Liberia to assess the level f adoption of the practice in-country. The objectives of the study were a) Analysis of the actual level of adoption of SRI in Liberia and the results generated by its adoption b) assess the penetration rate of SRI training at the level of West African rice producers and whether the technology package has been respected through its implementation c) highlight lessons learned and challenges related to the adoption of SRI in Liberia and d) Project the future of SRI within Liberia. The study was a basic socio-economic study including focus group discussion, structures, and FOs interviews, and individual survey and a total of 169 respondents participated. Results revealed that SRI adoption is low in Liberia, the practice has not been widely disseminated across all rice-producing areas of Liberia as only a few counties and few districts have heard of it or practiced it. The challenges farmers face such as the high cost of labor, lack of motivation, and lack of access to loans have served as a demotivating factor for the adoption of the technology. However, if stakeholders fully understand and support the practice of SRI in Liberia, more farmers would benefit and food security enhanced.

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List of abbreviations and acronyms

ROPPAA	Network of Peasant Organizations and Agricultural Producers in **West Africa**
SRI	System of Rice Intensification
CRCOPR	Regional Consultation Framework of Rice Producers
LCDA	Lofa County Development Agenda
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
CFSNS	Comprehensive Food Security and Nutrition Survey
CARI	Central Agricultural Research Institute
WARDA	West Africa Rice Development Authority
NRC	the Norwegian Refugee Counci
BCDA	Bong County Development Agenda
COVID	Corona Virus Disease
NRFL	National Rice Federation Of Liberia
MOA	Ministry of Agriculture
CHAP	Community of Hope Agriculture Program
FOs	Farmer Organizations
FUN	National Farmer Union of Lineria

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I am highly indebted to our sub-regional bodies (CRCOPR/ROPPAA) for the innovation and the financial and moral supports provided to this study. I gratefully acknowledge the efforts of all the enumerators who assisted in data collection across the study areas, your participation in the study will always be remembered. The data entry team also played a crucial role, and I wish to acknowledge your contribution to the success of this study.

1. INTRODUCTION

1.1 Context and rationale for the study

As the world gets warmer and the threats of drought/water shortage, soil degradation and desertification loom over many countries of the world, the demand for water for irrigation activities seems to surpass the amount of water used by households and for irrigation purposes. Essentially, the demand for more food to feed the world's growing population is on the high increase, thereby necessitating the need to have improved and appreciate technologies and farming practices that enhance more food production by reducing the use of water in farmer's fields **(**Fróna *et al.,* 2019).

Rice is the primary staple food for Liberia, but the majority of rice producers are subsistence farmers who mainly depend on rainfed rice cultivation or the practice of continuous flooding technique in their rice fields. The flooding technique requires the use of much water during crop production. Moreover, most of the farmers use the conventional practice of growing paddy by using local rice varieties and transplanting the seedlings at more than 21 days old, and 3 - 4 seedlings are transplanted per hill.

The conventional practice of cultivating rice has usually resulted in low yields in farmer's fields, as well as low water productivity. Water is not efficiently utilized under the conventional method of rice cultivation, as many farms are operated with good irrigation systems. But, the system of rice intensification (SRI) seems to be a promising new practice of growing rice in the lowland areas. In countries where the practice has been adopted, the SRI has proven to be an effective way of saving water and increasing rice yields in many parts of the world. While this practice is easily spreading fast and has been adopted in many countries around the world, there are other countries where the SRI has not been widely practiced by most rice farmers.

While the technology SRI has been introduced at a small, pilot scale in some communities in Liberia, observations shows that the adoption and diffusion rates of the technology appear to be very low. Given its unsubstantiated productivity and economic benefits, a low application of the SRI technology seems rather perplexing. The SRI technology is a rice-intensive cultivation technique that entails significant local adaptation and management skills, and little

evidence show that farmers are constrained by information, support, skills and tools necessary for local adaptation.

As a result of the differences between an SRI Fields and a traditional rice fields, social norms and conformity pressures may likewise discourage adaptation and eventually, adoption. In the rural communities in Liberia where there are resource constraints and limited access to formal finance sources, social networking may offer a viable alternative. Information on how best to harness social networks to promote technology adoption and diffusion in Liberia is either absent or scanty.

Even though about 71 % of the country's households and 80% of the women labour force currently make their living predominantly through agricultural activities, productivity is still low due to limited application of modern technologies (Comprehensive Food Security and Nutrition Survey, 2018), and other associated problems.

One of the ways to help our farmers is to identify best cultivation techniques to improve the farmer productivity, increase income and contribute to national food security. The kind of cultivation practices that supports improved food production, reduce the drudgery in cultivation activities and provides a low hanging fruit approach to farming should be promoted both on local level and national level for adoption by farmers in all our farming communities in Liberia.

Considering the economic status of Liberia compared to the global standards, Liberia is one of the least-developed, low-income countries with 51 percent of its estimated 4.5 million people living in poverty (UNDP, 2019). Moreover, despite the favourable conditions for agriculture production in the country, the country still depends on imports for over 60 percent of its basic food needs (rice) (UNDP, 2019). In addition, the country is challenged with various climate-related risks such as floods, coastal erosion, iron toxicity, salinity, and drought with a potential impact on its food security and poverty reduction (UNDP, 2019 and CFSNS, 2018). ideally, the system of rice intensification is the best and most cost effective rice cultivation practice the world over for increased rice productivity **(**Zotoglo, 2011).

SRI was introduced into Liberia in 2012 through a pilot project coordinated by the National Farmer Union of Liberia (FUN) in a little community situated in the suburb of Monrovia, but since its introduction, there is no data on the level of infusion or adoption by farmers, and it

clearly seems to indicate that the practice has not yet gained prominence in many farming communities in Liberia.

The System of Rice Intensification (SRI) is a practical solution to increasing rice productivity through the application of well-organized agronomic practices and approach (Uphoff and Randriamiharisoa, 2002), which could be applied in a small-scale farming system to make rice production more efficient by reducing the use of chemical inputs, water, and the use of seed contrary to the normal rice farming practices (Styger *et al*., 2011). Some previous studies on SRI have pointed out that the System of Rice Intensification approach is well associated with conservation of resource and the protection of the environment by using fewer external inputs, organic fertilizer and chemical to control pests (Noltze *et al.*, 2012); for this reason, this approach is thus appropriate as a farming practice which works well towards sustainable agriculture production in most parts of the world.

1.2. Study objectives

The main objective of the study is to assess the level of adoption of the System of Rice Intensification (SRI), the learning conditions and the mentoring process practiced in its implementation so as to draw lessons and identify best practices to improve its adoption by West African rice farmers. To this end, the specific objectives of the study will include:

- Analysis of the actual level of adoption of SRI in Liberia and the results generated by its adoption
- Assessing the penetration rate of SRI training at the level of West African rice producers and whether the technology package has been respected through its implementation.
- Highlight lessons learned and challenges related to the adoption of SRI in Liberia
- Projecting the future of SRI within Liberia.

2. DESCRIPTION OF THE STUDY AREA

2.1 Geographical location

This study was conducted in three of the fifteen counties of Liberia where the SRI technique of rice cultivation was apparently practiced or adopted by farmers. Precisely, the areas identified for the study were Lofa County (Voinjama, Kolahun and foyah), Bong County

(Suakoko, Bellemu, and Gbarngasiaquelle), and Montserrado County (Zubah Town, Duport road, Soul clinic, Lakpazee and thinkers village).

Lofa is a county situated in the northernmost portion of Liberia and it's one of the 15 counties that constitute the subdivisions in the country. There are nine (9) political districts in Lofa County and the provincial capital is Voinjama with a land area of 9,983 square kilometers. According to the 2008 national population census, Lofa has a total population of about 276, 863 residents making it the third-most populous county in Liberia next to Nimba County and Bong county (LISGIS 2008). The county has a border with the Republics, Guinea on the north, and Sierra Leone on the west, and the south by two counties of Liberia namely Gbarpolu and Bong Counties. Lofa is the third-largest county in Liberia and it is considered one of the breadbaskets of country due to the productivity of the land as well as the involvement of more farmers in food production to feed they and their families in particular and the country in general. Lofa County has a tropical, hot, and humid climate with an annual temperature generally ranging from 24^{o}C to about 30^{o}C.

Bong is a county situated in the north-central portion of Liberia, and it is one of the fifteen (15) counties that comprise subdivisions of Liberia. The county is made of twelve political district with Gbranga being its provincial capital. The total land area of the county is 8,772 square kilometers and the population 328, 919 residents, making it the third most populated county in Liberia (LISGIS, 2008).

Montserrado county is situated on the coast in the northwestern part of Liberia, and is bordered by three counties namely Bong county on the north, Bomi county on the west, Margibi county on the east and the Atlantic Ocean makes up the county's southern border, The land is mainly alluvial soils, primarily clay, washed seaward from the streams and rivers of the interior valleys. In the lowlands on the coast grow palm trees, mangrove woods, and savanna grasslands with tropical forest covering the interior hills and valleys. The county is composed of fifteen districts. The 2008 National population Census of Liberia indicates that the county has a population of 1,144,306, thereby making it the most populated county in Liberia (LISGIS, 2008). The area of the county measures 1,912.7 square kilometers, one of the smallest counties in the country with Bensonville serving as its capital.

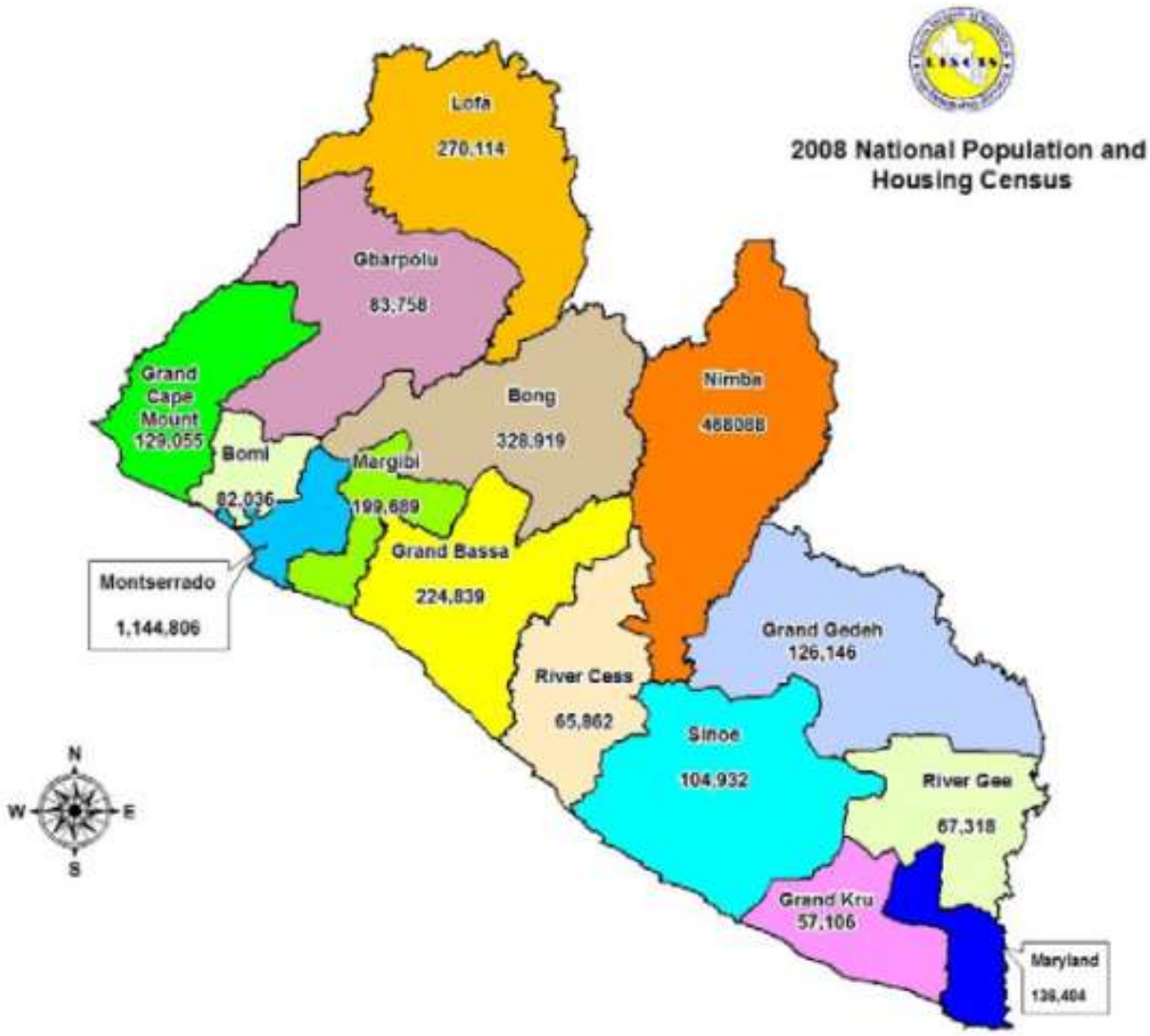

Plate 1. Liberia population census map of 2008

2.2 Climate

2.2.1 Regional climate of Montserrado, Bong and Lofa counties

Liberia has a tropical, hot and humid climate year round, with a wet season starting from May to October as a result of the African monsoon, and quite common rains in the other months, except in the short dry season that runs through form December to February, and it mostly occurs in the north of the country ((LISGIS, 2008). in the coastal regions of the country, the average rainfall is sometimes more than 3,000 millimetres yearly. But in the northern part of the coast of Monrovia, the rainfall sometimes reaches as high as 5 meters per annul, whilst in

the interior, precipitation is much less abundant, and drops in parts of the areas below 2,000 mm yearly (Climates to travel).

From December to February, which is winter in Liberia, rainfall becomes sporadic in the center and the north, and there are common sun shines, despite the fact that a few showers do occur. The temperature is excessive, and it's around 30/32 °C (86/90 °F) at some stage during the day, and the humidity stays high, especially alongside the coast and within the forested areas of the interior. Sometimes, however, a dry harmattan blows and fills the surrounding with dust, from the Saharan desert, and within the inland hilly regions, especially in areas with high elevations, the weather becomes cool or a bit cold at night (Stanturf *et. al.,* 2013).

Lofa County is a forested place in Liberia and the daily temperature commonly degrees yearly from 24^{C} to 30^{C}. Wind information from the County is incomplete; however, the wind usually blows from the Northeast in the course of the dry season and the Southwest in the course of the wet season. The extend of the wind is reportedly greatest in the wet season from July to September and lowest in the dry season during December and January.

The usual rainfall in Lofa County is around 115 inches (2,900mm) and three major kinds of rainfall are stated for the county. The kind is the heavy downpours that arise at the start and the end of the rainy season, the second one is the long interval of precipitation with involves the occurrence of less turbulence and covers large areas. The depth of this kind of rainfall is increased through the drop of temperature during the afternoon and the night hours every day, and the third is the relief rains which are produced by the friction between the topography and air masses which reach the county from the sea. The relief rains occur at mountain ranges and other relief features within the county. (LCDA, 2008).

In Bong County, the temperature is usually between 65F to 85F, and on the basis of the dominant rainfall, two different seasons have been identified, the wet and dry seasons. The wet season lasts from mid-April to mid-October, whilst the dry season starts in November and ends in April. However, with the planet experiencing weather changes, a moderate fluctuation in the timing of the seasons has been noticed (BCDA, 2008). Generally, the wind blows from the Northeast for the duration of the dry season and the Southwest during the wet season. Wind mileage is typically greatest in the wet season, now and then bringing violent storms able to destroy houses and crops. Bong County has a conventional type of rainfall of around

70 to 80 inches. Toward the interior, the rainfall decreases due to the fact the air loses moisture besides for high areas where the air forces move upward causing some relief rain.

The impact exerted by climate change in Liberia is severe due to the low adaptive capacity in the various sectors of government as a result of the low level of human and institutional capacities, infrastructure, technology, and economy. Various sectors have been impacted in diverse ways due to the fact that financial and natural capital and human capital are low to build adequate resilience to the impact of climate change in Liberia (EPA, 2018).

For example, in the forest dependent communities of Liberia, climate change has brought extreme happenings that limit the ability of various communities to meet their basic requirements for food as a result of the a reduction in the amount of productive land and pest attacks on crops, the lack of access to clean water, good health care, and fuel wood among other things. The agricultural system has also been experienced disruption resulting from climate change which is reflected in the changes in the patterns of rainfall in Liberia (EPA, 2018).

The temperature has direct consequences for the country, where more than 70% (Republic of Liberia 2010) of the population are engaged in agriculture as their main livelihood activity, with rice, the nation's staple food, covering a majority of the area under production. Strong rainfall could disturb the water facilities, which could also cause an increase in the amount of runoff into rivers and lakes by washing sediments, nutrients, pollutants, and other waste materials into water supplies or facilities. It is assumed that a sea-level rise, heavy flooding in Liberia is also a clear and instant threat to economic growth as this may affect energy supply, destroy roads and transport facilities as well as homes (USDA, 2013). Additionally, the impact of climate change may also affect food and agricultural activities, education, health, water and sanitation and social protection

2.3 Soils

Since the publication on the characteristics of the soil of Liberia by Reed (1951), there has been no other in-depth study done on the soil of Liberia, except a broad soil classification by FAO-UNESCO (1995) of soils extending across the West African region as reflected on the Soil Map of the World. In the year 2000, the FAO using the soil of Nigeria as case study, developed a critical minimum soil testing values for commonly deficient soils to serve as soil testing guide for tropical countries where such critical values have not been established. The

FAO recognized that soil fertility is particularly a major constraint for tropical soil including the soils of Liberia. The constraints identified include low cation exchange capacity, aluminium toxicity especially for sandy soils, non-humic ferrasol soil and high phosphorous fixation for clayey soils (FAO-UNESCO,).

The rice cultivation practice in Liberia is dominated by a slash and burn or the bush fallowing method wherein the vegetation is slashed and burn before the planting of food or cash crops yearly. The use of this method causes the accumulation of soil nitrogen and in bush cover and the upper layer of the fallowed soil, and as a result the available phosphorus content in the soil is reduced and then becomes less than other soil nutrient and is only replenished by the ash from cut bush that has been allowed to dry and then burnt in the field.

Most of the soil of Liberia and according to the FOA soil guide of 2000, have pH value below 5.0, and experiences the accumulation of aluminum, iron and some micronutrients at a toxic level which may otherwise reduce the microbial activities thereby causing nitrogen to become unavailable to plants (FAO, 2000a). In the upland ecology where aluminum toxicity is a major constraint, only tolerant crops easily survive in this environment (WARDA, 1999). In the lowland ecology or lowland acid soils, a high level of reduced iron (Fe2) oxidizes and result in iron toxicity and zinc and potassium deficiency in most rice fields in Liberia (Becker and Asch, 2005). FAO (2000b) reported that aluminium toxicity is one reason why subsistence agriculture is based on root crops, such as cassava and yams, rather than cereals in West Africa.

Most soils of Liberia are weathered as a result of the heavy downpour year-round, and the minerals are inert and/or incapable of maintaining several essential plant nutrients. The heavy downpour leaches essential nutrients in soils, and with the tropical heat, the organic minerals are easily decomposed which eventually leads to soil acidity and high iron concentrations that further inhibit nutrient availability.

2.4 Vegetation

For most of the year, the landscape of Liberia is lavishly green, and it's primarily dominated by the growth of beautiful natural vegetation (Rompaey, 2006). The green vegetation indicates that the land is highly fertile and suitable for the crop growth. Certainly, many crops do grow well here including food crops and cash crops alike. According to the

geomorphology of the Liberian soil, the landscape has been subject to intense weathering over hundreds of millions of years and has transformed the land.

Liberia is situated in the Tropical Rain Forest Vegetation Belt of West Africa. Most of Liberia is made of dense forest, but along the coast, there is a narrow strip of forest where the mangrove vegetation alternates with the coastal savannah. The climatic conditions in the entire country give rise to the type of vegetation that develops into a tropical rainforest. As the result of the climatic condition of the country and the soil types found in most parts of the country, three vegetation belts have been identified in Liberia. They include the Coastal Savanna belt, the High Rainforest Belt, and the Northern Savanna. (Wiles, 2005).

The Coastal Savanna belt is composed of low grasses and low-density forests with scattered trees or trees spaced apart. Oil palm trees, coconut trees, and raphia trees are found along the coast in addition to the mangrove trees. The dense forest which is also referred to as a high Rainforest Belt can be further divided into an evergreen rainforest zone and a moist semi-deciduous forest zone. The evergreen and dense-rain forest receives a high annual rainfall averaging 4475 mm and contains many plant species that do not have a well-developed marked period of the leaf. There are forest trees in these zones that are as tall as 50 meters. The semi-deciduous forest is similar to the deciduous forest type found in La Cote d'Ivoire. During the dry season (5 to 6 months) in Liberia, many trees in the deciduous forest are forced to drop their leaves to minimize high evapotranspiration.

In northern Liberia, there is the Savannah belt which comprises the tall grass woodlands in the far northwestern parts of the country and a small portion in the northeast (Wiles, 2005). It is mainly man-made vegetation due to continuous activities of the farmer which includes burning and clearing for agricultural purposes and this activity prevents the regeneration of the original vegetation in the area and subsequently exposes the soil to continuous direct sunray and erosion during the rainy season.

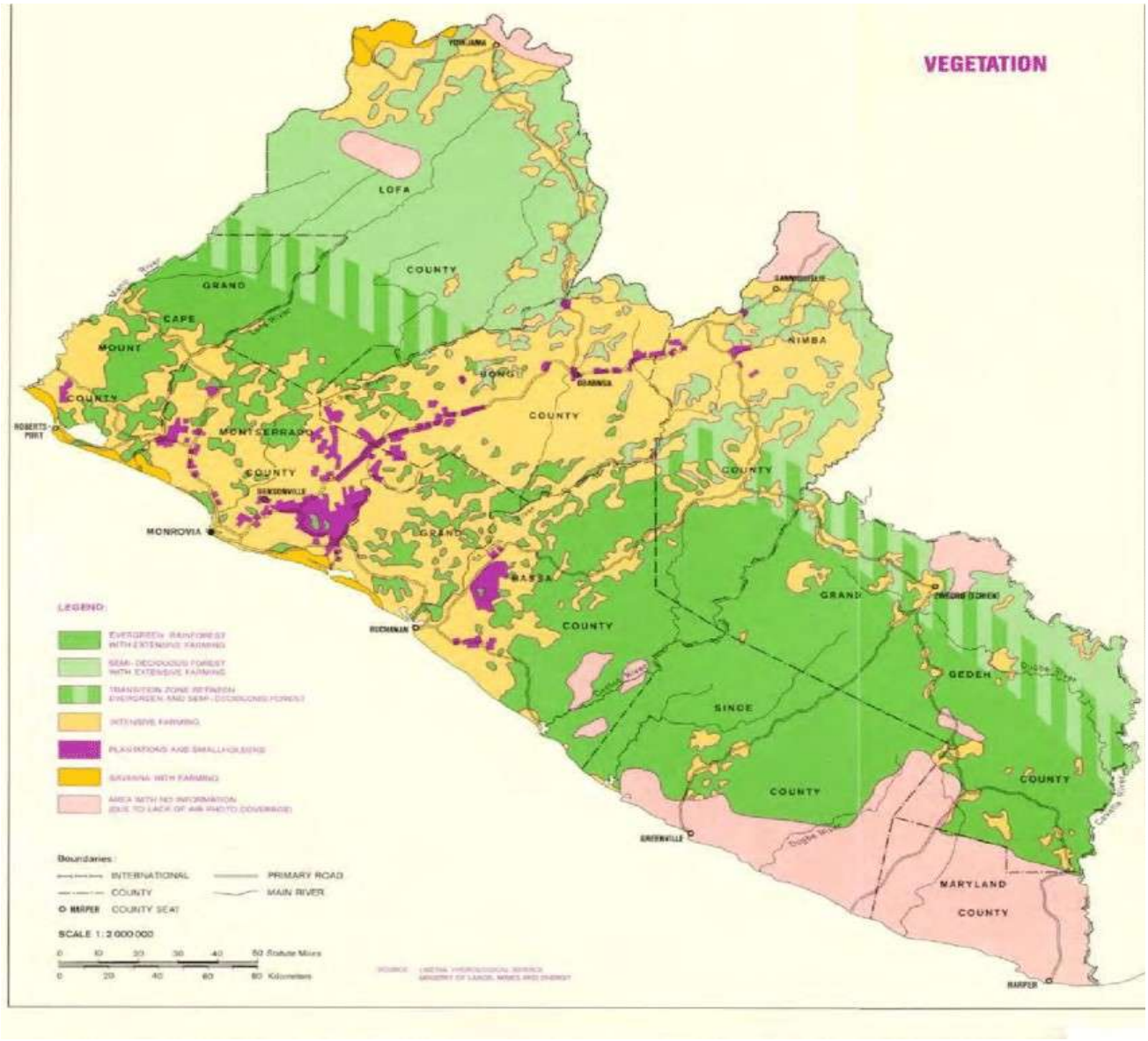

Plate 2. Vegetation Map of Liberia

2.5 Demographic characteristics

2.5.1 Population

The current population of Bong County is estimated at 520,000 based on a census of the County Health Team; while a Norwegian Refugee Council (NRC) needs assessment survey put the estimated population at 378,161. The NRC estimated annual population growth in the County at 4.5 percent. Traditionally, at certain times in the year, especially during the rains, people move in search of alternative sources of income, especially to the rubber plantations. The population is now thought to be decreasingly transient in nature.

According to the NRC, males are estimated at 49 percent, females 51 percent, about 46

percent of females are the children bearing age (15-49 years), fertilities rate of 6.7, children under five years is 15 percent. The County's dependency ratio is 1.41 according to the Information Management Office of Bong County (IMO), making it higher than Liberia as a whole, which has a ratio 1.37. Families or households in the County are generally headed by males at a rate slightly higher than the national average; the sex of household head is estimated at 84% male and 16% female, while the national figures are 87% and 13%. The percentage of elder-headed households in the County is the same as the national percentage, at 8%. (BCDA, 2008).

2.5.2 Ethnicity

The culture of the Africans uniquely incorporates diverse ethnic groupings, which has been an extremely important affairs in the life of the African; this African culture has provided the Africans with a way of life, until the arrival of the European colonialists in the late 19th century (Eghosa, 1994). The European colonialism came to modify the African society by destabilization of the ethnic groups; they created division among ethnic groups and weakened their ability to live together as one people such as what occurred in Liberia with the arrival of the freed slaves from America (Mobolade**,** 1990)**.** History tells us that Liberia is the only state in sub-Saharan Africa that was never colonized by the Europeans. Majority of Liberia's ethnic groups or tribes came to the country through migration.

The original tribes or first inhabitants of Liberia were descendants of two major tribal groups (Gola and Kissi) who migrated from north-central Africa and arrived into the country in early 12th century (Minority Rights Groups International, 2021). These tribes were later joined by the other tribal groups who moved from the northern and eastern Africa

To the African, ethnicity is seen as an aspect of their culture because it provides security to a group or individuals constituting the group (Hamer *et a*l., 2020; Burton *et al.,* 2005). Members of an ethnic are keen on maintaining the safety of their member. For the mere fact that an individual belongs to ethnic group, there is sense of safety as he mingles together with the rest of the group members, and they are always ready to defend themselves against any external attacks on their existence and sovereignty. This notion of security also provides the groups with a sense of direction in their lives. Additionally, ethnic group shares a common ancestry background and language which is an important aspect of the African peoples. The desire to know who or what gave birth to their ancestors and where they are destined is a

major preoccupation in the African culture. The feeling or knowledge of belonging to a common ancestry creates a strong bond among the members of various ethnic groups, knowing that safety for one is safety for all and vice versa (Fishman, 1999).

The ethno-linguistic groups of Liberia are mostly characterized as tribes that have never formed unified, historically continuous political entities since independence. Officially, Liberia has 17 ethnic groups that make up Liberia's indigenous African population, making up maybe 95% of the total: Kpelle, the largest group; Bassa, Gio, Kru, Grebo, Mandingo, Mano, Krahn, Gola, Gbandi, Loma, Kissi, Vai, Sapo, Belleh (Kuwait), Mende and Dey.

In the northwestern subdivision of Liberia lives the Mande-speaking groups that formed mixed chiefdoms and groupings that organized trade and warfare, especially during the period of the slave trade in Africa. The northwestern subdivision was not a pre-colonial state, but these peoples were united especially by the practice of two secret societies, Poro society (for men) and Sande (for women). While in the South and East of the Saint John River, the Kwaspeaking peoples who migrated from the east lived there in smaller, less stratified communities (Everyculture.com) when the Americo-Liberians attempted to extend their control from the coast to the interior, the tribes/ethnic groups created administrative units that were thought to have the same boundaries with existing "tribes." For example, Maryland County in the southeast was treated as the home of the "Grebo tribe," even though the people there did not recognize a common identity or history beyond speaking dialects of the same language.

For most of the history of Liberia, the primary meaningful division on the national level was between the tribal majority and the settler minority; with few exceptions, one's tribe made little difference in terms of life chances and upward mobility.

2.6 Socio-economic activities

The Liberian economy is predominantly agrarian, and raw materials, equipment, and consumer goods are imported. Production for export is carried out on a large scale through foreign investment in rubber, forestry, and mining. This economy, already enduring a challenging domestic and external environment, is now facing the COVID-19 pandemic**.**

The Liberian economy suffered a great deal of setback as a result of the Ebola epidemic in 2014 and is currently experiencing similar setback due to the global pandemic (COVID-19). The disease has negatively affected economic growth, investment, and access to social

services, which reduced growth to an estimated 1.8% in 2014, though the economy had been projected to grow by 6.8% (African Development Bank 2015, and Toweh 2014). The agriculture, services, and mining sectors were significantly impacted by the Ebola epidemic. Food prices rose considerably as a result of roadblocks, border closures, travel restrictions, and a reduction in importation of goods and srvices. By August 2014, the price of imported rice had risen by 18% in just one month (World Bank 2015). Residents of Lofa County faced food price increases between 25%– 79%. The fiscal impact has also been substantial due to a reduction in tax revenue and the costs to fight Ebola (Ibid). Prior to Ebola outbreak, Liberia enjoyed a prolonged economic rebound since the war ended due to the resurgence of extractive and export crop industries. However, high unemployment in urban areas and poor road access and agricultural yields in rural areas had kept most Liberians in poverty.

3. MATERIALS AND METHODS

3.1 Materials

A semi structured questionnaire was prepared and circulated by the heads of the platform to assess the views farmers, support structures and farmer's organization on the level of adoption of SRI in their various communities in particular and the country in general.

3.2 Data collection

A multi-stage (3-stage) sampling technique was employed in the study. The first stage was the purposive selection of three counties (subdivision of the country) where farmers have been involved with the practice of the system of rice intensification (SRI) in Liberia since the practice was introduced into Liberia in 2012. The second stage involved a selection of convenient samples of communities where the SRI has purportedly been practiced by farmer over the past years, while the third stage involved a random selection of 50 respondents respectively from the selected SRI practicing communities to give a sample size of 200 respondents. Unfortunately, after data collection, only 169 questionnaires (169 respondents) were returned. Data analysis was based on the number of questionnaire received after data collection, data were thus obtained primarily from information gathered by the administering of semi-structured questionnaires. A focus group discussion was conducted with farmers who practiced the SRI and individual farmers were interviewed along with support organization and institution which were associated with practice of Sri in Liberia.

Prior to the conduct of interview, the interviewer firstly introduced him/herself and briefly explained the purpose of the study to the understanding of the respondent to arouse the interest of the interviewee to acquiesce to the interview process.

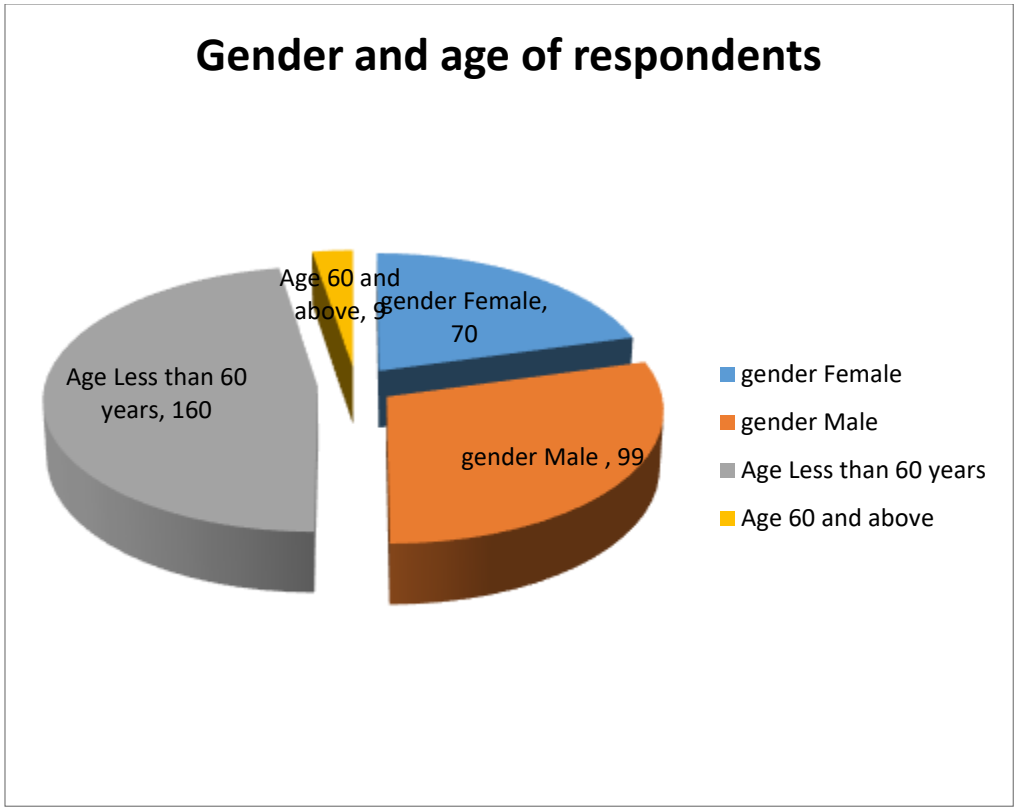

Figure 1. Individual farmer's survey

Another interview was conducted with available support structure actors who provided support to farmers in the adoption of SRI. A total of four support structures were interviewed based on their availability to respond to the questionnaire. Almost all the interview conducted with these structures was done via mobile phone and with employees of the structures as the heads of structures could not agree to sit through an interview due to their tight daily schedules. There are few structures currently implementing the SRI practices namely the national rice federation of Liberia (NRFL), the community of hope agriculture program (CHAP), the ministry of agriculture (MOA) extension department and the partly the Central Agricultural Research Program (CARI).

3.3 Data processing and analysis

Data collected from the field were entered into a well prepared data entry template in excel file and later exported into SPSS and then descriptive statistics such as frequency counts, percentages, crosstab were used in analysing the data. The level of adoption of SRI was tested by determining the number of adopters of the SRI principles in the country and number of principles adopted.

4. RESULTS

4.1 Socio-demographic characteristics of producers

The total number of farmers interviewed was 169, consisting of adopters and non-adopters (Table 1). Agriculture is the main occupation and livelihood strategy for most of the farming households in the study counties and districts. Majority of the farmers interviewed were males 104 (61.5%) and females were 65 (38.5%). Majority of the farmers were either youth/young farmers 15 (8.9%) below 30 years or young adults and adults 145 (85.8%) between the ages 30 and 60 years. Farmers in the retirement ages (60 years and above) were 9 (5.3%). Nine (9) of the sixteen tribes of Liberia were based in the target districts and farmers from each tribe was interviewed during the study. The most populated tribe in the four districts was the Kpelle tribe 69 farmer constituting 40.8% of the total number of respondents followed by Kissi 32 farmers constituting 18.93% of the total respondents.

The least ethnic group found in the study areas was kru tribe 2 farmers constituting 1.18 % of all the respondents. In terms of literacy, most of the farmers interviewed were either alphabetized in the local language or had no education at all 76 (44.97%). Farmer who attained primary level education were 47 (27.81%; secondary level 1 education were 31 farmers constituting 18.34%, while secondary level 2 and higher education were 6 (3.55%) and 9 (5.33%) respectively.

Understanding the socio-demographic characteristics of respondents/farmers is crucial to determining whether the researcher has actually reached target audience or whether the researcher is gathering the information being sought. Researchers have posited that socio-demographic characteristics may impact adherence by influencing an individual's ability to acquire knowledge, communicate effectively (Apter *et al*., 2003).

Table 1. Socio-demographic characteristics of producers

Municipalities / Region / provinces	Variables	Modalities	Number or size	Relative frequency (%)
	Sex	F	65	38.5
		M	104	61.5
	Age	<30 years	15	8.9
		30<age <60years	145	85.8
		>60 years	9	5.3
	Ethnic group	Kpelle	69	40.83
		Kissi	32	18.93
		Bassa	2	1.18
		Grebo	10	5.92
		Mandigo	8	4.73
		Lorma	20	11.83
		Kru	2	1.18
		Mano & Gio	9	5.33
		Gbandi	17	10.06
	Educational level	*Alphabetized in local language*	76	44.97
		Primary	47	27.81
		Secondary Level 1	31	18.34
		Secondary Level 2	6	3.55
		High school	9	5.33
		Koranic school	0	0

The result presented in Table 2 shows that majority (102) of the respondents has not been exposed to any agriculture vocational training, but may have had some other training in agriculture, while a few farmer/respondent (67) had some exposure to vocational education.

Vocational training, especially agricultural vocational training is quite necessary to turn the farmers and other actors in the agriculture and food system into experienced businesspersons to efficiently run their farms or businesses as economic and productive sustainable enterprises. This vocational program can either be secondary or post-secondary in nature, and

in most cases it can focus on direct training for groups of farmers or training for individual farmers, but is also important in building the capacity of organizations and individuals to transmit and adapt new applications of existing information, new products and processes, and new organizational cultures and behaviours.

Table 2. Farmer's exposure to agricultural vocational training

Response category	Frequency	Percent
no	102	60.4
yes	67	39.6
Total	169	100

The membership of farmers both SRI adopter and non-adopters in the study areas are presented in Table 3 below. The result of the analysis performed on farmer membership showed that 70 percent of the farmer belonged to a farmer organization while 30 percent had no membership with any farmer organization. However, the membership of the organization varied among the various study locations (counties). A descriptive statistics and chi square test was conducted to describe the membership of the farmers in each county and to verify the significant level of association among locations and farmers' membership with a farmer organization. The difference in belonging to a farmer organization was significant associated with farmer's exposure to vocational training per county (X^2= 8.74, P <0 0.03). Uphoff (1986) reported that farmer organization attempt to influence institutional environment to create conduction conducive for success and that of it members. This indicates that there were signification association among the three counties in terms of the farmer membership of an organization and the location of the organization within the country.

Membership in a farmers organization generally contributes to the likelihood of a farmer receiving information about various available technologies and good farming practices (Water resource management, transplanting of seedlings at early age, mechanical weeding, etc) from a household belonging to that group or from the extension service providers in the area; therefore, membership in a farmers organization helps to reduce the likelihood that such information is obtained from informal sources. This result is in agreement with Kumar *et. al*., (2020) who argued that information gathering rom more formal sources is associated with greater exposure to demonstrations or training and membership in farmers groups or cooperatives. Additionally, the current distribution of extension staff in Liberia largely depends on the several factors, the location of the county and the accessibility of various

districts within the county as most of the activities of ministry are arranged in these accessible counties, and Montserrado and Bong are more accessible counties compared to Lofa county where most of the food is provide in Liberia.

Table 3: Membership of a farmers' organization (FO)

Membership of FOs							
		Bong	**Lofa**	**Montserrado**	**Percent**	**X^2**	**p-value**
Belonging to a farmer organization	No	17	24	9	30%	8.74	P < 0.03
	Yes	43	36	40	70%		
Total		60	59	50	100%		

Table 4 reports the frequency and percent of the group characteristics/membership. Participation as group member is very high; 60.95% of the members in our sample participated as members only, while 24.26% of the of our sample did not participate in any group activities. In terms of occupying a responsible position, 5.33% of the members occupied the leading position (Chairman) while the remaining members served as advisor (4.73%), supervisor (2.37%), and secretary (1.18%) respectively. The positions least available in the group were assistant head (.59%), treasurer (0.59%). A description statistics and chi square test conducted to describe the responsible position and the demographic characteristic of the respondents and to validate the significant association between the FO and socio-demographic characteristics, revealed that the differences between responsible position in FO and Socio-demographic characteristics was significant for farmer age (X^2= 664.5; P<0.00). In many cultures of today like the Liberian culture, many people see experience as a function of age to the extent that a familiar quotation in Liberia that says that the "there is wisdom in white hair", because age is an important factor that determine the style of leadership of any organization.

Table 4. Responsible position in the FO

			Age*Responsible position	
Category of membership	**Frequency**	**Percent**	X^2	P-value
Member	103	60.95	664.5	P < 0.00
No	41	24.26		
Advisor	8	4.73		

Assistant head	1	0.59		
Chairman	9	5.33		
Supervisor	4	2.37		
Treasurer	1	0.59		
Secretary	2	1.18		

It is clearly shown in Table 4.4.1 that fewer farmers' organization had membership or affiliation with national associations. Out of the 169 farmers interviewed, 102 (60%) had no affiliation with a national association while only 67 (40%) had affiliation with national association.

Table 5. Affiliation of the FO to the national association of rice growers

Response	Frequency	Percent
no	102	0.60
yes	67	0.40
Total	172	100

4.2 Adoption of SRI by producers in Liberia

Adoption of a particular technology such as the SRI system of cultivation is a complete process of making use of the recommended practices by the extension services providers. The extension and advisory service agents is responsible not only to disseminate improved farm techniques to farmers but also to make new farming methods adopted by the farmers in order to ensure an increase in productivity. Meanwhile during this study, effort was made to assess the level/extent of adoption of the SRI cultivation practices by farmers in the study areas as presented in table 6. The frequency distribution of adoption level of the SRI practices obtained from the study, the category of adoption and percent of respondents are presented in Table 6 below.

From the table below, it can be observed that majority of the respondents (62.72 percent) had high level of adoption in the cultivation of paddy under the SRI method, 10.06 percent of the respondents had come under medium level of adoption while 5.33 percent of the respondents

had low level of adoption of the SRI practices in the study areas. The high level of adoption by most of the respondents might be due to their higher knowledge level on the recommended practices, better extension and advisory services and higher motivation due to the profitability of the practices.

Table 6 Distribution of respondents according to their adoption level

No of practices adopted by farmer	Category	frequency	percent
2	High	106	62.72
none	no adoption	37	21.89
1	medium	17	10.06
3	low	9	5.33

4.2.1. Practice of rice cultivation

The practices of rice cultivation as presented in table 7 shows the years of experience of all respondents, and the result of the analysis indicates that most of the farmer were older farmers and had more experience in rice cultivation in the lowland ecology. The result from the analysis reveals that the adoption of the SRI practices had a positive relationship with the experiences of farmer in rice cultivation as indicated by the significant relationship between variables (X^2 = 597.3; P = 0.00. Older farmers or those farmers who had been in rice cultivation for many years seemed to be more enthusiastic about adopting SRI practice as evident from the positive and statistically significant relationship between the variable (experience in agriculture and the different combinations/practices of SRI).

Previous studies have shown that older farmers are more experienced and might have accumulated greater physical and social capital (Kassie *et al*., 2013) that enhances their adoption of new technologies faster than younger or less experienced farmer. Therefore the findings from the current analysis are consistent with the finding of Nyambose and Jumbe (2013), who argued that "adoption of the technology by the older farmers may be attributable to the fact that older people may have had better access to resources, coupled with experience and knowledge that had been gained over time compared to younger farmers."

Table 7. Practice of rice cultivation

Farmer's year of experience in rice cultivation	Frequency	percent
Between 5 and 10 years	61	36.09
Less than 5 years	30	17.75
More than 10 years	78	46.15
Total	**169**	**100.00**

4.2.2. Principles of SRI

The System of Rice Intensification (SRI) is a unique innovation in that the productivity of four factors of production land, labour, capital and water can be increased at the same time, not requiring trade-offs. The first thing to stress is that SRI is a combination of practices that need to be used with appropriate adaptation to local conditions, and practices that have synergistic effect on one another. The extent and mechanisms of such synergy have not been well studied, so what is reported here comes mostly from observation, though there are some thesis research projects that have given some precise and systematic measurements, which support what has been observed.

The result from the study on the level of adoption of SRI practices revealed that all **six principles of the SRI system were adopted by farmers in various combinations**; Plant spacing and planting at early age received the highest percentage of adoption (33.14%), followed by planting at early age (11.83%). The result also revealed that 23.08% of the respondent were non-adopters of the SRI principles, which indicates that those rice farmers have never heard of or being involved with the practice of SRI in their various rice fields or communities. Despite the many advantages of SRI technology, the extent of its spread or dissemination in Liberia still remains insignificant in many of the counties in Liberia due to high input costs and labour expenses and the limited number of extension staff assigned in the various counties. At present the ratio of extension staff to farmers in Liberia is one extension officer to three thousand, three hundred and thirty-three farmers (1:3333), which makes the dissemination of innovation and technologies very difficult if not impossible. One key thing to understand is that most of the farmers who adopt the SRI principles tend to practice it on only part of their rice land, they only partly follow the principles when they are taught, but they hardly improve their practices following their initial experience unless further training or

intensive follow-up occurs by extension agents or the national platform actors. The report is confirmed by the work of Christopher *et, al*, 2021. Table of constraints to be inserted.

Table 8. Adopting the Principles of SRI

SRI Practices adopted by farmers	Frequency	Percent
Plant Spacing & Plant age	56	33.14
Mechanical weeding	3	1.78
Organic manure & Plant age	14	8.28
organic manure, spacing & planting age	4	2.37
Plant spacing & use organic manure	11	6.51
Transplanting early, plant age & use of organic	2	1.18
water application	3	1.78
water application & plant age	2	1.18
Mechanical weeding & use organic manure	2	1.18
Plant age only	20	11.83
Spacing only	6	3.55
No Practice at all	39	23.08
plant age, plant spacing, and transplanting 1 seedling per hill	1	0.59
plant age, plant spacing, & mechanical weeding	2	1.18
plant age, weeding	4	2.37

4.2.3. Suggestions for improving practices and increasing the level of adoption of SRI in Liberia

Table 9 presents the recommendations and suggestion advanced by farmers for the enrichment of the SRI adoption in Liberia. Most of the respondent's/rice farmer believed/suggested that more training of farmers, access to credit or loan and government support for farming tools would enhance the practice of SRI and its subsequent adoption in Liberia. Out of the 169 rice farmer interviewed 56 (33.14 %) suggested the provision of more training for farmers as the best way of increasing the level of adoption of the SRI system in Liberia, while access to loan 42 (24.85%) and government support for agricultural tool 30 (17.75%) were suggested respectively as the second and third most effective ways of increasing the adoption SRI Liberia. These suggestions should influence the crafting of government policies to promote the SRI cultivation in Liberia**.**

Table 9 Suggestions for improving practices SRI in Liberia

Suggestions	Frequency	Percent
Provide planting material for farmers (improved seeds)	19	11.24
Provide more training for farmer	56	33.14
Provide financial support to farmer	8	4.73
Need access to loan	42	24.85
More awareness on SRI system	4	2.37
More trained technicians	7	4.14
Support farmers with tools	30	17.75
Don't know	3	1.78

4.2.4 Lessons Learned

- Farmers suggested the need for more awareness, however raising awareness and advocating for SRI adoption is more easily said than done. This process requires both patience and persistence and it has proved to be an important factor in the project's success.

  • Involving key actors from the start was will guarantee that SRI will be promoted and sustained beyond training periods

  • Establishing more field demonstrations with farmers full participation will enhance the adoption of the practice.

4.3 IMPLEMENTATION OF SRI BY FOS

There were nine (9) farmer organizations/groups interviewed during the study and each group's view on the practices of SRI was recorded and categorized accordingly.

4.3.1 Actions carried out on the SRI

Action taken by FOs varied among FOs to some extent based on the core function of the organization and most of the actions taken by FOs were very similar to that of the support structure. But by and large, most of the FOs undertook various training activities/programs aimed at building the capacities of their member and other farmers and introducing the practices of rice cultivation under the SRI. It was also observed that few FOS collaborated with the extension service department for the sustainable dissemination of principles and technologies of SRI to enhance the adoption of the practices among farmers. FOs boasted of

setting up demonstration sites to help fellow farmers understand the methods of applying the SRI practices in their various communities. Those demonstration plots/sites were set up parallel to farmer conventional practices and farmers were given hands-on practical drills on the six principles of SRI. The use of demonstration plots was a very useful group technique used for extension purposes. The purpose of using the demonstration method was to prove that the new practice (SRI) was superior to the conventional/traditional method being used currently by the farmers and to convince and motivate farmers to try out the new practice, and to set up the long-term teaching-learning situation for adoption.

4.3.2 Adoption of SRI

Farmers organizations identified three challenges they considered as barriers to the continuous practices of SRI by most adopters, these challenges include the relative advantage', 'complexity, and 'compatibility of the SRI principles.

4.3.3 Perception

The perceptions of farmers on the practices of SRI and its adoption is crucial in the promotion of best practices to address the needs of the farmers, and it may provide helps to extension officers to promote best measures that safe guide the farmer production within a given location. The study revealed that the perception of farmer groups focused basically on barriers/challenges to the adoption of SRI (advantages and complexity).

4.4.3.2 Complexity (the complexity of SRI as mentioned as mentioned by FOs):

4.4.3.2.1 Use of machinery

One participant (farmer) revealed that rice farming in Liberia faces a lack of machine and if available the skills of operating such machine is limited. The power tiller is an important piece of machinery during tillage preparation before the planting season, but most farmers stated that they had to endure the drudgery of manually preparing their land for planting.

4.4.3.2.2 Technical difficulties

As SRI is a new farming technique, some technical instructions are difficult for farmers to adopt, such as planting seeds in a tray, shallow planting, and land preparation. Previous farming practices applied deep planting, planting seedlings aged greater than 15 days, and

planting two or more plants per hole. Some respondents mentioned that these SRI practices may become barriers to farmers continuing to adopt SRI.

4.4.3.2.3 Weeds and pests.

Two farmers (a male in montserrado and a female in Bong counties) mentioned that they face problems with weeds and another in Lofa county mentioned that birds are attracted to her rice due to the attractiveness of the plant during the productive growth stages. The SRI system involves cultivating rice with wide spacing between plants, organic fertilizer, and less water, and this results in the rapid growth of weeds and vigorous growth of plants. Farmers may need to use labor to reduce weedy plants and manage birds, causing an increase in production costs. When birds feed on the grains of plants, they reduce farmer's total potential harvest. Most farmers are unable to obtain mechanical weeders to manage weeds in their plot, worse of all, there is strict restriction by the environmental protection agency on the use of birds nets in rice fields across the country. This supposedly creates an obstacle to continuing to adopt SRI.

4.4.3.2.4 Organic matter

One elderly man mentioned that there are few field schools and little training in making organic fertilizer and pesticides to increase farmers' skills and capacity concerning organic farming; this was another reason to discontinue the SRI practices.

4.3.4 Prospect for SRI

The practice of SRI in Liberia has a lot of prospects, and many farmers undertaking the practice clearly understand that the practice has more advantages over the conventional methods. Most farmers currently involved with practice are farmers receiving support from various projects and the question remains "what happens after the closure of these projects"? The FOs mentioned that most farmers adopt the SRI due to its relative advantage over convention methods, and more is needed to address concerns related to purported advantages of the system/method namely price production cost and yield.

4.3.4.1. Production costs

Many FOs agreed that SRI can provide greater income for farmers because the system reduces the production costs of chemical fertilizer, seed, and, in some cases, labor. However, some farmers mentioned that SRI is labor-intensive, particularly in terms of weeding, fertilization application, and water application activities. The production of compost is labor-intensive when SRI methods are applied. A farmer mentioned that "We need to hire more workers to control weeds due to the wide spaces between rows and the high use of organic fertilizer. The costs are high for us". Another challenge to farmers continuing SRI is that many workers are interested in working in the extractive industry rather than on farms. Most farmers agree that they use a fewer amount of seeds as compared to the conventional methods..

4.3.4.2 Yield

All adopters (previous or current) of SRI in the study areas disclosed that SRI gives a higher production level than conventional farming. The average yield per ha is 5-7-ton dry grain/ha higher than that of conventional systems, which is 3-5 tons' dry grain/ha. However, good results can be achieved if farmers used good seed varieties and apply good crop management practices. According to some farmers, they cannot afford high-quality seed and therefore they use the local varieties.

4.3.4.3. Price

The price of rice seems to be one of the most important considerations for farmers when deciding to adopt or not to adopt SRI practices. One farmer mentioned that he has less negotiating power in the local market. Farmer opined that due to technical skills required for the production of rice under SRI, the price of SRI rice should be higher than that of conventional rice methods.

One farmer mentioned that "Selling SRI Rice at a higher price is still difficult in the country due to low price of imported rice which is largely consumed by the population". The SRI rice prices are not significantly different from those of rice produced using a conventional farming system. The price of dry grain at the farmer level ranges from 20 USD to 21 USD for SRI rice and conventional rice.

4.4 IMPLEMENTATION OF THE SRI BY SUPPORT STRUCTURES

Each of these structures provides support to the practice and adoption of SRI in a completely different form and degree. CARI uses SRI in their research field to demonstrate its superiority to conventional farming while also providing training or training of trainers workshops for interested farmers and farmers from other structures on demand. The national Rice Federation of Liberia and the MOA work with individual rice producers and farmer's groups in the practice of SRI and also offer series of training to those farmers aimed at building their capacity to adopt the methods and upscale to other farmers. The CHAP as part of the national farmer union of Liberia (FUN) has established several rice plots across the country to pilot/demonstrate the SRI target project beneficiaries under the CHAP-sponsored programs.

4.4.1 Actions carried out on the SRI

Action taken by structure varied based on the core mandate or function. But by and large most of the structure undertook various training activities/program aimed at building the capacities of farmers and introducing the new methods of rice cultivation under the SRI. It was also observed that few structures maintained coordination with the extension service department for the sustainable dissemination of innovations and technologies that enhance the adoption or SRI among farmers. For the purpose of enhancing the capacity building process of the farmer under the SRI, various facilities are setup and used by the structures. Key among the facilities were demonstration sites where various practices/principles of SRI were showcased alongside farmer conventional practices and farmer were given hand-on practical drills on the six principles of SRI. The use if demonstration plots was a very good group techniques used for extension purposes. The purpose of using demonstration method was to prove that the new practice (SRI) was superior to the conventional/traditional method being used currently by the farmers, and to convince and motivate farmers to try out the new practice, and to set up long-term teaching-learning situation for adoption.

4.4.2 Adoption of SRI

Support structures considered the adoption of SRI as a key priority area that could yield huge dividends in addressing the food security and nutrition crises in the country due to its high production, less stress on the environment, and efficient management of water and inputs. However, adoption could be hindered if the issue of compatibility is not adequately addressed, for example, the farmer's condition and attitude.

4.4.2.1 Personal condition

It has been observed by few structures (non-governmental) that the low motivation of farmers is one of the difficulties to the complete adoption of SRI by the farmer. It was mentioned that most farmers who attend SRI training programs do not continue to practice SRI beyond the training period due to the lack of support or incentives to continue/upscale the practice. They believe that this system does not promise high short-term benefits during the application, but a culture of instant results among farmers is often mentioned by farmers and serves to demotivate them.

4.4.2.2 Farmers' attitudes

The adoption of SRI helps to changes farmer's attitudes toward the practice of rice cultivation. Farming was normally considered a daily habit, but then when a farmer participates in SRI activities they began to learn about record keeping, farming as a business, water application and land ownership. They also started to classify organic and inorganic waste to process it into compost. If farmers are adequately encouraged to stay on, they could drop the practice and return to business as usual.

4.4.3 Perceptions of SR

The general perception gathered from the structures on the practices of SRI and its adoption are essential to the promotion of best practices that address the needs of the farmers, and it may provide helps to extension officers to promote best measures that safe guide the farmer production within a given location.

4.4.4 Perspectives of SRI

Reports from the structure indicated that SRI methods reportedly increased the productivity of farmers. However, farmers in Liberia are practicing the SRI method on smallholder farms without adequate mechanization to reduce labor requirements. The report revealed that one important barrier to SRI concepts and techniques has been, mental since SRI requires new ways of thinking rather than the use of costly new inputs. Moreover, the concept requires sufficient water control to avoid continuous flooding of rice fields. It was reported by the

structures the most farmer thinks that SRI is more labor-intensive, but the additional labor time is mostly required for learning the new methods.

The adoption of the SRI method in rice production by farmers is not as easy as one thinks because most of the restrictions on adoption come not only from the farmer side but sometimes from government officials who do not fully understand the principles of SRI. So to change the culture of rice cultivation from flooding fields planting of older seedlings to a new method like cultivating on moist soil and planting young seedlings using wider spacing is not an easy concept to accept by many farmers. Luckily, there are almost always some farmers in these communities who may welcome the idea and practice it. Therefore, active participation of all stakeholders is necessary and encouraged for the adoption of SRI by more farmers.

5.0 CONCLUSION

The system of rice intensification has since been introduced into Liberia in 2012, however, the level of adoption and diffusion of the technology has not been established empirically. Various communities in the country have participated and farmer's organizations and institutions have all admitted knowing the practice in the country. Farmers who have participated in pieces of training and workshops intended for capacity building, have in most cases acquired the knowledge, but failed to continue the practice, due to factors such as low or lack of motivation and personal conditions. Although FOs and support structures have contributed in diverse ways to disseminate information on the importance of the practice, the level of adoption is still low, and only a few professional institutions have at some point in time actively supported the practice. Farmers have mentioned various constraints which are reasons why the rate of adoption is low in-country namely lack of farming tools, lack of trained technicians, no access to loan/credit, cost of labor, and lack of machines for weed control. Additionally, the competitiveness of SRI products on the local markets seems to be low and the culture of instant results among farmers as often mentioned by farmers tends to serve as a demotivating factor to the continual practice of the SRI in the country.

5.1 RECOMMENDATIONS

- With all hands on deck, the active participation of all stakeholders is necessary and encouraged for the adoption of SRI by more farmers.

- The continued participation of relevant stakeholders and support to agriculture will not only motivate active farmers but will attract more farmers to the sector and expand rice cultivation across the country.

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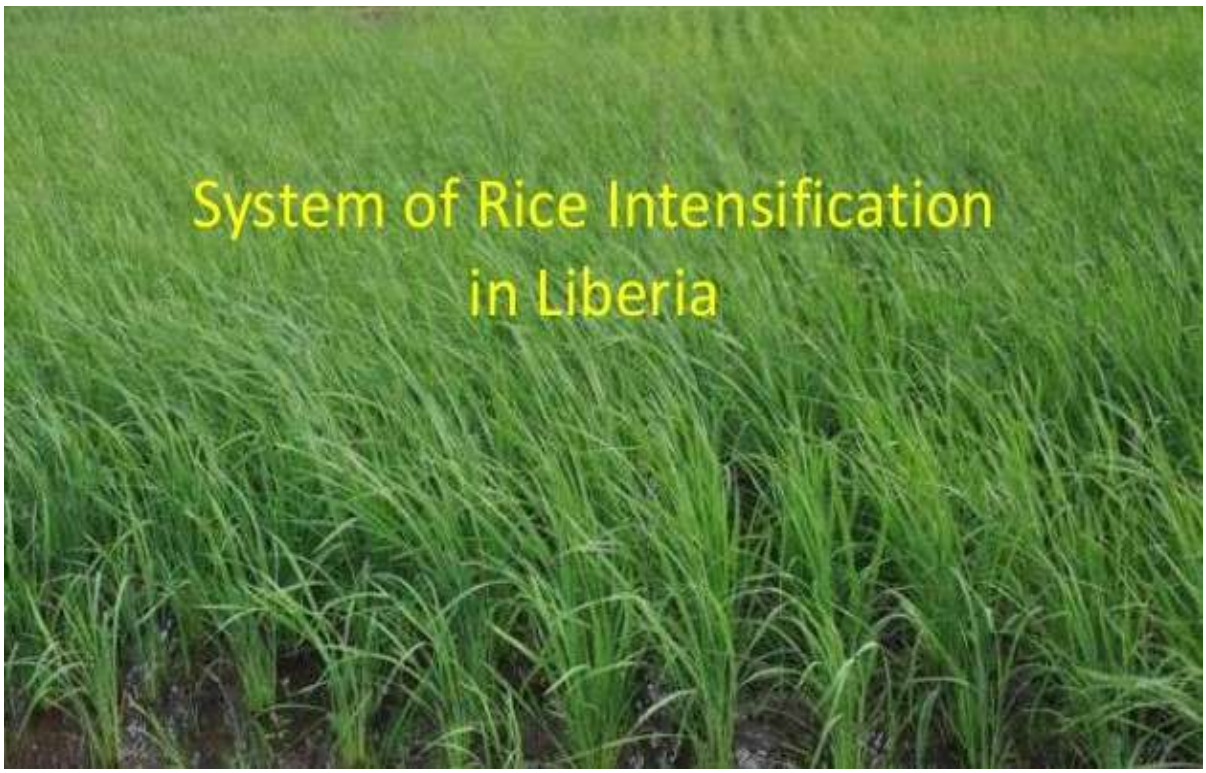
Appendix 1 Relationship between marital status and organization membership

FO's Affiliation status		Marital status of respondent				Total		
	Response	Single	Married	Divorced	Widow		X^2	P-value
FO affiliation with national association of rice growers	No	21	78	1	5	105	8.97	0.030
	Yes	26	35	0	3	64		
Total		47	113	1	8	169		

Appendix 2. Interview with a rice farmer in Garmue town, Bong County



Appendix 3. SRI farm in Liberia

Appendix 4. Data collection in Suakoko Town Bong County

Appendix 5.. Focus group discussion in Bellemu Town Bong County