CSA practices that need to be scaled up in the Western Region

1. Preparation of farmland by less disturbance of the soil by farmers in the region.
2. Diversify soil biota by using intercropping and crop rotation.
3. Ensure that much of the soil of the farmland is covered as much as possible using cover crops, mulching.
4. Application of poultry/pig manure and/or compost to farmland as sources of fertilizer to enhance soil organic matter increase, carbon sequestration in soil.

Agroforestry

Agroforestry is an integrated approach of using the interactive benefits from combining trees and/or shrubs with crops and/or livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy and sustainable land use systems.

Agroforestry systems could be advantageous over conventional agricultural and forest production methods through increased productivity, economic benefits, social outcomes and the ecological goods and services provided. Biodiversity in agroforestry systems is typically higher than in conventional agricultural systems. Agroforestry incorporates at least several plant species into a given land area and creates a more complex habitat that could support a wider variety of birds, insects, and other animals. Agroforestry also has the potential to help reduce climate change since trees take up and store carbon at a faster rate than crop plants.

Agroforestry is the concept of multiple use of land with multipurpose tree species and this concept has become immensely important in the agriculture and forestry sectors.

Reasons for increased productivity under agroforestry

1. Greater efficiency of tree species for photosynthesis.
2. Improved soil structure and fertility with increasing effects on crop yield.

3. Reduce losses from soil erosion and more closed cycling of organic matter and nutrients.
4. Creating better micro climatic conditions for the growth of agricultural crops.

Principles of Agroforestry
Agroforestry is one of the sources of Carbon Sinks

Land-management actions for farming that enhance the uptake of CO_2 or reduce its emissions have the potential to remove a significant amount of CO_2 from the atmosphere if the trees are harvested, accompanied by regeneration of the area, and sequestered carbon is locked through non-destructive (non-CO_2 emitting) use of wood.

Carbon management through afforestation and reforestation in degraded natural forests is an useful option, -but agroforestry is attractive because:

1. it sequesters carbon in vegetation and possibly in soils depending on the pre-conversion soil C;
2. the more intensive use of land for agricultural production reduces the need for slash and burn or shifting cultivation, which contributes to deforestation;
3. the wood products produced under agroforestry serve as a substitute for similar products unsustainably harvested from the natural forest and
4. to the extent that agroforestry increases the income of farmers, it reduces the incentive for further extraction from the natural forest for income augmentation.
5. Agroforestry also enhances soil fertility and water use efficiency, conserves biodiversity, promote biological pest management, and contribute to poverty reduction and food security.

In Bomi, Gbarpolu and Grand Cape Mount Counties, tree crops such as oil palm, cocoa and rubber are cultivated there and need to be further spread in that region.

Climate Smart Agriculture (CSA) in Liberia

FACT SHEET

CSA Technologies/Practices Adopted and Used by some smallholder farmers in Bomi, Grand Cape & Gbarpolu Counties

LIBERIA

Liberia is situated on 9.8 million hectares (ha) of land space. Land area available in the country for farming is estimated at 41% of the total land space or 4.02 million ha. Of this arable land space 600,000 hectares is lowland.

Farming practices in Liberia is predominantly subsistence in nature, rainfall dependent, where the smallholder farmers practice shifting cultivation using small hand tools as well as unimproved local seeds as planting materials, resulting into low agricultural production and productivity. Yield of agriculture enterprises is always low. For example, the yield of improved rice varieties cultivating in the country is around 3 tonne/ha.

Liberia staple food crops: Rice and cassava
Tree crops: Rubber, cocoa, oil palm and coffee.

2008 National Population and Housing Census (NPHC) recorded number of farming households at 670,295. Disaggregated into crop farming households (287,300) and livestock farming households (2,650).

CLIMATE CHANGE PHENOMENA IN LIBERIA

Liberia is among nations around the world experiencing climate variability and change over the last seven (7) decades. For instance, experts have observed in Liberia that mean annual temperature has increased by 0.8°C between 1960 and 2006 with an average rate of 0.18°C per decade (Bateman *et. al.*, 2000).

This increase in mean annual temperature and changes in other climatic parameters like prolong and erratic rainfall patterns, flooding, as well as storm are affecting the Liberia agriculture sector and consequently threaten the viability of farm production and productivity in many ways including diseases outbreaks, crop failure and reduced yield.

Farming depends on the weather and most farming practices are season-based. Moreover, Season is determined by certain weather patterns and climatic conditions. Changes in climatic conditions can have profound impacts on crop, animal and fish farming productivity.

CSA CONCEPT, DEFINITION AND ITS PRACTICES

CSA is that farming system that could also generate meaningful mitigation benefits by increasing carbon sinks, as well as reducing emissions per unit of agricultural product.

It is farming that sustainably increases productivity, enhances the resilience of livelihoods and ecosystems, reduces and/or removes greenhouse gases (GHGs) and enhances the achievement of national food security and development goals (FAO definition).

Climate-smart agriculture (CSA) is an integrated approach to address the interwoven challenges pose by food insecurity and climate change.

CSA Three Pillars
1. Mitigation
2. Adaptation
3. Productivity (MAP)

CSA Practices to increase productivity
1. Improve soil fertility and health
2. Soil water availability
3. Reduced loss of nutrient – rich topsoil

CSA Practices to Adaptation to climate change
1. Contour ploughing and/or tillage
2. Ridges
3. Surface mulching
4. Land terracing
5. Agroforestry

CSA Practices to Mitigate Greenhouse Gases Emissions
1. Organic matter addition to soil
2. Inclusion of tree crops in fields
3. Integrated soil fertility management
4. Irrigated paddy rice production using System of Rice Intensification (SRI)

Conservation Agriculture

Conservation Agriculture (CA) is based on three (3) principles. These principles include:
1. No soil disturbance by tilling (i.e. minimal or zero tillage)
2. Ensure that the soil is covered
3. Rotate crops

Farm lands cover 4.02 million ha in Liberia, ensuring the production of food, feed, fiber and rearing of livestock as well as fish farming. Conservation agriculture is the most widespread sustainable management practice to improve soil health and sequester Carbon. This CSA technology has been observed and adopted in some of the counties (Bomi, Grand Cape Mount, Gbarpolu) in Liberia.

However, conventional tillage is still the predominant farmland preparation method adopted in Liberia farming system. Therefore, the adoption of conservation agriculture must be promoted to deliver multiple benefits, such as:

1. Preventing soil disturbance through minimal or zero tillage, mitigating soil CO_2 emissions to the atmosphere;
2. Protecting soil surface with crop residues such as mulching, reducing soil erosion and enhancing soil health and soil C sequestration by applying compost and/or manure to cultivated land as source of fertilizer, soil amendment and increased soil organic matter;
3. Introducing cover crops to improve soil biodiversity, soil health and increase soil C stocks in degraded farmland by 2030;
4. Reducing applications of synthetic fertilizer and pesticides as well as reduced emission of methane, nitrous oxide and CO_2 by using SRI;
5. Scaling up/out conservation agriculture to 50% of the current area cultivated with the main annual staple crops such as rice, cassava, corn, and vegetable, Liberia with large area of land cover with forest has the potential to sink and sequester quantity of Carbon over some 20 to 50 years.